

Specifications for

**WOOSTER CITY SCHOOLS AND
BOYS & GIRLS CLUB OF WOOSTER
EDGEWOOD MIDDLE SCHOOL ADDITION**

**2695 Graustark Path
Wooster, Ohio 44691**

by

Wooster City School District

**144 North Market Street
Wooster, Ohio 44691**

Prepared by:



A r c h i t e c t s , I n c .

1020 Goodale Boulevard
Columbus, Ohio 43212
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**WOOSTER CITY SCHOOLS AND
BOYS & GIRLS CLUB OF WOOSTER
EDGEWOOD MIDDLE SCHOOL ADDITION
2695 Graustark Path
Wooster, Ohio 44691**

for

WOOSTER CITY SCHOOLS
144 North Market Street
Wooster, Ohio 44691

PROJECT DIRECTORY

Owner:

Wooster City School District
144 North Market Street
Wooster, Ohio 44691

Phone: 330 262-9616 Ext 1501

Fax: 330 262-0937

E-mail: wstr_mfoore@woostercityschools.org

Contact: ***Mike Foore, Manager of Building and Grounds***

Architect:



A r c h i t e c t s , I n c .
1020 goodale boulevard
columbus, ohio 43212

Phone: 614 447-9770

Fax: 614 447-9775

E-mail: mjv@bshm-architects.com

Contact: ***Byron H. Manchester, AIA, LEED AP***

MEPT Engineers:

Karpinski Engineering
13714 Cleveland Avenue NW
Unitontown, Ohio 44685

Phone: 330 699-4077

Fax: 330 699-4005

Electrical Contact: **Jeremy Bower, P.E.**
E-mail: jbowers@karpinskieng.com

Mechanical Contact: **Joel Schulabach**
E-mail: jschlabach@karpinskieng.com

Civil Engineer: **Engineering Associates**
1935 Eagle Pass
Wooster, OH 44691

Phone: 330 345-6556

Structural Engineer: **Jezerinac Geers**
5640 Frantz Road
Dublin, OH 43017

Phone 614 766-0066

LEGAL NOTICE

Sealed bids for furnishing all labor, material and equipment necessary for and incidental to the construction of:

**WOOSTER CITY SCHOOLS AND
BOYS & GIRLS CLUB OF WOOSTER
EDGEWOOD MIDDLE SCHOOL ADDITION
2695 Graustark Path
Wooster, Ohio 44691**

will be received by the Treasurer of the Board of Education, Wooster City School District, 144 North Market Street, Wooster, Ohio 44691, until **12:00 noon**, local time, **Friday, May 22, 2015**, where bids will be publicly opened and read aloud by the Treasurer.

Bids will be received for:

General Contractor (includes General Trades, Plumbing, HVAC and Electrical Construction) all Trades

Each bid must be accompanied by a Combination Bid Guaranty and Contract Bond in the sum of 100% of the amount of the Base Bid and all Alternates.

The attention of bidders is also directed to the Equal Employment Opportunity regulations which are applicable to this project.

The Bid Documents, including Drawings and Specifications, will be available for examination to prospective bidders and other interested parties at the office of the Treasurer, but not to be removed. Copies of Bid Documents may be picked up at the Printer, **ARC - Document Solutions**, 1159 Dublin Road, Columbus, Ohio 43215 (614) 224-5149, or can be shipped upon request after receipt of deposit (each Plan Holder is responsible for their own shipping fees). Responsible Contractors may obtain documents upon **\$50.00 deposit** (made payable to BSHM Architects), which deposit will be refunded to **PRIME CONTRACTORS only**, who submit a bid and who return documents to the Architect: **BSHM Architects, Inc.**, 1020 Goodale Blvd., Columbus, Ohio 43212 within ten (10) days of opening of bids, if same are in good and non-mutilated condition.

If, in the opinion of the Owner or his/her delegated representative, the acceptance of the lowest bid is not in the best interest of the Owner, the Owner may accept another proposal so opened or reject all proposals and advertise for other bids. No bid may be withdrawn for a period of 60 days after closing time for receipt of bids.

The Board Reserves the right to accept or reject any or all bids, to waive any informalities in bidding and to accept any bid deemed most favorable to the School District.

A Pre-Bid meeting will be conducted at the job site, 2695 Graustark Path, Wooster, Ohio 44691 **Tuesday, May 12, 2015, at 3:30 pm.**

Bonnie West, Treasurer
Wooster City Schools

Advertise: May 5, and May 12, 2015

1 INSTRUCTIONS TO BIDDERS

2
3
4 PART 1 - SCOPE OF WORK

5
6 Before submitting a proposal, bidders should carefully examine drawings and specifications, visit
7 the site, fully inform themselves of all existing conditions and limitations, and shall include in the
8 proposal a sum to cover the cost of all items made necessary by existing conditions and limitations.
9 No allowance whatsoever will be made due to bidder's failure to avail himself of pertinent
10 information, nor shall such failure in any way relieve successful bidder from furnishing materials or
11 performing work required to comply with intent of documents.

12
13 Proposals shall be received for:

14
15 **General Contractor (includes General Trades, Plumbing, HVAC and Electrical**
16 **Construction) all Trades**

17
18
19 PART 2 - INQUIRIES AND ADDENDA

20
21 Should a bidder find discrepancies in, or omissions from, drawings or specifications, or should
22 he/she be in doubt as to their meaning, he/she should at once write/fax/e-mail the Architect who
23 will send written instructions to all bidders. Neither the Owner nor the Architect will be responsible
24 for any oral instructions.

25
26 **The Architect will receive written, faxed and e-mailed inquiries on drawings and**
27 **specifications until five (5) days (weekends and holidays excluded) prior to the Bid Due Date,**
28 **no exceptions.** All addenda will be issued to bidders no later than three (3) days prior to the bid
29 due date. For the purpose of this project "issued" is defined as being sent out by parcel post or sent
30 by fax (with a valid transmittal indicating that the fax was received) or e-mail (with response
31 indicating that the e-mail was received.) Proposers are to provide at the time of the Pre-Bid
32 meeting, a contact person's phone number, fax number and e-mail address of the responsible
33 person who is to receive communications pertaining to Addendum Items.

34
35 All addenda issued during the time of bidding are to be covered in the proposal.

36
37
38 PART 3 - PROPOSALS

39
40 Proposals shall be made upon form provided by Architect and all applicable blank spaces shall be
41 fully filled; numbers shall be stated both in writing and figures; signature shall be by hand; and the
42 completed form shall be without interlineation, alterations or erasure.

43
44 The proposal shall include all items of labor, material and equipment to fully complete the project
45 as indicated on drawings and specifications.

46
47 Proposals shall be addressed to the Owner, and enclosed in an opaque envelope, sealed, marked
48 PROPOSAL, and bearing the title of the work and the name of the bidder.

1 Each proposal shall be properly signed as follows:
2

- 3 1) When a corporation, with the name of the corporation, signature of an officer or other
4 person properly authorized to enter into obligations for it, his/her title and the corporation
5 seal;
6
- 7 2) When a partnership, with the name of the partnership and signature of one of the partners;
8
- 9 3) When a sole proprietorship, with his/her signature.
10

11 A list of subcontractors shall be submitted prior to the start of construction. Any subcontractor
12 preparing a bid for performance of a portion of the work is advised that the final selection of
13 subcontractors is subject to the approval of the Architect, acting on behalf of the Owner.
14

15 The Owner reserves the right to reject any or all bids, to waive any informalities in the bidding, and
16 to choose the sole supplier of this equipment which he/she deems to be of the highest quality and
17 most consistent with his/her interests, regardless of cost.
18
19

20 PART 4 - COMBINATION BID GUARANTY AND CONTRACT BOND

21

22 A Bid Guaranty and Contract Bond in accordance with Chapter 153.57 of the Ohio Revised Code
23 in the amount of 100 percent of the total bid shall accompany each bid or a bid security in the form
24 of a certified check, cashier's check, or letter of credit pursuant to Chapter 1305 of the Ohio Revised
25 Code in the amount of 10 percent of the total bid shall accompany each bid.
26

27 Each successful bidder is required to furnish a Performance Bond and Labor and Material Payment
28 Bond from an acceptable surety in the amount of 100 percent of the full contract amount in
29 accordance with Section 153.57 of the Ohio Revised Code if a bid security in the amount of 10
30 percent of the full bid amount as specified above is submitted in lieu of the Bid Guaranty and
31 Contract Bond of 100 percent above.
32

33 No bid may be withdrawn after the scheduled closing time for receipt of bids for at least sixty (60)
34 days.
35

36 The surety company furnishing bonds shall be licensed to do business in the State of Ohio, and the
37 form of Combination Bid Guaranty and Contract Bond shall conform with the requirements of that
38 State.
39

40 The bond shall provide, in addition to other requirements, that any person who has furnished labor
41 or material in the prosecution of the work shall have a direct right of action against the surety
42 company furnishing the bond, provided the action is instituted within a reasonable time. The bond
43 must afford the persons furnishing either labor or material a reasonable time in which to notify the
44 surety of their claim.
45

46 PART 5 - PERSONAL PROPERTY TAX CERTIFICATE 47 48

1 The successful bidder will be required to complete and submit the Personal Property Tax Certificate
2 provided in this specification, prior to commencement of work.
3
4

5 PART 6 - NON COLLUSION AFFIDAVIT
6

7 Each bidder is required to complete and submit, with the form of proposal at time of bid, the Non
8 Collusion Affidavit provided in this Specification.
9

10
11 PART 7 - DETERMINATION OF LOWEST RESPONSIBLE BID
12

13 Subject to the right of the Owner to reject each and every bid, the Owner will award the Contract
14 for the Work to the bidder submitting the **lowest responsible** Base Bid plus Alternates as selected
15 by the Owner. In determining which bid is the **lowest responsible** bid, The Owner may take into
16 consideration not only the amount of the bid but such of the following criteria as it, in its discretion,
17 deems appropriate and may give such weight thereto as it deems appropriate:
18

- 19 a) The bidder's financial ability to complete the Contract successfully without resort to
20 its Surety;
- 21
22 b) The bidder's prior experience with similar work on comparable or more complex
23 projects;
- 24
25 c) The bidder's prior history for the successful and timely completion of projects;
- 26
27 d) The bidder's equipment and facilities;
- 28
29 e) The adequacy, in numbers and experience, of the bidder's work force to complete
30 the Contract successfully.
- 31
32 f) The bidder's demonstrated ability to complete its work on previous projects in
33 accordance with the Contract Documents and on time;
- 34
35 g) The bidder's prior experience on other projects of the Owner or other institutions.
- 36
37 h) The bidder's compliance with federal, state, and local laws, rules, and regulations.
- 38
39 i) Depending upon the type of work, other essential factors.
40

41 Bidders must submit on his/her own letterhead a minimum of five references for completed projects
42 similar in size, scope and construction cost. List name and phone number of contact person. The
43 references must be submitted to the Owner within five (5) days after a request for references is
44 received. The failure to submit requested information on a timely basis may result in the
45 determination that the bidder is not responsible. If an apparent low bidder is found not to be
46 responsive or responsible the bidder shall be notified by the Owner of that finding and the reasons
47 for it. The notification shall be given in writing and by certified mail.
48

1 If the apparent low bidder chooses to protest the Owner's decision a notice shall be forwarded to
2 the Owner. The notification shall be given in writing and by certified mail. The notification shall be
3 received by the Owner within five (5) days (excluding weekends and holidays) after receipt of the
4 Owner's decision.

5
6
7 PART 8 - FORM OF CONTRACT
8

9 Bidders who are to be awarded a contract shall be required to enter into a contract using the
10 Standard AIA Form A101 (2007 Edition). A copy of this contract is available in the office of the
11 Architect and each bidder is advised to review this document carefully.
12

13
14 PART 9 - PROGRESS PAYMENTS
15

16 If satisfactory progress is being made, the Contractor will receive monthly payments of the value
17 of work and materials in place in accordance with the Ohio Revised Code, parts of which are as
18 follows:
19

20 Partial payments to the Contractor shall be made at the rate of 92% of estimates prepared by the
21 Contractor and approved by the Architect. All labor and materials after the job is 50% complete
22 shall be paid for at the rate of 100% of the estimates submitted and approved.
23

24 From the date the contract is 50% complete (computed by payments made), all retained funds will
25 be deposited in an escrow account.
26

27 Upon substantial completion (as defined in the General Conditions) and there exists no other
28 reason to withhold retainage, the retained funds will be released to the Contractor, withholding only
29 that amount necessary to assure completion. Funds in the escrow account not hereto with paid,
30 with accumulated interest, will be paid within 30 days from the date of completion or either
31 acceptance or occupancy.
32

33 Partial payments will be made within 30 days from the date of receipt by the Architect of the
34 Application.
35

36 Applications for Payment shall be made on standard AIA Form G-702 in triplicate. Forms shall be
37 provided by the Contractor.
38

39
40 PART 10 - PERMITS
41

42 Each Contractor shall be responsible for obtaining, applying for, and paying for all permits, fees and
43 inspections from municipal and authorities which are applicable to his/her work; and shall give all
44 notices required by law or municipal ordinance.
45

46
47 PART 11 - SITE INSPECTION
48

1 Bidders are encouraged to visit the project site to fully inform themselves of all existing conditions
2 and limitations. Contact **Mike Foore at (330) 262-9616 x 1501** to arrange a site inspection.
3

4
5 PART 12 - PRE BID MEETING
6

7 A pre-bid meeting will be held on **Tuesday, May 12, 2015, at 3:30 pm**. The meeting will be held
8 at the Wooster High School, Large Group Instruction Room, 515 Oldman Road, Wooster, Ohio
9 44691.
10

11
12 PART 13 - PREVAILING WAGE EXEMPTION
13

14 Senate Bill 102 effective on August 19, 1997, exempts the prevailing wage law on all public
15 improvements and construction undertaken by school districts; therefore, prevailing wages do not
16 have to be paid for work performed on or after August 19, 1997. The Contractor may elect to pay
17 prevailing wages, however, it is not a requirement of this bid package.
18

19
20
21 END OF INSTRUCTIONS TO BIDDERS

1 **FORM OF PROPOSAL**

2
3
4 To: **Wooster City School District**
5 **144 North Market Street**
6 **Wooster, Ohio 44691**

7
8 **NAME OF BIDDER:**
9 _____

10
11 Ladies and Gentlemen:

12
13 Having examined the Specifications and Drawings, entitled:

14
15 **WOOSTER CITY SCHOOLS AND**
16 **BOYS & GIRLS CLUB OF WOOSTER**
17 **EDGEWOOD MIDDLE SCHOOL ADDITION**
18 **2695 Graustark Path**
19 **Wooster, Ohio 44691**

20
21 prepared by BSHM ARCHITECTS INC., for the construction of said project, and having inspected
22 the site and any conditions affecting and governing the construction of the project, the undersigned
23 hereby proposes to furnish all material and to perform all labor as specified and described in the
24 Contract Documents for the following sum(s):

25
26
27 **BASE BID - GENERAL CONTRACTOR (INCLUDING GENERAL TRADES,**
28 **PLUMBING, HVAC, AND ELECTRICAL CONSTRUCTION) ALL TRADES**

29	Material	\$
30	_____	_____
31	Labor	\$
32	_____	_____
33	TOTAL	\$
34	_____	_____

35
36 **ALTERNATE A-1 - ENTRY CANOPY AND ASSOCIATED LIGHTING:**

37	ADD	\$
38	_____	_____

39
40
41 **ALTERNATE A-2 -BRICK VENEER RAMP:**

42	ADD	\$
43	_____	_____

44
45
46 **ALTERNATE A-3 - RUBBER TILE IN LIEU OF VCT:**

47	ADD	\$
48	_____	_____

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ALTERNATE A-4 - REPLACE FLOORING IN STUDENT DINING WITH RUBBER TILE:

ADD _____ \$ _____

ALTERNATE A-5 - NEW VESTIBULE ENTRY AT MIDDLE SCHOOL ENTRANCE:

ADD _____ \$ _____

ALTERNATE A-6 - PLAZA IMPROVEMENTS:

ADD _____ \$ _____

ALTERNATE A-7 - NEW ROOFTOP UNITS AND ASSOCIATED ELECTRICAL AND PLUMBING FOR LIBRARY AND CAFETERIA:

ADD _____ \$ _____

ALTERNATE A-8 - GRIND AND RESURFACE DRIVEWAY:

ADD _____ \$ _____

ALTERNATE A-9 - ENHANCED TECHNOLOGY:

ADD _____ \$ _____

ADDENDA: The undersigned acknowledges receipt of the following addenda:

Addendum No. _____ dated _____
Addendum No. _____ dated _____
Addendum No. _____ dated _____

1 **BID WITHDRAWAL**: No Bid may be withdrawn until 60 days after receipt of bids.

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Submitted by:

Name of Corporation/
Partnership/Owner _____

Name of President _____

Corporation organized under laws of _____

Manual signature _____

Typed signature _____

Address _____

Phone _____

Date _____

SUBSTITUTIONS

Bidder shall list any substitutions for which consideration is desired, showing the addition to or reduction in the Base Bid to be made for each, if the substitution is accepted, or stating 'No Change' if none is proposed.

BRAND, MAKE OR METHOD SPECIFIED	PROPOSED SUBSTITUTION	ADD	DEDUCT
---------------------------------	-----------------------	-----	--------

It is understood and agreed that the Proposal submitted is based on furnishing standards specified or their equals, and entitles the Owner to require that such materials and methods be incorporated in the work, except substitutions shown above which are accepted and subsequently made part of the written contract.

Signed _____

NON-COLLUSION AFFIDAVIT
(THIS AFFIDAVIT IS PART OF THE PROPOSAL)

State of Ohio)
County of _____)

Project _____ *

Affiant _____ **

being the first duly sworn, deposes and says that he/she is _____ ***

(sole owner, a partner, president, secretary, etc.) of _____ ****

the party making the foregoing bid; that such bid is not made in the interest of or on behalf of any undisclosed persons, partnership, company, association, organization or corporation; that such bid is genuine and not collusive or sham; that said bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that said bidder has not in any manner, directly or indirectly, sought by agreement, communication or conference with anyone to fix the bid price of said bidder or of any other bidder, or to fix any overhead, profit or cost element of such bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract or anyone interested in the proposed contract; that all statements contained in such bid are true; and, further, that said bidder has not, directly or indirectly, submitted his/her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid and will not pay any fee in connection therewith, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, or to any other individual except to such person or persons as have a partnership or other financial interest with said bidder in his general business.

CONTRACTOR

Signed

Title

Subscribed and sworn to before me this _____ day of _____, 20____.

Seal of Notary

- * Name of Project
- ** Print or type name of Affiant
- *** Print or type office (President, etc.) of Affiant
- **** Print or type name of firm submitting bid

BID GUARANTY AND CONTRACT BOND

(SECTION 153.571 Ohio Revised Code)

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned

(Here insert full name or legal title of Contractor and Address)

as Principal and

(Here insert full name or legal title of Surety)

as Surety, are hereby held and firmly bound unto

(Here insert full name or legal title of Owner)

hereinafter called the Obligee, in the penal sum of the dollar amount of the bid submitted by the Principal to the Obligee on ____ day of _____, 20__ to undertake the project know as:

(Here insert full name address and description of Project)

The penal sum referred to herein shall be the dollar amount of the Principal's bid to the Obligee, incorporating any add or deduct alternate proposals made by the Principal on the date referred to above to the Obligee, which are accepted by the Obligee. In no case the penal sum exceed the amount of

_____ (\$ _____)

(If the above line is left blank, the penal sum will be the full amount of the Principal's bid including alternates. Alternatively, if completed, the amount stated must not be less than the full amount of the bid, including alternates, in dollars and cents. A PERCENTAGE IS NOT ACCETABLE)

For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above named Principal has submitted a bid on the above referred to project;

NOW, THEREFORE, if the Obligee accepts the bid of the Principal and the Principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications, and bills of material; and in the event the principal pays to the Obligee the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid and such larger amount for which the Obligee may in good faith contract with the next lowest bidder to perform the work covered by the bid; of in the event the Obligee does not award the contract to the next lowest bidder and resubmits the project for bidding, the Principal will pay the Obligee the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid, or the costs, in connection with the re-submission, of printing new contract documents, required advertising and printing and mailing

notices to prospective bidders, whichever is less, than this obligation shall be null and void, otherwise to remain in full force and effect. If the Obligee accepts the bid of the Principal and the Principal in accordance with the bid, plans, details, specifications, and bills of material, which said contract is made part of this bond the same as though set forth herein; and

IF THE SAID Principal shall well and faithfully perform each and every condition of such contract; and indemnify the Obligee against all damage suffered by failure to perform such contract according to the provisions thereof and in accordance with the plans, details, specifications, and bills of material therefor; and shall pay all lawful claims of subcontractors, material-men, and laborers; for labor performed and materials furnished in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any material-man or laborer having a just claim, as well as for the Obligee herein; then this obligation shall be void; otherwise and the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

THE SAID Surety hereby stipulates and agrees that no modifications, omissions, or additions, in or to the terms of said contract or in or to the plans and specifications therefore shall in any wise affect the obligations of said Surety on this bond, and it does hereby waive notice of any such modifications, omissions or additions to the terms of the contract or to the work to the specifications.

SIGNED AND SEALED This _____ day of _____, 20 _____

PRINCIPAL:

By: _____

Title: _____

SURETY:

By: _____

Attorney-in-Fact

Surety Company Address:

Street

City, State, Zip

SURETY AGENT

Agency Name

Street

City, State, Zip

**CERTIFICATE OF COUNTY TREASURER THAT
PERSONAL PROPERTY TAXES OF CORPORATION HAVE BEEN PAID**

Ohio Revised Code Section 5719.042

The State of Ohio, _____ County, ss:

I, _____ Treasurer of said County, do hereby certify that
all personal property taxes assessed against

of _____
as of _____, 20 _____, have been paid.

WITNESS my official signature this _____ day of _____, 20____.

County Treasurer

Deputy

Personal Property Certificate to be completed by successful bidders only, for county in which project is located.

BIDDER'S CERTIFICATION

The Bidder hereby acknowledges that the following representations in this bid are material and not mere recitals:

1. Bidder has read and understands the Contract Documents and agrees to comply with all requirements of the Contract Documents, regardless of whether the Bidder has actual knowledge of the requirements and regardless of any statement or omission made by the Bidder which might indicate a contrary intention.
2. The Bidder represents that the bid is based upon the Standards specified by the Contract Documents.
3. The Bidder has visited the Project site, become familiar with local conditions and has correlated personal observations about the requirements of the Contract Documents. The Bidder has no outstanding questions regarding the interpretation of the Contract Documents.
4. The Bidder understands that the award of separate contracts for the Project will require sequential, coordinated and interrelated operations which may involve interference, disruption, hindrance or delay in the progress of the Bidder's Work. The Bidder agrees that the Contract price, as amended from time to time, shall cover all amounts due from the State resulting from interference, disruption, hindrance or delay caused by or between Contractors or their agents and employees.

The Bidder agrees that any such interference, disruption, hindrance or delay is within the contemplation of the Bidder and the State and that the Contractor's sole remedy for such interference, disruption, hindrance or delay shall be an extension of time in accordance with the Contract Documents. This provision is intended to be, and shall be construed as, consistent with and not in conflict with, Section 4113.62, ORC.

5. During the performance of the Contract, the Bidder agrees to comply with OAC Chapters 123:2-3 through 123:2-9 and agrees to incorporate the provisions contained in the Governor's January 27, 1972 Executive Order into all subcontracts on the Project, regardless of tier. The Bidder understands the State Equal Opportunity Center may conduct pre-award and post-award compliance reviews to determine if the Bidder maintains nondiscriminatory employment practices, maintains an affirmative action program and is exerting good faith efforts to accomplish the goals of the affirmative action program. For a full statement of the rules regarding Equal Employment Opportunity in the Construction Industry, see OAC Chapters 123:2-1 through 123:2-9.

The Bidder and each person signing on behalf of the Bidder certifies, and in the case of a joint or combined bid, each party thereto certifies as to such party's organization, under penalty of perjury, that to the best of the undersigned's knowledge and belief: (a) the Base Bid, any Unit Prices and any Alternate Bid in the bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition as to any matter relating to such Base Bid, Unit Prices or Alternate bid with any other Bidder; (b) unless otherwise required by law, the Base Bid, any Unit Prices and any Alternate bid in the bid have not been knowingly disclosed by the Bidder and will not

knowingly be disclosed by the Bidder prior to the bid opening, directly or indirectly, to any other Bidder who would have any interest in the Base Bid, Unit Prices or Alternate bid; (c) no attempt has been made or will be made by the Bidder to induce any other individual, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

7. Bidder will enter into and execute the Contract with the School District Board, if a Contract is awarded on the basis of this bid, and if the Bidder does not execute a Contract for any reason, other than as authorized by law, the Bidder and the Bidder's Surety are liable to the School District Board as provided in Article 6 of the Instructions to Bidders.
8. Bidder certifies that the upon the award of a Contract, the Contractor will make a good faith effort to ensure that all of the Contractor's employees, while working on the site of the Project, will not purchase, transfer, use or possess illegal drugs or alcohol or abuse prescription drugs in any way.
9. Bidder agrees to furnish any information requested by the School District Board to evaluate the responsibility of the Bidder.

Each bid shall contain the name of every person interested therein. If the Bidder is a corporation, partnership or sole proprietorship, an officer, partner or principal of the Bidder, as applicable, shall print or type the legal name of the Bidder on the line provided and **sign the Bid Form**. If the Bidder is a joint venture, an officer, partner or principal, as applicable, of each member of the joint venture shall print or type the legal name of the applicable member on the line provided and sign the Bid Form.

BIDDER'S NAME:

Authorized Signature: _____

Print Name: _____

Title: _____

Company Name: _____

Mailing Address: _____

Telephone Number: (_____) _____

Facsimile Number: (_____) _____

Where Incorporated: _____

Federal ID Number: _____

Contact person for
Contract processing: _____

BIDDER'S NAME:

Authorized Signature: _____

Print Name: _____

Title: _____

Company Name: _____

Mailing Address: _____

Telephone Number: (_____) _____

Facsimile Number: (_____) _____

Where Incorporated: _____

Federal ID Number: _____

Contact person for
Contract processing: _____

EQUAL EMPLOYMENT OPPORTUNITY
in the
CONSTRUCTION INDUSTRY

OHIO ADMINISTRATIVE CODE RULE

Each Contractor must fully comply with State's Equal Employment Opportunity in the Construction Industry rules set forth in Chapters 123:2-3 through 123:2-9, OAC.

123:2-3-02 ESTABLISHMENT OF AFFIRMATIVE ACTION PROGRAMS.

(A) Contractors and Subcontractors with fifty (50) or more employees and a contract of \$50,000.00 or more must establish an affirmative action program. Contractors and Subcontractors are required to exert every good faith effort to accomplish the goals of an affirmative action program. Contractors and Subcontractors may obtain an acceptable affirmative action program by either of the following methods:

- (1) Contractors and Subcontractors may adopt the following state percentage goals for minority utilization work hours. The goals are listed as the proportion of minority workhours to the Contractor's or Subcontractor's total workforce hours, for all jobs, during the performance of the state contract. The minority work hours are provided by trade and designated geographic area. Where the project is not in one of the designated geographic areas, the contractor or subcontractor may adopt the minority utilization goals of the nearest designated geographic area. Contractor's and Subcontractor's good faith efforts shall not be determined solely by the Contractor's or Subcontractor's accomplishment of the utilization work hour goals.

AKRON

Asbestos Workers.....	10.0%
Boilermakers	10.0%
Bricklayers	10.0%
Electricians	10.0%
Elevator Constructors	10.0%
Glaziers.....	10.0%
Ironworkers	10.0%
Lathers.....	10.0%
Operating Engineers	10.0%
Painters	10.0%
Plasterers	10.0%
Plumbers.....	10.0%
Roofers	10.0%
Sheet Metal Workers	10.0%
Other Trades	10.0%
Sheet Metal Workers	11.0%

CINCINNATI

Asbestos Workers	9.0%
Boilermakers.....	9.0%
Carpenters.....	10.0%
Elevator Constructors	11.0%
Floor Layers.....	10.0%
Glaziers	10.0%
Lathers	10.0%
Marble, Tile and Terrazzo Workers and Helpers	8.0%
Millwrights	10.0%
Operating Engineers	11.0%
Painters	11.0%
Pipe Fitters.....	11.0%
Plasterers.....	10.0%
Plumbers	11.0%
Other Trades	11.0%

COLUMBUS

Asbestos Workers.....	10.0%
Boilermakers	10.0%
Bricklayers	10.0%
Carpenters.....	10.0%
Cement Masons	10.0%
Electricians	10.0%
Elevator Constructors	10.0%
Glaziers.....	10.0%
Ironworkers	10.0%
Lathers.....	10.0%
Operating Engineers	10.0%
Painters	10.0%
Plasterers	10.0%
Plumbers and Pipe Fitters.....	10.0%
Roofers	10.0%
Sheet Metal Workers	10.0%
Other Trades	10.0%

CLEVELAND

Asbestos Workers	17.0%
Boilermakers.....	10.0%
Carpenters.....	16.0%
Electricians	20.0%
Elevator Constructors	11.0%
Glaziers.....	17.0%
Ironworkers.....	13.0%
Operating Engineers	10.0%
Painters	17.0%
Pipe Fitters.....	17.0%
Plasterers.....	20.0%
Plumbers	17.0%
Roofers	17.0%
Other Trades	17.0%

DAYTON

Asbestos Workers.....	11.0%
Boilermakers	11.0%
Carpenters.....	11.0%
Electricians	11.0%
Elevator Constructors	11.0%
Ironworkers	11.0%
Lathers.....	11.0%
Operating Engineers	11.0%
Painters	11.0%
Plumbers.....	11.0%
Sheet Metal Workers	11.0%
Other Trades	11.0%
Millwrights	11.0%

YOUNGSTOWN-WARREN

Asbestos Workers	9.0%
Bricklayers.....	9.0%
Carpenters.....	9.0%
Electrical Workers	9.0%
Elevator Constructors	9.0%
Floor Mechanics	9.0%
Glaziers.....	9.0%
Lathers	9.0%
Operating Engineers	9.0%
Painters and Decorators	9.0%
Plumbers and Pipe Fitters and Steam Fitters	9.0%
Sheet Metal Workers	9.0%
Other Trades	9.0%
Teamsters & Chauffeurs	9.0%

TOLEDO

Asbestos Workers.....	9.0%
Carpenters.....	9.0%
Elevator Constructors	9.0%
Ironworkers	9.0%
Operating Engineers	9.0%
Plumbers.....	9.0%
Other Trades	9.0%
Helpers & Workers.....	9.0%
Boilermakers.....	9.0%
Electricians	9.0%
Glaziers.....	9.0%
Lathers	9.0%
Painters	9.0%
Sheet Metal Workers	9.0%
Tile Marble and Terrazzo	9.0%

Contractors and Subcontractors that do not meet the state utilization work hour goals must implement and demonstrate a good faith effort to make the following state specific affirmative action steps work toward the accomplishment of the state's utilization work hour goals.

- (i) Maintenance of a file of minority and women job applicants and the action taken regarding each applicant, including the reasons therefore.

To Demonstrate Compliance:

Maintain a file of the names, addresses, telephone numbers, and craft of each minority and female applicant showing: (a) the date of the contract and whether the person was hired; if not, the reason, (b) if the person was sent to a union for referral, and the results, (c) follow-up contacts when the Contractor was hiring.

- (ii) Notification to the contracting agency of any labor union practice that impedes the equal employment of minorities and women, including the union's failure to refer minority and women applicants back to the Contractor or Subcontractor after the Contractor's or Subcontractor's referral of the applicant to the union.

Have a copy of letters sent or do not claim the union is impeding the Contractor's efforts to comply.

- (iii) Publication and implementation of an equal employment opportunity policy within the Contractor's organization.

To Demonstrate Compliance:

Have a written EEO Policy which includes the name and how to contact the Contractor's EEO Officer and (a) include the Policy in any company policy manuals, (b) post a copy of the Policy on all company bulletin boards (in the office and on all job sites); (c) records, such as reports or diaries, etc., that each minority and female employee is aware of the Policy and that it has been discussed with them, (d) that the Policy has been discussed regularly at staff meetings, and three copies of newsletters and annual reports which include the policy.

- (iv) Evaluation of Contractor's or Subcontractor's employment practices, including job classifications, promotions, recruitment and seniority designations, for discriminatory impact.

To Demonstrate Compliance:

Have records that the company EEO Officer reviews all: (a) monthly workforce reports, (b) hiring and terminations, (c) training provided on-the-job, (d) minority and female employees quarterly for promotion and encourages them to prepare for and seek promotion. The records should be in the EEO Officer's job description, reports, memos, personnel files, etc., documenting the activities for possible discriminatory patterns.

- (v) Maintenance of records detailing Contractor or Subcontractor efforts to recruit minorities and women.

To Demonstrate Compliance:

Have copies of (a) letters sent, at least every six months or at the start of each new major contract, to all recruiting sources (including labor unions) requiring compliance with the Policy, (b)

advertising which has the EEO "tagline" on the bottom, and (c) purchase order and subcontract agreement forms will include or make reference to OAC Chapter 123:2-3 through 123:2-9.

- (vi) Participation in community training programs designed for minorities and women.

To Demonstrate Compliance:

Have a record either in a follow-up file for each organization or on the reverse of the notification letters sent under Item i, above, of the dates, individuals contacted, and the results of the contact from telephone calls or personal meetings with the individuals or groups notified under Item i.

- (vii) Solicitation of Subcontracts with minority and women Contractors and/or Subcontractors, including contracts for supply purchases.

To Demonstrate Compliance:

Have copies of letters or other direct solicitation of bids for subcontracts/joint ventures from minority/female contractors with a record of the specific responses and any follow-up the Contractor has done to obtain a price quotation or to assist a minority/female contractor in preparing or reducing a price quotation; have a list of all minority/female subcontractors awarded or joint ventures participated in with dollar amounts, etc.

- (2) Contractors and Subcontractors may submit for approval by the contracting agency the Contractor's or Subcontractor's own affirmative action program developed in conformity with Rule 123:2-3-04 of the Administrative Code, either with the Contractor's bid or prior to the submission of bids. Contractor's and Subcontractor's good faith efforts shall not be determined solely by the Contractor's or Subcontractor's accomplishment of the utilization work hour goals.
- (B) Where a Contractor's or Subcontractor's contract for a state public works contract exceeds an estimated total cost of \$500,000.00 and the contract site is within a designated geographic area, the Contractor or Subcontractor, regardless of the number employees employed by the Contractor or Subcontractor, is subject to the rules and regulations set forth in Chapters 123:2-3 through 123:2-9 of the Administrative Code for all state and non-state construction activities within the designated geographic area.
 - (1) Contractors and Subcontractors may obtain an acceptable affirmative action program in accordance with subsection (a) of this rule.
 - (2) Where the provisions of this subsection apply, notice shall be provided in the invitation to bid.
- (C) All affirmative action programs, whether the Contractor or Subcontractor adopts the state affirmative action program or develops the Contractor's or Subcontractor's own affirmative action program, must include the separate utilization work hour goal of 6.9 percent for women. The goals must be applied as the proportion of women workhours to the Contractor's or Subcontractor's total workforce hours, for all jobs, during the performance of the state contract.

- (D) Contractors and Subcontractors shall inform subcontractors with fifty (50) or more employees and a contract of \$50,000.00 or more of the requirement to comply with the rules and regulations set forth in Chapters 123:2-3 through 123:2-9 of the Administrative Code. Contractors and Subcontractors shall not contract with any Subcontractor that has been found to be not responsible for state contracts pursuant to Administrative Rule 123:2-07-01. A Contractor's or Subcontractor's failure to comply with this requirement shall provide a basis to invoke any of the sanctions set forth in Rule 123:2-7-01 of the Administrative Code against the Contractor or Subcontractor.

DRAFT AIA® Document A101™ - 2007

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the [] day of [] in the year []
(In words, indicate day, month and year)

BETWEEN the Owner:
(Name, address and other information)

[Redacted area for Owner information]

and the Contractor:
(Name, address and other information)

[Redacted area for Contractor information]

for the following Project:
(Name, location, and detailed description)

[Redacted area for Project description]

The Architect:
(Name, address and other information)

[Redacted area for Architect information]

The Owner and Contractor agree as follows.

[Redacted area for Additions and Deletions]

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

AIA Document A201™-2007, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

[Redacted area for Additions and Deletions]

[Redacted area for Additions and Deletions]

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TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS
10	INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

If, prior to the commencement of the Work, the Owner requires time to file mortgages and other security interests, the Owner's time requirement shall be as follows:

§ 3.2 The Contract Time shall be measured from the date of commencement.

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than () days from the date of commencement, or as follows:

(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

Portion of Work

Substantial Completion Date

, subject to adjustments of this Contract Time as provided in the Contract Documents.

(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be [redacted] (\$ [redacted]), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

§ 4.3 Unit prices, if any:

(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price Per Unit
[redacted]	[redacted]	[redacted]

§ 4.4 Allowances included in the Contract Sum, if any:

(Identify allowance and state exclusions, if any, from the allowance price.)

Item	Price
[redacted]	[redacted]

ARTICLE 5 PAYMENTS

§ 5.1 PROGRESS PAYMENTS

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the [redacted] day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the [redacted] day of the same month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than [redacted] ([redacted]) days after the Architect receives the Application for Payment. *(Federal, state or local laws may require payment within a certain period of time.)*

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported

by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of (). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction;
- .2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of ();
- .3 Subtract the aggregate of previous payments made by the Owner; and
- .4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007.

§ 5.1.7 The progress payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

- .1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and
(Section 9.8.5 of AIA Document A201–2007 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)
- .2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2007.

§ 5.1.8 Reduction or limitation of retainage, if any, shall be as follows:

(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.6.1 and 5.1.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 FINAL PAYMENT

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201–2007, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 INITIAL DECISION MAKER

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker. *(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)*

§ 6.2 BINDING DISPUTE RESOLUTION

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A201–2007, the method of binding dispute resolution shall be as follows:

(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.)

Arbitration pursuant to Section 15.4 of AIA Document A201–2007

Litigation in a court of competent jurisdiction

Other *(Specify)*

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2007.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

per annum

§ 8.3 The Owner’s representative:

(Name, address and other information)

§ 8.4 The Contractor’s representative:

(Name, address and other information)

§ 8.5 Neither the Owner's nor the Contractor's representative shall be changed without ten days written notice to the other party.

§ 8.6 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A101–2007, Standard Form of Agreement Between Owner and Contractor.

§ 9.1.2 The General Conditions are AIA Document A201–2007, General Conditions of the Contract for Construction.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

§ 9.1.4 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

Title of Specifications exhibit:

§ 9.1.5 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

Title of Drawings exhibit:

§ 9.1.6 The Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents:

- .1 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed by the parties, or the following:



- .2 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2007 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)



ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007.)

Type of insurance or bond	Limit of liability or bond amount (\$ 0.00)

This Agreement entered into as of the day and year first written above.

OWNER (Signature)

(Printed name and title)

CONTRACTOR (Signature)

(Printed name and title)



DRAFT AIA[®] Document A201[™] - 1997

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address):

THE OWNER:
(Name and address):

THE ARCHITECT:
(Name and address):

TABLE OF ARTICLES

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- 12 UNCOVERING AND CORRECTION OF WORK
- 13 MISCELLANEOUS PROVISIONS
- 14 TERMINATION OR SUSPENSION OF THE CONTRACT

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document has been approved and endorsed by The Associated General Contractors of America

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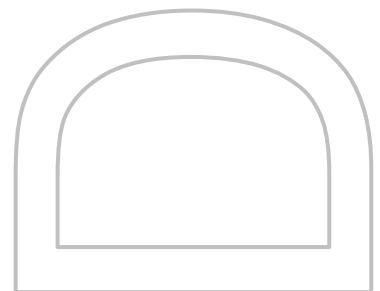
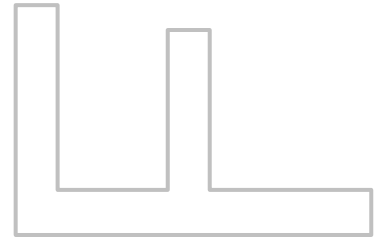
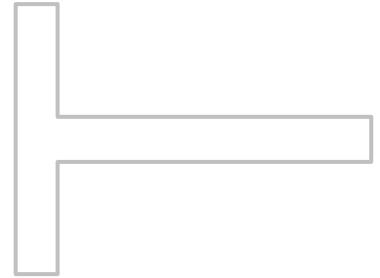
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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of Addenda relating to bidding requirements).

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and Contractor, (2) between the Owner and a Subcontractor or Sub-subcontractor, (3) between the Owner and Architect or (4) between any persons or entities other than the Owner and Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 THE PROJECT MANUAL

The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

§ 1.3.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

§ 1.4.1 In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 EXECUTION OF CONTRACT DOCUMENTS

§ 1.5.1 The Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

§ 1.5.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 1.6 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.6.1 The Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect or the Architect's consultants, and unless otherwise indicated the Architect and the Architect's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights. All copies of Instruments of Service, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this authorization shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' copyrights or other reserved rights.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 The Owner shall, at the written request of the Contractor, prior to commencement of the Work and thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Furnishing of such evidence shall be a condition precedent to commencement or

continuation of the Work. After such evidence has been furnished, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees, including those required under Section 3.7.1, which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work under the Owner's control shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

§ 2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

§ 2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven-day period give the Contractor a second written notice to correct such deficiencies within a three-day period. If the Contractor within such three-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Since the Contract Documents are complementary, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the

Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, any errors, inconsistencies or omissions discovered by the Contractor shall be reported promptly to the Architect as a request for information in such form as the Architect may require.

§ 3.2.2 Any design errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect, but it is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents. The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations, but any nonconformity discovered by or made known to the Contractor shall be reported promptly to the Architect.

§ 3.2.3 If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Architect in response to the Contractor's notices or requests for information pursuant to Sections 3.2.1 and 3.2.2, the Contractor shall make Claims as provided in Sections 4.3.6 and 4.3.7. If the Contractor fails to perform the obligations of Sections 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. The Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents or for differences between field measurements or conditions and the Contract Documents unless the Contractor recognized such error, inconsistency, omission or difference and knowingly failed to report it to the Architect.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

§ 3.5 WARRANTY

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

§ 3.6.1 The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES AND NOTICES

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations. However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

§ 3.7.4 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect and Owner, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances;
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner in sufficient time to avoid delay in the Work.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important

communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare and keep current, for the Architect's approval, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows the Architect reasonable time to review submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

§ 3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record field changes and selections made during construction, and one record copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action.

§ 3.12.6 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

§ 3.13 USE OF SITE

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

§ 3.16 ACCESS TO WORK

§ 3.16.1 The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

§ 3.17.1 The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law and to the extent claims, damages, losses or expenses are not covered by Project Management Protective Liability insurance purchased by the Contractor in accordance with Section 11.3, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ADMINISTRATION OF THE CONTRACT

§ 4.1 ARCHITECT

§ 4.1.1 The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a new Architect against whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the former Architect.

§ 4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents, and will be an Owner's representative (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Section 12.2. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

§ 4.2.2 The Architect, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed, (2) to endeavor to guard the Owner against defects and

deficiencies in the Work, and (3) to determine in general if the Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will neither have control over or charge of, nor be responsible for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect will have authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion, will receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and initial decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.3 CLAIMS AND DISPUTES

§ 4.3.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 4.3.2 Time Limits on Claims. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be initiated by written notice to the Architect and the other party.

§ 4.3.3 Continuing Contract Performance. Pending final resolution of a Claim except as otherwise agreed in writing or as provided in Section 9.7.1 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 4.3.4 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the Architect has given notice of the decision. If the conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but if the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceedings pursuant to Section 4.4.

§ 4.3.5 Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.6.

§ 4.3.6 If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, Claim shall be filed in accordance with this Section 4.3.

§ 4.3.7 Claims for Additional Time

§ 4.3.7.1 If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 4.3.7.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 4.3.8 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 4.3.9 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 4.3.10 Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 4.3.10 shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 4.4 RESOLUTION OF CLAIMS AND DISPUTES

§ 4.4.1 Decision of Architect. Claims, including those alleging an error or omission by the Architect but excluding those arising under Sections 10.3 through 10.5, shall be referred initially to the Architect for decision. An initial decision by the Architect shall be required as a condition precedent to mediation, arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered by the Architect. The Architect will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 4.4.2 The Architect will review Claims and within ten days of the receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Architect is unable to resolve the Claim if the Architect lacks sufficient information to evaluate the merits of the Claim or if the Architect concludes that, in the Architect's sole discretion, it would be inappropriate for the Architect to resolve the Claim.

§ 4.4.3 In evaluating Claims, the Architect may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Architect in rendering a decision. The Architect may request the Owner to authorize retention of such persons at the Owner's expense.

§ 4.4.4 If the Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either provide a response on the requested supporting data, advise the Architect when the response or supporting data will be furnished or advise the Architect that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Architect will either reject or approve the Claim in whole or in part.

§ 4.4.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefor and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be final and binding on the parties but subject to mediation and arbitration.

§ 4.4.6 When a written decision of the Architect states that (1) the decision is final but subject to mediation and arbitration and (2) a demand for arbitration of a Claim covered by such decision must be made within 30 days after the date on which the party making the demand receives the final written decision, then failure to demand arbitration within said 30 days' period shall result in the Architect's decision becoming final and binding upon the Owner and Contractor. If the Architect renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence, but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

§ 4.4.7 Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect or the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Architect or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 4.4.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines prior to resolution of the Claim by the Architect, by mediation or by arbitration.

§ 4.5 MEDIATION

§ 4.5.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Sections 4.3.10, 9.10.4 and 9.10.5 shall, after initial decision by the Architect or 30 days after submission of the Claim to the Architect, be subject to mediation as a condition precedent to arbitration or the institution of legal or equitable proceedings by either party.

§ 4.5.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.

§ 4.5.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 4.6 ARBITRATION

§ 4.6.1 Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Sections 4.3.10, 9.10.4 and 9.10.5, shall, after decision by the Architect or 30 days after submission of the Claim to the Architect, be subject to arbitration. Prior to arbitration, the parties shall endeavor to resolve disputes by mediation in accordance with the provisions of Section 4.5.

§ 4.6.2 Claims not resolved by mediation shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect. The demand for arbitration shall be filed in writing with the other party to the Contract and with the American Arbitration Association, and a copy shall be filed with the Architect.

§ 4.6.3 A demand for arbitration shall be made within the time limits specified in Sections 4.4.6 and 4.6.1 as applicable, and in other cases within a reasonable time after the Claim has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Section 13.7.

§ 4.6.4 Limitation on Consolidation or Joinder. No arbitration arising out of or relating to the Contract shall include, by consolidation or joinder or in any other manner, the Architect, the Architect's employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Architect, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Contractor, a separate contractor as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the Owner, Contractor or a separate contractor as described in Article 6 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a Claim not described therein or with a person or entity not named or described therein. The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 4.6.5 Claims and Timely Assertion of Claims. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 4.6.6 Judgment on Final Award. The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitute.

§ 5.3 SUBCONTRACTUAL RELATIONS

§ 5.3.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Section 4.3.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

§ 6.2.4 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

§ 6.3.1 If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect, stating their agreement upon all of the following:

- .1 change in the Work;
- .2 the amount of the adjustment, if any, in the Contract Sum; and
- .3 the extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in Section 7.3.3.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 as provided in Section 7.3.6.

§ 7.3.4 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.5 A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.6 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.6 shall be limited to the following:

- .1 costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2 costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.7 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.8 Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Architect will make an interim determination for purposes of monthly certification for payment for those costs. That determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a claim in accordance with Article 4.

§ 7.3.9 When the Owner and Contractor agree with the determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

§ 7.4 MINOR CHANGES IN THE WORK

§ 7.4.1 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by the Contract Documents or a notice to proceed given by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing the Work to permit the timely filing of mortgages, mechanic's liens and other security interests.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner pending mediation and arbitration, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Section 4.3.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

§ 9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for operations completed in accordance with the schedule of values. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to

payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.8, such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Such applications may not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of:

- .1 defective Work not remedied;

- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or another contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 persistent failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law.

§ 9.6.5 Payment to material suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

§ 9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by arbitration, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.4.1.5 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the

final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

§ 10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 The Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to verify that it has been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. The Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up, which adjustments shall be accomplished as provided in Article 7.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) and provided that such damage, loss or expense is not due to the sole negligence of a party seeking indemnity.

§ 10.4 The Owner shall not be responsible under Section 10.3 for materials and substances brought to the site by the Contractor unless such materials or substances were required by the Contract Documents.

§ 10.5 If, without negligence on the part of the Contractor, the Contractor is held liable for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.6 EMERGENCIES

§ 10.6.1 In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Section 4.3 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 claims for damages insured by usual personal injury liability coverage;
- .5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 claims for bodily injury or property damage arising out of completed operations; and
- .8 claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Section 9.10.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

§ 11.2 OWNER'S LIABILITY INSURANCE

§ 11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROJECT MANAGEMENT PROTECTIVE LIABILITY INSURANCE

§ 11.3.1 Optionally, the Owner may require the Contractor to purchase and maintain Project Management Protective Liability insurance from the Contractor's usual sources as primary coverage for the Owner's, Contractor's and Architect's vicarious liability for construction operations under the Contract. Unless otherwise required by the Contract Documents, the Owner shall reimburse the Contractor by increasing the Contract Sum to pay the cost of purchasing and maintaining such optional insurance coverage, and the Contractor shall not be responsible for purchasing any other liability insurance on behalf of the Owner. The minimum limits of liability purchased with such coverage shall be equal to the aggregate of the limits required for Contractor's Liability Insurance under Sections 11.1.1.2 through 11.1.1.5.

§ 11.3.2 To the extent damages are covered by Project Management Protective Liability insurance, the Owner, Contractor and Architect waive all rights against each other for damages, except such rights as they may have to the proceeds of such insurance. The policy shall provide for such waivers of subrogation by endorsement or otherwise.

§ 11.3.3 The Owner shall not require the Contractor to include the Owner, Architect or other persons or entities as additional insureds on the Contractor's Liability Insurance coverage under Section 11.1.

§ 11.4 PROPERTY INSURANCE

§ 11.4.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.4 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.4.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.4.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.4.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.4.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.4.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.4.2 Boiler and Machinery Insurance. The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.4.3 Loss of Use Insurance. The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.4.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.4.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.4.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.4.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.4. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.4.7 Waivers of Subrogation. The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.4 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.4.8 A loss insured under Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.4.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.4.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Section 4.6. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.4.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved as provided in Sections 4.5 and 4.6. The Owner as fiduciary shall, in the case of arbitration, make settlement with insurers in accordance with directions of the arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

§ 11.5 PERFORMANCE BOND AND PAYMENT BOND

§ 11.5.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.5.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered which the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

§ 12.2.1.1 The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract

Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

§ 12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

§ 13.1.1 The Contract shall be governed by the law of the place where the Project is located.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to an institutional lender providing construction financing for the Project. In such event, the lender shall assume the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

§ 13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

§ 13.6.1 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

§ 13.7.1 As between the Owner and Contractor:

- .1 Before Substantial Completion. As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;
- .2 Between Substantial Completion and Final Certificate for Payment. As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and
- .3 After Final Certificate for Payment. As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any Warranty provided under Section 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Section 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .1 issuance of an order of a court or other public authority having jurisdiction which requires all Work to be stopped;
- .2 an act of government, such as a declaration of national emergency which requires all Work to be stopped;
- .3 because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 the Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work

by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor:

- .1 persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 accept assignment of subcontracts pursuant to Section 5.4; and
- .3 finish the Work by whatever reasonable method the Owner may deem expedient. Upon request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

- .1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work;
and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.



1 SECTION 000100 - MODIFICATIONS TO 2007 AIA GENERAL CONDITIONS

2
3

4 PART 1 - GENERAL

5
6

6 RELATED DOCUMENTS:

7
8

8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specification Sections, apply to this Section.

10
11

12 PART 2 - MODIFICATIONS TO 2007 AIA GENERAL CONDITIONS:

13
14

14 ARTICLE 1 GENERAL PROVISIONS

15
16

16 Section 1.1, BASIC DEFINITIONS:

17
18

18 Add Sub-Section 1.1.9 - "Wherever terms 'as approved, as directed, as selected,' or similar
19 expressions appear in Contract Documents, such terms mean 'as approved by Architect, as
20 directed by Architect, as selected by Architect,' etc."

21
22

22 Section 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS:

23
24

24 Add Sub-Section 1.2.4 - "Precedence of construction documents is as follows: Agreement takes
25 precedence over original documents and addenda. Addenda take precedence over specifications
26 and drawings. Specifications take precedence over drawings. Large scale drawings take
27 precedence over small scale drawings. Figures and dimensions take precedence over scaled
28 measurements."

29
30

30 Add Sub-Section 1.2.5 - "Reference to known standards, unless specifically shown otherwise,
31 intends latest edition published prior to date of contract."

32
33

33 ARTICLE 2 OWNER

34
35

35 Section 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER: Delete Sub-Section
36 2.2.1 through 2.2.4.

37
38

38 ARTICLE 3 CONTRACTOR

39
40

40 Sub-Section 3.6 TAXES: Revise Sub-Section 3.6.1 to read: "This project is tax exempt".

41
42

42 Section 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES:

43
44

44 Add to Sub-Section 3.10.1: "The Contractor shall utilize the established milestone dates for the
45 preparation of the Master Schedule as established in Section 011000 Summary".

46
47

47 Section 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES:

48

1 Add Sub-Section 3.12.11 - "Submit five (5) copies of architectural and structural shop drawings, and
2 six (6) copies of site, mechanical, plumbing and electrical shop drawings."
3

4 Section 3.14 CUTTING AND PATCHING: Revise Sub-Section 3.14.1 to read:
5

6 "The Contractor shall, unless noted otherwise in the Contract Documents, perform all cutting and
7 patching as required to accommodate his own new work, patch up and finish off all altered areas
8 resulting from his work to effect one complete surface with no visible evidence of the cutting and
9 patching operations."
10

11 "Patch all surfaces damaged or opened as a result of demolition under this contract."
12

13 "Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest
14 intersection; for an assembly, refinish entire unit."
15

16 "Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces."
17

18 "Maintain integrity of all fire-rated walls, ceilings, or floor construction."
19

20 Article 3.15 CLEANING UP:
21

22 Revise Sub-Section 3.15.1 to read: "The Contractor shall be responsible for depositing his rubbish
23 and debris in their containers for removal from site. The size of the container shall be determined
24 by the Contractor and all costs related to the container shall be paid for by the Contractor."
25

26 Daily Cleanup: "The Contractor shall promptly remove from the premises all waste materials and
27 rubbish resulting from performance of the work included in his contract. Contractor shall restore
28 his own working areas of the project to a neat and orderly condition at end of each day's work
29 during all periods while either his employees or his subcontractors are present on site. Cleaning
30 up shall be continuing operation on a day-to-day basis throughout construction period and shall not
31 be left to be performed after the work or portion of the work is complete."
32

33 "At completion of the Work the Contractor shall remove from and about the Project waste materials,
34 rubbish, the Contractor's tools, construction equipment, machinery and surplus materials."
35

36 "In addition, Contractor shall replace any broken glass, remove stains, spots and dirt from all
37 decorative work; clean hardware; remove paint spots and smears from all surfaces; clean all
38 electrical, plumbing, heating, ventilating and air conditioning fixtures."
39

40 Revise Sub-Section 3.15.2 to read: "If a Contractor fails to clean up as provided in the Contract
41 Documents, the Owner may do so and the cost thereof shall be charged to the respective
42 Contractor."
43

44 ARTICLE 4 ARCHITECT
45

46 Section 4.2 ADMINISTRATION OF THE CONTRACT
47

48 Add to Sub-Section 4.2.2: "The Architect has no obligation to discover unsafe conditions or
49 practices by others at the job site or take any action to correct any unsafe practices or conditions."
50

1 Add to Sub-Section 4.2.8: “All Change Orders must be approved by the Owner's Representative
2 prior to the Architect issuing same.”
3

4 ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

5
6 Section 10.3 HAZARDOUS MATERIALS: Revise Sub-Section 10.3.2 to read:
7

8 “The Owner shall obtain the services of a licensed laboratory to verify the presence or absence of
9 the material or substance reported by the Contractor and, in the event such material or substance
10 is found to be present, to verify that it has be rendered harmless. Unless otherwise required by the
11 Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names
12 and qualifications of persons or entities who are to perform tests verifying the presence or absence
13 of such material or substance or who are to perform the task of removal of safe containment of such
14 material or substance, when the material or substance has been rendered harmless. Work in the
15 affected area shall resume upon written agreement of Owner and Contractor. The Contract time
16 shall be extended appropriately. The Contract Sum shall not be increased due to shut-down, delay
17 and start-up.”
18

19 Revise Sub-Section 10.3.3. to read:
20

21 “To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner
22 and Architect, Architect’s consultants and agents and employees of any of them from and against
23 claims, damages, losses and expenses, including but not limited to attorney’s fees, arising out of
24 or resulting from performance of the Work in the affected area if in fact the material or substance
25 presents the risk of bodily injury or death as described in Subparagraph 10.3.1 and has not been
26 rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily
27 injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the
28 Work itself) and provided that such damage, loss or expense is not due to the sole negligence of
29 a party seeking indemnity.”
30

31 ARTICLE 11 INSURANCE AND BONDS

32
33 Section 11.1 CONTRACTOR’S LIABILITY INSURANCE:
34

35 Revise Sub-Section 11.1.1.8 to read:
36

37 “In addition, in order to assure the Owner, and the Architect protection against all claims or liabilities
38 based upon acts or omissions of the Owner, or the Architect, the Contractor shall either add the
39 Owner, the Architect as additional insured under the Contractor’s Commercial General liability
40 Insurance Policy or purchase an Owner’s Protective Liability Policy naming the Owner, and the
41 Architect as insured thereunder, the same minimum limits as specified above for the Contractor’s
42 Commercial General Liability Insurance Policy.”
43

44 Revise Sub-Section 11.1.2 to read:
45

46 “The Contractor shall purchase prior to commence of work, and maintain during construction,
47 policies of insurance of the following descriptions:
48

49 COMPREHENSIVE GENERAL LIABILITY

1	General Aggregate Limit (Other Than Products - Completed Operations)	\$	1,000,000
2	Products Completed Operations Aggregate Limit	\$	1,000,000
3	Personal and Advertising Injury Limit	\$	500,000
4	Each Occurrence Limit	\$	500,000
5	Fire Damage Limit	\$	25,000
6	Medical Expense Limit	\$	5,000

7
8 General Liability policy must contain endorsement for X, C, U Exposure (Explosion, Collapse and
9 Undermine)."

10
11 AUTOMOTIVE AND TRUCK LIABILITY

12
13 (On all owned, non-owned and hired vehicles) \$ 1,000,000

14
15 STOP GAP LIABILITY \$ 100,000

16
17 OWNERS AND CONTRACTOR'S PROTECTIVE LIABILITY \$ 1,000,000

18
19 "The aforementioned insurance shall provide adequate protection for each Contractor and each
20 subcontractor against all claims, damages, losses and expenses, including attorney's fees which
21 may arise from operations under this Contract, including all owned, non-owned and hired vehicles
22 and trucks whether such operations be by the insured or by anyone directly or indirectly employed
23 by him."

24
25 ARTICLE 11.3 PROPERTY INSURANCE: Delete Sub-Section 11.3.1

26
27 Delete Sub-Section 11.3.2 11.3.4 and 11.3.5.

28
29 Revise Sub-Section 11.3.6 to read: "The Owner shall maintain copies of the insurance it is required
30 to purchase and maintain hereunder at its offices and permit the Architect, or any Contractor to
31 inspect the policies during normal business hours and upon reasonable advance written notice."

32
33 Revise Sub-Section 11.3.10 to read: "The Owner, as trustee, will have the power to adjust and
34 settle any loss with its insurers."

35
36 ARTICLE 15 CLAIMS AND DISPUTES: Sub-Section 15.1.5 Claims for Additional Time:

37
38 Revise Sub-Section 15.1.5.1 to read:

39
40 "No extension of time shall be granted for delays on account of, or resulting from, weather
41 conditions except only for the catastrophic weather conditions mentioned in this paragraph; nor
42 shall the Contractor be granted an extension of time for delays resulting from interruptions to or
43 suspensions of his work to enable other Contractors to perform their work."

44
45 "The Contractor agrees that whether or not any delay shall be the basis for an extension of time he
46 shall have no claim against the Owner for an increase in the contract price, nor a claim against the
47 Owner for a payment or allowance of any kind for damage, loss or expense resulting from delays
48 caused by the interruptions to, or suspension of, his work to enable other contractors to perform
49 their work. The only remedy available to the Contractor shall be an extension of time."

1 "For Changes in the Work initiated by the Owner which significantly affect the time and progress
2 of the entire Work, any time extension shall be made no later than when the Change is authorized
3 by the Owner. Any claim shall be made at the time the Change is requested. For Changes in the
4 Work which do not affect the progress of the entire Work, the Owner reserves the right to grant a
5 time extension only for the area, phase or element of the entire Work affected by the Change."
6

7 "Delays resulting from a labor dispute will result in a time extension no longer than the dispute
8 period, in addition to a reasonable mobilization period that is unavoidable, and may be less
9 depending on the actual effect the dispute had on the overall progress and the operations that were
10 actually curtailed or suspended. Lockouts, over which the Trade Contractor has control, will not
11 be a valid reason for time extension."
12

13 "No time extension will be granted as a result of improper scheduling or for failure to have shop
14 drawings or samples submitted in ample time for review under a reasonable schedule."
15

16

17

18 END OF SECTION

1 SECTION 011000 - SUMMARY

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 PROJECT DESCRIPTION:

12
13 The Edgewood Middle School addition Boys and Girls Club Base Bid is a one-story 3,941 sf brick
14 and metal siding addition to the front of the school. Demolition to the front is required to tie the two
15 structures together and approximately 9,641 SF scope of work adjacent to the existing building is
16 planned for renovation.

17
18 The program spaces for the new addition are lobby, reception, circulation, toilet rooms, offices, and
19 a large recreational multi-purpose room. The existing hallway, media center, lunch room/study hall
20 will be renovated.

21
22 There will be a fire separation between structures, scope of work in the front plaza is a series of
23 Alternates.

24
25 WORK SCHEDULE AND COMPLETION:

26
27 It is the intent of the Owner to award contracts on or about **May 27, 2015**. Work can begin on **June**
28 **8, 2015**.

29
30 MILESTONE COMPLETION DATES FOR THE PROJECTS ARE AS FOLLOWS:

31		
32	Project Substantial Completion	November 17, 2015
33	Project Punch List Completion	November 24, 2015
34		

35 LIQUIDATED DAMAGES:

36
37 Upon failure to have the entire project completed within the time period established, this Contractor
38 will forfeit and pay cause to be paid, to the Owner for and as liquidated damages to be deducted
39 from any payment due or to become due to said Contractor the sum of \$500.00 per day for each
40 and every day thereafter that the said work remains in an unfinished condition.

41
42 OPINION OF PROBABLE CONSTRUCTION COST (BASE BID):

43
44 Construction cost is estimated at \$880,000.00

45
46 In accordance with Section 153.12 of the ORC, the actual aggregate contract award amount (total
47 of all Prime Contracts) will not exceed the total opinion of probable construction cost by 10%,

1 unless the Board of Education, by use of reasonable and logical discretion, adopt a resolution
2 declaring an "Urgent Necessity" upon review of bids.

3

4 CONTRACTOR USE OF PREMISES:

5

6 General: Limit use of the premises to construction activities in areas indicated; allow for Owner
7 occupancy and use by the public.

8

9 Contractor(s) should coordinate his work with the school administration in order to accommodate
10 summer programs. **Please note the facility is to be available Friday June 12 and Saturday**
11 **June 13 2015 for "Relay for Life".**

12

13 Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in
14 which construction operations are indicated and **are not to be disturbed.**

15

16 Limits: Limit site disturbance to 40 feet beyond building perimeter; 10 feet beyond surface
17 walkways, patios, surface parking, and utilities less than 12 inches in diameter; 15 feet beyond
18 primary roadway curbs and main utility branch trenches; and 25 feet beyond constructed areas with
19 permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing
20 fields) that require additional staging areas in order to limit compaction in the constructed area.

21

22 Keep driveways and entrances serving the premises clear and available to the Owner's
23 Representative and the Owner's employees at all times. Do not use these areas for parking or
24 storage of materials. Schedule deliveries to minimize space and time requirements for storage of
25 materials and equipment on site. Coordinate delivery schedules with school district personnel.

26 **Contact Mike Foore at (330) 262-9616 Ext 1501.**

27

28 Nonsmoking Building: Smoking is not permitted within the building or on school property.

29

30

31

32 END OF SECTION

1 SECTION 011010 - SPECIAL CONDITIONS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.
10

11
12 PART 2 - SPECIAL CONDITIONS

13
14 SITE EXAMINATION:

15
16 Prior to bidding, Contractor shall examine the site and all conditions affecting work. No allowance
17 whatsoever will be made due to bidders' failure to avail himself/herself of pertinent information, nor
18 shall such failure in any way relieve the successful bidder from furnishing materials or performing
19 work required to comply with intent of documents. Contact **Mike Foore at (330) 262-9616 Ext 1501**
20 to arrange a site inspection.
21

22 COORDINATION OF WORK:

23
24 Contractor(s) shall become familiar with work of other trades to avoid disputes over space
25 requirements or equipment locations. Contractor shall assume all responsibility for any delay or
26 expense caused by failure to do so and shall cooperate fully with trades to work out difficulties
27 presented by adverse field conditions at no additional cost.
28

29 Contractor(s) shall coordinate work of all subcontractors, trades and adjacent work to facilitate
30 timely progress of work, and shall be responsible for making certain that each subcontractor or
31 trade affords every other subcontractor or trade every reasonable opportunity for coordination and
32 installation of their work at a time and manner not to delay or interfere with work of others.
33

34 COST BREAKDOWN:

35
36 Upon the award of a contract Contractor shall submit to the Owner's Representative a cost
37 breakdown in a form approved by the Owner's Representative for each trade for the purpose of
38 controlling payments and checking Contractor's Applications for Payment.
39

40 SPECIFICATIONS:

41
42 For convenience of reference and to facilitate letting of contracts and subcontracts, these
43 Specifications are separated into 'Divisions'. Such separation shall not, however, operate to make
44 Owner's Representative an arbiter to establish limits to contracts between Contractor and
45 subcontractors. Contractor only shall be recognized as party to this contract and he/she shall be
46 solely responsible for segregation of work of various trades.
47

1 Abbreviations or other references to known specifications, technical societies or manufacturers'
2 instructions mean and intend latest editions of such specifications or instructions, unless otherwise
3 noted.

4
5 SUBSTITUTIONS:
6

7 Wherever in this Specification a particular brand or the product of a particular manufacturer is
8 specified, that brand or product, or its equal, shall be used in the size, and other identifying
9 description as called for herein or on the Drawings.

10
11 In case Contractor wishes to use a substitute brand or product of another manufacturer which does
12 not meet standards established by named brand or product, he shall make such request in writing,
13 attaching catalogs, test reports, descriptive literature, samples or portions of the product, and shall
14 state both unit and total price difference which is involved in proposed use of the substitute product.
15

16 In case no price difference is involved, use of substitute brand or product, with standards other than
17 named brand, will not be entertained, unless Contractor can offer definite proof satisfactory to
18 Owner's Representative that substitute brand or Product is superior either in quality or
19 performance, or both, to that originally specified.
20

21 All such substitute proposals, either with or without price difference, shall be made at time of
22 original bid for performance of work and shall be attached to each copy of submitted Form of
23 Proposal on form supplied.
24

25 In any case, purchase or use of any substitute brand or product shall not be made until formal
26 acceptance in writing, and including a Change Order stating price difference, is received by
27 Contractor.
28

29 MEASUREMENTS:
30

31 Before ordering any materials or doing any work, each Contractor shall verify all measurements at
32 the project and shall be responsible for correctness of same. No extra charge or compensation will
33 be allowed on account of difference between actual dimensions and measurements indicated on
34 the drawings; any difference which may be found shall be submitted to the Owner's Representative
35 for consideration before proceeding with the work.
36

37 PROTECTION OF EXISTING CONSTRUCTION:
38

39 During progress of work, any existing features of existing facilities, site or adjacent to site shall be
40 protected from all injury, and if damaged shall be replaced at completion of the job.
41

42 STORAGE
43

44 The existing site can be used as storage space for building materials and/or tools. Exact location
45 of designated area will be determined by the Owner's Representative .
46

47 TOILET FACILITIES:
48

1 Contractor may utilize the existing toilet facilities and shall leave premises in a clean and sanitary
2 condition at completion of the job. Coordinate with the middle school administration office
3

4 WATER:
5

6 Contractor shall utilize existing water service during construction. Cost of water shall be paid for
7 by Owner's Representative.
8

9 ELECTRICITY:
10

11 Electrical Contractor shall utilize existing electrical service. Cost of electricity shall be paid for by
12 Owner.
13

14 TELEPHONE:
15

16 Contractor to supply the superintendent in field with a cell phone.
17

18 TEMPORARY HEAT:
19

20 Temporary Heat and Ventilation: General Contractor shall provide temporary heat and ventilation
21 as required to maintain adequate environmental conditions to facilitate the progress of the Work,
22 to meet specified minimum conditions for installation and proper curing of materials, and to protect
23 materials and finishes from damage due to temperature or humidity. He/she shall provide adequate
24 forced ventilation of enclosed areas for curing of installed materials, to disperse humidity and to
25 prevent hazardous accumulations of dust, fumes, vapor or gasses.
26

27 General Contractor is not responsible for providing temporary heat for the entire building at one
28 time. Contractor should provide adequate equipment for 20,000 sf of space maximum.
29

30 Portable heaters shall be standard units complete with thermostats and safety controls. When used
31 in enclosed areas provide combustion air and vent direct-fired units to the exterior. Salamander
32 heaters will not be permitted.
33

34 General Contractor shall provide temporary enclosures, for the protection of work before the
35 building is enclosed.
36

37 Contractor is absolutely obligated to adhere to the approved Construction Schedule regardless of
38 weather conditions during the period when their work is scheduled to be performed. All required
39 work and the cost thereof to meet this obligation shall be included in the Contractor's Base Bid and
40 in the resulting Contract Sum. No increase in Contract Sum will be honored by the Owner's
41 Representative if such claim is based upon the cost of providing construction heat as specified
42 above.
43

44 Mechanical Sub-Contractor shall protect existing and installed equipment from dirt and damage.
45

46 The Mechanical Sub-Contractor shall include in his/her price to the General Contractor, one (1) filter
47 change in all existing and installed HVAC Equipment at time directed by the Owner's
48 Representative.
49

1 TEMPORARY FIELD OFFICE:

2
3 A temporary field office is not required for the project. However, the Contractor has the right to
4 maintain a field office for their own use upon approval of Owner's Representative .

5
6 DUMPSTER:

7
8 The Contractor shall provide a dumpster for all refuse and debris created by this project. Size of
9 each dumpster shall be the discretion of Contractor. The dumpsters shall be emptied promptly
10 when full and all expenses and charges shall be paid for by the Contractor.

11
12 FINAL ACCEPTANCE:

13
14 Contractor shall perform and complete all work according to contract documents without fault or
15 defect of any kind. In absence of more specific directive, work shall:

16
17 Be completed in first class manner.

18
19 Be left thoroughly clean and in unmarred condition.

20
21 Be checked out in a step-by-step manner to ascertain that all operating devices and other
22 required appurtenances have been provided in accordance with Contract Documents.

23
24 Be free of previously condemned or rejected parts.

25
26 Be balanced for proper operation wherever adjustments for balancing equipment exist.

27
28 When this condition of completion exists, Contractor shall request final inspection by Owner's
29 Representative, who will visit site and make one "Punch List" inspection only. Where any
30 inadequacies are encountered, they will be noted on the "Punch List." Contractor shall then remedy
31 each and every Punch List item in manner directed and make work conform to contract documents,
32 notify the Owner's Representative in writing that each item has been addressed and corrected and
33 only after this procedure request reinspection. All Punch List items must be completed within 7
34 calendar days.

35
36
37
38 END OF SECTION

1 SECTION 012300 - ALTERNATES

2
3

4 PART 1 - GENERAL

5
6

6 RELATED DOCUMENTS

7
8

8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11

11 SUMMARY

12
13

13 This Section specifies administrative and procedural requirements for Alternates.

14
15

15 Definition: An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain
16 construction activities defined in the Bidding Requirements that may be Added to or Deducted from
17 the Base Bid amount if the Owner's Representative decides to accept a corresponding change in
18 either the amount of construction to be completed, or in the products, materials, equipment,
19 systems or installation methods described in Contract Documents.

20
21

21 Coordination: Coordinate related work and modify or adjust adjacent work as necessary to ensure
22 that work affected by each accepted Alternate is complete and fully integrated into the project.

23
24

25 PART 2 - PRODUCTS (Not Applicable).

26
27

28 PART 3 - EXECUTION

29
30

30 SCHEDULE OF ALTERNATES

31
32

32 ALTERNATE A-1 - ENTRY CANOPY AND ASSOCIATED LIGHTING:

33
34

34 Contractor will state the amount to be **ADDED** to Base Bid for a new entry canopy at the Boys and
35 Girls Club of Wooster entrance. There is also electrical lighting in the scope of work.

36
37

37 ALTERNATE A-2 -BRICK VENEER RAMP:

38
39

39 Contractor will state the amount to be **ADDED** to Base Bid for aesthetic upgrade of the Base Bid
40 ramp to include brick veneer and a limestone cap. The facebrick will match the facebrick on the
41 new addition.

42
43

43 ALTERNATE A-3 - RUBBER TILE IN LIEU OF VCT:

44
45

45 Contractor will state the amount to be **ADDED** to Base Bid for a material upgrade of rubber tile in
46 the areas where new vinyl composition tile (VCT) is specified.

47
48

48 ALTERNATE A-4 - REPLACE FLOORING IN STUDENT DINING WITH RUBBER TILE:

49

1 Contractor will state the amount to be **ADDED** to Base Bid to replace the existing VCT flooring in
2 Student Dining with a new rubber tile floor.

3

4 ALTERNATE A-5 - NEW VESTIBULE ENTRY AT MIDDLE SCHOOL ENTRANCE:

5

6 Contractor will state the amount to be **ADDED** to Base Bid for a new Vestibule Entry at the current
7 and existing middle school public entrance.

8

9 ALTERNATE A-6 - PLAZA IMPROVEMENTS:

10

11 Contractor will state the amount to be **ADDED** to Base Bid for plaza improvements which include
12 infrastructure, new surfaces, benches, planters and plant material.

13

14 ALTERNATE A-7 - NEW ROOFTOP UNITS AND ASSOCIATED ELECTRICAL AND PLUMBING
15 FOR LIBRARY AND CAFETERIA:

16

17 Contractor will state the amount to be **ADDED** to Base Bid for new rooftop units and associated
18 electrical and plumbing for the Library and Cafeteria areas. Scope of work also includes the
19 removal of existing equipment serving these areas.

20

21 ALTERNATE A-8 - GRIND AND RESURFACE DRIVEWAY:

22

23 Contractor will state the amount to be **ADDED** to Base Bid for grinding the existing asphalt entry
24 loop and parking area and resurfacing as shown on the Civil Engineer's Documents.

25

26 ALTERNATE A-9 - ENHANCED TECHNOLOGY:

27

28 Contractor will state the amount to be **ADDED** to Base Bid provide and install one (1)
29 Smartboard/Projector in the Collaboration Room, relocating an existing projector and the addition
30 of two (2) wireless access points.

31

32

33

34 END OF SECTION

1 SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes administrative provisions for coordinating construction operations on Project
14 including, but not limited to, the following:

- 15
16 Coordination Drawings.
17 Administrative and supervisory personnel.
18 Project meetings.

19
20 Each contractor will participate in coordination requirements. Certain areas of responsibility will be
21 assigned to a specific contractor.

22
23 Related Sections include the following:

- 24
25 Division 1 Section "Summary."
26
27 Division 1 Section "Closeout Procedures."

28
29 COORDINATION

30
31 Coordination: Coordinate construction operations included in different Sections of the Specifications
32 to ensure efficient and orderly installation of each part of the Work. Coordinate construction
33 operations, included in different Sections, that depend on each other for proper installation,
34 connection, and operation.

35
36 Coordination: Each contractor will coordinate its construction operations with those of other
37 contractors and entities to ensure efficient and orderly installation of each part of the Work. Each
38 contractor will coordinate its operations with operations, included in different Sections, that depend
39 on each other for proper installation, connection, and operation.

40
41 Schedule construction operations in sequence required to obtain the best results where
42 installation of one part of the Work depends on installation of other components, before or
43 after its own installation.

44
45 Coordinate installation of different components with other contractors to ensure maximum
46 accessibility for required maintenance, service, and repair.

47
48 Make adequate provisions to accommodate items scheduled for later installation.
49

1 Where availability of space is limited, coordinate installation of different components to
2 ensure maximum performance and accessibility for required maintenance, service, and
3 repair of all components, including mechanical and electrical.
4

5 Prepare memoranda for distribution to each party involved, outlining special procedures required
6 for coordination. Include such items as required notices, reports, and list of attendees at meetings.
7

8 Prepare similar memoranda for Owner's Representative and separate contractors if
9 coordination of their Work is required.
10

11 Administrative Procedures: Coordinate scheduling and timing of required administrative procedures
12 with other construction activities and activities of other contractors to avoid conflicts and to ensure
13 orderly progress of the Work. Such administrative activities include, but are not limited to, the
14 following:

15
16 Preparation of Contractor's Construction Schedule.

17
18 Preparation of the Schedule of Values.

19
20 Installation and removal of temporary facilities and controls.

21
22 Delivery and processing of submittals.

23
24 Progress meetings.

25
26 Pre-installation conferences.

27
28 Project closeout activities.

29
30 Startup and adjustment of systems.

31
32 Project closeout activities.
33

34 Conservation: Coordinate construction activities to ensure that operations are carried out with
35 consideration given to conservation of energy, water, and materials.
36

37 Salvage materials and equipment involved in performance of, but not actually incorporated
38 into, the Work. Refer to other Sections for disposition of salvaged materials that are
39 designated as Owner's Representative's property.
40

41 SUBMITTALS 42

43 Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates
44 maximum utilization of space for efficient installation of different components or if coordination is
45 required for installation of products and materials fabricated by separate entities.
46

47 Content: Project-specific information, drawn accurately to scale. Do not base Coordination
48 Drawings on reproductions of the Contract Documents or standard printed data. Include
49 the following information, as applicable:

1 Indicate functional and spatial relationships of components of architectural,
2 structural, civil, mechanical, and electrical systems.

3
4 Indicate required installation sequences.

5
6 Indicate dimensions shown on the Contract Drawings and make specific note of
7 dimensions that appear to be in conflict with submitted equipment and minimum
8 clearance requirements. Provide alternate sketches to Owner's Representative for
9 resolution of such conflicts. Minor dimension changes and difficult installations will
10 not be considered changes to the Contract.

11
12 Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.

13
14 Number of Copies: Submit two (2) opaque copies of each submittal. Owner's
15 Representative will return one copy.

16
17 Submit five (5) copies where coordination Drawings are required for operation and maintenance
18 manuals as determined by Owner's Representative. Owner's Representative will retain two (2)
19 copies; remainder will be returned.

20
21 Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

22
23 Key Personnel Names: Within 15 days of starting construction operations, submit a list of key
24 personnel assignments, including superintendent and other personnel in attendance at Project Site.
25 Identify individuals and their duties and responsibilities; list addresses and telephone numbers,
26 including home and office telephone numbers. Provide names, addresses, and telephone numbers
27 of individuals assigned as standbys in the absence of individuals assigned to Project.
28 Superintendent or Contractor's representative must have signature authority.

29
30 Post copies of lists in Project meeting room, in temporary field office, and by each
31 temporary telephone. Keep list current at all times.

32 33 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

34
35 General: In addition to Project Superintendent, provide other administrative and supervisory
36 personnel as required for proper performance of the Work.

37
38 Include special personnel required for coordination of operations with other contractors.

39 40 PROJECT MEETINGS

41
42 General: Owner's Representative will schedule and conduct meetings and conferences at Project
43 Site, unless otherwise indicated.

44
45 Attendees: Participants and others involved, and individuals whose presence is required,
46 of date and time of each meeting will be notified. Attendance by all contractors is
47 mandatory.

48
49 Agenda: The agenda will be distributed to all invited attendees.

1 Minutes: Significant discussions and agreements achieved will be recorded and distribute
2 the meeting minutes to everyone concerned, including Owner's Representative, within one
3 week of the meeting.
4

5 Preconstruction Conference: A preconstruction conference will be scheduled before starting
6 construction, at a time convenient to Owner's Representative, but no later than fifteen (15) days
7 after execution of the Agreement. The conference will be held at Project Site or another convenient
8 location. Conduct the meeting to review responsibilities and personnel assignments.
9

10 Attendees: Authorized Owner's Representative, and their consultants; Contractor and its
11 superintendent; major subcontractors; suppliers; and other concerned parties shall attend
12 the conference. All participants at the conference shall be familiar with Project and
13 authorized to conclude matters relating to the Work.
14

15 Agenda: Discuss items of significance that could affect progress, including the following:
16

17 Tentative construction schedule.

18 Phasing.

19 Critical work sequencing and long-lead items.

20 Designation of key personnel and their duties.

21 Procedures for processing field decisions and Change Orders.

22 Procedures for requests for interpretations (RFI's).

23 Procedures for testing and inspecting.

24 Procedures for processing Applications for Payment.

25 Distribution of the Contract Documents.

26 Submittal procedures.

27 Preparation of Record Documents.

28 Use of the premises and existing building.

29 Work restrictions.

30 Owner's occupancy requirements.

31 Responsibility for temporary facilities and controls.

32 Construction waste management and recycling.

33 Parking availability.
34
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Office, work, and storage areas.

Equipment deliveries and priorities.

First aid.

Security.

Progress cleaning.

Working hours.

Minutes: Owner's Representative will record and distribute meeting minutes.

Pre-installation Conferences: Conduct a pre-installation conference at Project Site before each construction activity that requires coordination with other construction.

Attendees: Installers and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Owner's Representative of scheduled meeting dates.

Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

The Contract Documents.

Options.

Related requests for interpretations (RFI's).

Related Change Orders.

Purchases.

Deliveries.

Submittals.

Review of mockups.

Possible conflicts.

Compatibility problems.

Time schedules.

Weather limitations.

1
2 Manufacturer's written recommendations.
3
4 Warranty requirements.
5
6 Compatibility of materials.
7
8 Acceptability of substrates.
9
10 Temporary facilities and controls.
11
12 Space and access limitations.
13
14 Regulations of authorities having jurisdiction.
15
16 Testing and inspecting requirements.
17
18 Installation procedures.
19
20 Coordination with other work.
21
22 Required performance results.
23
24 Protection of adjacent work.
25
26 Protection of construction and personnel.
27
28 Record significant conference discussions, agreements, and disagreements,
29 including required corrective measures and actions.
30
31 Reporting: Distribute minutes of the meeting to each party present and to parties
32 who should have been present.
33
34 Do not proceed with installation if the conference cannot be successfully concluded.
35 Initiate whatever actions are necessary to resolve impediments to performance of
36 the Work and reconvene the conference at earliest feasible date.
37
38 Progress Meetings: Conduct progress meetings at regular intervals. Coordinate dates of meetings
39 with preparation of payment requests.
40
41 Attendees: In addition to Owner's Representative, each contractor, subcontractor, supplier,
42 and other entity concerned with current progress or involved in planning, coordination, or
43 performance of future activities shall be represented at these meetings. All participants at
44 the conference shall be familiar with Project and authorized to conclude matters relating to
45 the Work.
46
47 Agenda: Review and correct or approve minutes of previous progress meeting. Review
48 other items of significance that could affect progress. Include topics for discussion as
49 appropriate to status of Project.

1 Contractor's Construction Schedule: Review progress since the last meeting.
2 Determine whether each activity is on time, ahead of schedule, or behind schedule,
3 in relation to Contractor's Construction Schedule. Determine how construction
4 behind schedule will be expedited; secure commitments from parties involved to do
5 so. Discuss whether schedule revisions are required to ensure that current and
6 subsequent activities will be completed within the Contract Time.

7
8 Review schedule for next period.

9
10 Review present and future needs of each entity present, including the following:

11 Interface requirements.

12 Sequence of operations.

13 Status of submittals.

14 Deliveries.

15 Off-site fabrication.

16 Access.

17 Site utilization.

18 Temporary facilities and controls.

19 Work hours.

20 Hazards and risks.

21 Progress cleaning.

22 Quality and work standards.

23 Status of correction of deficient items.

24 Field observations.

25 Requests for interpretations (RFI's).

26 Status of proposal requests.

27 Pending changes.

28 Status of Change Orders.

29 Pending claims and disputes.

1 Documentation of information for payment requests.

2
3 Minutes: Owner's Representative will record and distribute to Contractor the meeting
4 minutes.

5
6 Reporting: Distribute minutes of the meeting to each party present and to parties who
7 should have been present.

8
9 Coordination Meetings: Conduct Project coordination meetings at monthly intervals. Project
10 coordination meetings are in addition to specific meetings held for other purposes, such as progress
11 meetings and pre-installation conferences.

12
13 Attendees: In addition to Owner's Representative, each contractor, subcontractor, supplier,
14 and other entity concerned with current progress or involved in planning, coordination, or
15 performance of future activities shall be represented at these meetings. All participants at
16 the conference shall be familiar with Project and authorized to conclude matters relating to
17 the Work.

18
19 Agenda: Review and correct or approve minutes of the previous coordination meeting.
20 Review other items of significance that could affect progress. Include topics for discussion
21 as appropriate to status of Project.

22
23 Combined Contractor's Construction Schedule: Review progress since the last
24 coordination meeting. Determine whether each contract is on time, ahead of
25 schedule, or behind schedule, in relation to Combined Contractor's Construction
26 Schedule. Determine how construction behind schedule will be expedited; secure
27 commitments from parties involved to do so. Discuss whether schedule revisions
28 are required to ensure that current and subsequent activities will be completed
29 within the Contract Time.

30
31 Schedule Updating: Revise Combined Contractor's Construction Schedule after
32 each monthly coordination meeting where revisions to the schedule have been
33 made or recognized. Issue revised schedule concurrently with report of each
34 meeting.

35
36 Review present and future needs of each contractor present, including the following:

37
38 Interface requirements.

39
40 Sequence of operations.

41
42 Status of submittals.

43
44 Deliveries.

45
46 Off-site fabrication.

47
48 Access.

49

- 1 Site utilization.
- 2
- 3 Temporary facilities and controls.
- 4
- 5 Work hours.
- 6
- 7 Hazards and risks.
- 8
- 9 Progress cleaning.
- 10
- 11 Quality and work standards.
- 12
- 13 Change Orders.
- 14

15 Reporting: Record meeting results and distribute copies to everyone in attendance and to
16 others affected by decisions or actions resulting from each meeting.

17

18

19 PART 2 - PRODUCTS (Not Used)

20

21

22 PART 3 -EXECUTION (Not Used)

23

24

25

26 END OF SECTION

1 SECTION 017329 - CUTTING AND PATCHING

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 Section includes:

14
15 Requirements for cutting and patching to integrate the work. Each contractor shall perform
16 all cutting and patching required for the completion of their respective scope of work.

17
18 SYSTEM DESCRIPTION

19
20 General: Do not cut and patch structural elements in a manner that would reduce their load-carrying
21 capacity or load-deflection ration without prior written permission.

22
23 Design Requirements: Do not cut and patch construction exposed on the exterior or in occupied
24 interior spaces in a manner that would, in the opinion of the Architect, reduce the building's
25 aesthetic qualities, or result in visual evidence of cutting and patching.

26
27 Remove work that has been cut and patched in a visually unsatisfactory manner and install
28 new.

29
30 Performance Requirements: Do not cut and patch operating elements or safety-related components
31 in a manner that would result in reducing their capacity to perform as intended, or result in
32 increased maintenance or decreased operational life or safety.

33
34 SUBMITTALS

35
36 Comply with Section's General Conditions, unless otherwise indicted.

37
38 QUALITY ASSURANCE

39
40 Installers' Qualifications: Firm experienced in installation of systems similar in complexity to those
41 required for this project, including specific requirements indicated.

42
43 Employ skilled workmen to perform cutting and patching.

44
45 On materials still under a warranty, utilize methods, materials and procedures only as
46 authorized by the warrantor.

47
48 Notification: Notify the Owner's Representative before executing cutting or alterations which affect
49 the following:

- 1 Work of separate contractors.
- 2
- 3 Structural value or integrity of an element of the project.
- 4
- 5 Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
- 6
- 7 Efficiency, operational life, maintenance, or safety of operational elements.
- 8
- 9 Visual qualities of sight-exposed elements.

10
11 PROJECT CONDITIONS

12
13 Environmental Requirements: Comply with recommendations of product manufacturers or
14 requirements specified under the original specification section, whichever is the more
15 stringent.

16
17
18 PART 2 - PRODUCTS

19
20 MATERIALS

21
22 Use materials that are identical to existing materials. If identical materials are not available or
23 cannot be used where exposed surfaces are involved, use materials that match existing adjacent
24 surfaces to the fullest extent possible with regard to visual effect and are compatible with existing
25 material. Use materials whose installed performance will equal or surpass that of existing
26 materials.

27
28
29 PART 3 - EXECUTION

30
31 PREPARATION

32
33 Before proceeding, meet at Project Site with parties involved in cutting and patching, including other
34 trades. Review areas of potential conflict and interface and coordinate procedures to eliminate
35 conflicts.

36
37 Temporary Support: Provide temporary support of work to be cut to assure structural integrity of
38 work and surroundings.

39
40 Protection: Protect existing construction during cutting and patching to prevent damage. Provide
41 protection from adverse weather conditions for portions of the project that might be exposed during
42 cutting and patching operations.

43
44 Execute cutting, fitting, and patching (and related work) to complete project work and to:

45
46 Fit the several parts together, to integrate with other work.

47
48 Uncover work to install ill-timed work.

49

- 1 Remove defective or non-conforming work and install new.
- 2
- 3 Remove samples not part of final work.
- 4
- 5 Proceed at earliest feasible time and complete without delay.
- 6
- 7 Cutting: Cut pre-existing construction using methods least likely to damage elements to be retained
- 8 or adjoining construction.
- 9
- 10 In general, where cutting is required, use hand or small power tools designed for sawing
- 11 and grinding, not hammering and chopping. Cut holes and slots neatly to size required with
- 12 minimal disturbance of adjacent surfaces.
- 13
- 14 Patching: Provide durable seams that are as invisible as possible. Comply with specified
- 15 tolerances.
- 16
- 17 Restore exposed finishes of patched areas and extend finish restoration into retained
- 18 adjoining construction in a manner that will eliminate evidence of patching and finishing.
- 19
- 20 Patch, repair, or rehang existing ceilings as necessary to provide an even plane surface of
- 21 uniform appearance.
- 22
- 23
- 24
- 25 END OF SECTION

1 SECTION 017700 - CLOSEOUT PROCEDURES

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes administrative and procedural requirements for contract closeout including,
14 but not limited to, the following:

15
16 Inspection procedures.

17
18 Project record document submittal.

19
20 Operation and maintenance manual submittal

21
22 Submittal of warranties.

23
24 Final cleaning.

25
26 Closeout requirements for specific construction activities are included in the appropriate Sections
27 in Divisions 2 through 32.

28
29 SUBSTANTIAL COMPLETION

30
31 Preliminary Procedures: Before requesting inspection for certification of Substantial Completion,
32 complete the following. List exceptions in the request.

33
34 In the Application for Payment that coincides with, or first follows, the date Substantial
35 Completion is claimed, show 100 percent completion for the portion of the Work claimed as
36 substantially complete.

37
38 Include supporting documentation for completion as indicated in these Contract
39 Documents and a statement showing an accounting of changes to the Contract
40 Sum.

41
42 If 100 percent completion cannot be shown, include a list of incomplete items, the
43 value of incomplete construction, and reasons the Work was not completed.

44
45 Advise the Owner's Representative of pending insurance changeover requirements.
46

- 1 Submit specific warranties, final certifications, and similar documents.
2
- 3 Obtain and submit releases enabling the Owner's Representative unrestricted use of the
4 Work and access to services and utilities. Include occupancy permits, operating certificates,
5 and similar releases.
6
- 7 Submit record drawings, maintenance manuals, final project photographs, damage or
8 settlement surveys, property surveys, and similar final record information.
9
- 10 Deliver tools, spare parts, extra stock, and similar items.
11
- 12 Make the final changeover of permanent locks and transmit keys to the Owner's
13 Representative. Advise the Owner's Representative's personnel of the changeover in
14 security provisions.
15
- 16 Complete startup testing of systems and instruction of the Owner's Representative's
17 operation and maintenance personnel. Discontinue and remove temporary facilities from
18 the site, along with mockups, construction tools, and similar elements.
19
- 20 Complete final cleanup requirements, including touch-up painting.
21
- 22 Touch up and otherwise repair and restore marred, exposed finishes.
23
- 24 Inspection Procedures: On receipt of a request for inspection, the Owner's Representative will
25 either proceed with inspection or advise the Contractor of unfilled requirements. The Owner's
26 Representative will prepare the Certificate of Substantial Completion following inspection or advise
27 the Contractor of construction that must be completed or corrected before the certificate will be
28 issued.
29
- 30 The Owner's Representative will repeat inspection when requested and assured that the
31 Work is substantially complete.
32
- 33 Results of the completed inspection will form the basis of requirements for final acceptance.
34
- 35 FINAL ACCEPTANCE
36
- 37 Preliminary Procedures: Before requesting final inspection for certification of final acceptance and
38 final payment, complete the following. List exceptions in the request.
39
- 40 Submit the final payment request with releases and supporting documentation not
41 previously submitted and accepted. Include insurance certificates for products and
42 completed operations where required.
43
- 44 Submit an updated final statement, accounting for final additional changes to the Contract
45 Sum.
46

1 Submit a certified copy of the Owner's Representative's final inspection list of items to be
2 completed or corrected, endorsed and dated by the Owner's Representative. The certified
3 copy of the list shall state that each item has been completed or otherwise resolved for
4 acceptance and shall be endorsed and dated by the Owner's Representative.

5
6 Submit consent of surety to final payment.

7
8 Submit evidence of final, continuing insurance coverage complying with insurance
9 requirements.

10
11 Reinspection Procedure: The Owner's Representative will reinspect the Work upon receipt of
12 notice that the Work, including inspection list items from earlier inspections, has been completed,
13 except for items whose completion is delayed under circumstances acceptable to the Owner's
14 Representative.

15
16 Upon completion of reinspection, the Owner's Representative will prepare a certificate of
17 final acceptance. If the Work is incomplete, the Owner's Representative will advise the
18 Contractor of Work that is incomplete or of obligations that have not been fulfilled but are
19 required for final acceptance.

20
21 If necessary, reinspection will be repeated.

22 RECORD DOCUMENT SUBMITTALS

23
24
25 General: Do not use record documents for construction purposes. Protect record documents from
26 deterioration and loss in a secure, fire-resistant location. Provide access to record documents for
27 the Owner's Representative's reference during normal working hours.

28
29 Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract
30 Drawings and Shop Drawings. Mark the set to show the actual installation where the installation
31 varies substantially from the Work as originally shown. Mark which drawing is most capable of
32 showing conditions fully and accurately. Give particular attention to concealed elements that would
33 be difficult to measure and record at a later date.

34
35 Mark record sets with a red erasable pencil. Use other colors to distinguish between
36 variations in separate categories of the Work.

37
38 Mark new information that is important to the Owner's Representative but was not shown
39 on Contract Drawings or Shop Drawings.

40
41 Note related change-order numbers where applicable.

42
43 Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover
44 sheets; print suitable titles, dates, and other identification on the cover of each set.

1 Record Specifications: Maintain one complete copy of the Project Manual, including addenda.
2 Include with the Project Manual one copy of other written construction documents, such as Change
3 Orders and modifications issued in printed form during construction.

4
5 Mark these documents to show substantial variations in actual Work performed in
6 comparison with the text of the Specifications and modifications.

7
8 Give particular attention to substitutions and selection of options and information on
9 concealed construction that cannot otherwise be readily discerned later by direct
10 observation.

11
12 Note related record drawing information and Product Data.

13
14 Upon completion of the work, submit record Specifications to the Owner's Representative
15 for the Owner's Representative's records.

16
17 Record Product Data: Maintain one copy of each Product Data submittal. Note related Change
18 Orders and markup of record drawings and Specifications.

19
20 Mark these documents to show significant variations in actual Work performed in
21 comparison with information submitted. Include variations in products delivered to the site
22 and from the manufacturer's installation instructions and recommendations.

23
24 Give particular attention to concealed products and portions of the Work that cannot
25 otherwise be readily discerned later by direct observation.

26
27 Upon completion of the markup, submit complete set of record Product Data to the Owner's
28 Representative for the Owner's Representative's records.

29
30 Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable
31 size. Bind properly indexed data in individual, heavy-duty, 2-inch, 3-ring, vinyl-covered binders, with
32 pocket folders for folded sheet information. Mark appropriate identification on front and spine of
33 each binder. Include the following types of information:

- 34
35 Emergency instructions
36 Spare parts list
37 Copies of warranties
38 Wiring diagrams
39 Recommended "turn-around" cycles
40 Inspection procedures
41 Shop Drawings and Product Data
42 Fixture lamping schedule

43
44
45 PART 2 - PRODUCTS (NA)
46

1 Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator
2 of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health
3 or property or that might damage finished surfaces.

4
5 Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable,
6 use products that comply with the California Code of Regulations maximum allowable VOC
7 levels.

8 9 PART 3 - EXECUTION

10 11 CLOSEOUT PROCEDURES

12
13 Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires
14 regular maintenance to meet with the Owner's Representative's personnel to provide instruction
15 in proper operation and maintenance. Provide instruction by manufacturer's representatives if
16 installers are not experienced in operation and maintenance procedures. Include a detailed review
17 of the following items:

- 18
- 19 Maintenance manuals
- 20 Record documents
- 21 Spare parts and materials
- 22 Tools
- 23 Identification systems
- 24 Control sequences
- 25 Hazards
- 26 Cleaning
- 27 Warranties and bonds
- 28 Maintenance agreements and similar continuing commitments
- 29

30 As part of instruction for operating equipment, demonstrate the following procedures:

- 31
- 32 Startup
- 33 Shutdown
- 34 Emergency operations
- 35 Noise and vibration adjustments
- 36 Safety procedures
- 37 Economy and efficiency adjustments
- 38 Effective energy utilization
- 39

40 FINAL CLEANING

41
42 General: Refer to General Conditions for daily cleaning during construction.

43
44 Cleaning: Clean each surface or unit to the condition expected in a normal, commercial building
45 cleaning and maintenance program. Comply with manufacturer's instructions.

1 Complete the following cleaning operations before requesting inspection for certification of
2 Substantial Completion.

3
4 Remove labels that are not permanent labels.

5
6 Clean transparent materials, including mirrors and glass in doors and windows. Remove
7 glazing compounds and other substances that are noticeable vision-obscuring materials.
8 Replace chipped or broken glass and other damaged transparent materials.

9
10 Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of
11 stains, films, and similar foreign substances. Restore reflective surfaces to their original
12 condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

13
14 Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and
15 other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and
16 lamps.

17
18 Clean the site, including roof and landscape development areas, of rubbish, litter, and other
19 foreign substances. Sweep paved areas broom clean; remove stains, spills, and other
20 foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-
21 textured surface.

22
23
24
25 END OF SECTION

1 SECTION 017839 - PROJECT RECORD DOCUMENTS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Division
9 0 and 1 Specifications Sections, apply to this Section.

10
11 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

12
13 Shop Drawings, Product Data, and Samples per General Conditions.

14
15 Division 1, Section "Summary"

16
17 MAINTENANCE OF DOCUMENTS

18
19 Each Prime Contractor will, via coordination with the Owner's Representative maintain at the job
20 site, one copy of:

21
22 Contract Drawings

23
24 Specifications

25
26 Addenda

27
28 Reviewed Shop Drawings

29
30 Change Orders

31
32 Other Modifications to Contract

33
34 Field Test Records

35
36 Store Documents in approved location, apart from documents used for construction.

37
38 Maintain documents in clean, dry, legible condition.

39
40 Do not use record documents for construction purposes.

41
42 Make documents available at all times for inspection by Owner's Representative.

43
44 RECORDING

45
46 In addition to copies of Contract Documents to be furnished by the Owner's Representative
47 for construction, the Owner's Representative will furnish the Contractor one (1) complete
48 set of drawings and one (1) set of Specifications. The Contractor and/or Subcontractors

1 under his direction will record on set of white prints each and every change that is made
2 from the Contract drawings at the time it is made.
3

4 General: Specific requirements for record documents are indicated in individual sections of
5 these specifications, additional requirements are indicated in General Conditions. General
6 submittal requirements are indicated in "Submittals" sections. Do not use record documents
7 for construction purposes; protect them from deterioration and loss by keeping such in a
8 secure, fire-resistive location; provide access to record documents for the Owner's
9 Representative's reference during normal working hours.

10
11 Record Drawings: Maintain a set of Contract Drawings and shop drawings in clean,
12 undamaged condition, with the markup of actual installations which vary from the work as
13 originally shown. Mark whichever drawing is most capable of showing "Field" condition fully
14 and accurately. However, where shop drawings are used for the markup, record cross-
15 references at corresponding location on working drawings. Mark with a red erasable pencil
16 and, where feasible, use other colors to distinguish between variations in separate
17 categories of work. Markup new information which is recognized to be of importance to
18 Owner's Representative, but was for some reason not shown on either contract drawings
19 or shop drawings. Give particular attention to concealed work, which would be difficult to
20 measure and record at a late date. Note related change-order numbers where applicable.
21 Organize record drawing sheets into manageable sets, bind with durable paper cover
22 sheets, and print suitable titles, dates and other identification on cover of each set.
23

24 Operation and Maintenance Manuals (in triplicated minimum):

25
26 Organize maintenance and operating manual information into suitable sets of manageable
27 size.

28
29 Bind into individual binders properly identified.

30
31 Include pocket folders for folded sheet information.

32
33 Print identification on both the front and spine of each binder.

34
35 Include Project Name, Contractor Name, Architect's Name, Date and Scope of
36 Work.

37
38 Index by specification section (thumb-tabbed).

39
40 Include Table of Contents, subs/suppliers names, addresses, emergency phone
41 number, emergency instructions and scope of work.

42
43 Spare parts listing

44
45 Wiring diagrams

46
47 Warranties

48
49 Recommended "turnaround" cycles

1 Inspection procedures.

2
3 Items to be included, but not necessarily limited to, the following items: Refer to the General
4 Conditions and Divisions 1 through 32 of the Specifications for specific requirements by Section:

5
6 Manufacturers' Warranties indexed by Specification Section. All Manufacturer's warranties
7 are to start from the Date of Substantial Completion.

8
9 Attic Stock Receipts by Specification Section.

10
11 Demonstration and Training Log by Specification Section.

12
13 Maintenance Data.

14
15 Operating Instructions

16
17 Building Department, Health Department, Fire Marshal, Elevator Inspection, etc. Inspection
18 Certificates.

19
20 Testing Reports.

21
22 Balance Reports.

23
24 Filter Schedule.

25
26 Material Schedules.

27
28 Record Submittals: Maintain one copy of each approved submittal, to be submitted in the
29 Operation and Maintenance Manuals when information differs from Operating and
30 Maintenance Instructions.

31
32 The Contractor will provide the following information for Record Purposes. Refer to the General
33 Conditions and Divisions 1 through 32 of the Specifications for specific requirements by Section:

34
35 Punch lists signed by the Contractor

36
37 One (1) year Guarantee Letter from Contractor from Date of Substantial Completion

38
39 Consent of Surety (AIA 707)

40
41 Waiver of Lien from Contractor in the Entire Contract Amount

42
43 Affidavit of Contractor

44
45 Letter Requesting Retainage

46
47 Letter stating all start-up testing is complete and in compliance with the Specifications.
48

1 Certificate of Warranty Commencement with a List of Manufacturers' Warranties by Section
2 attached for reference.

3

4 PROJECT RECORD DOCUMENTS SUBMISSION PROCESS

5

6 Prior to Retainage Payment, the Contractor will deliver all record documents, Operation and
7 Maintenance Manuals and other documentation as required to the Owner's Representative, for
8 theirs and the Owner's Representative's review and acceptance.

9

10 Accompany submittal with a transmittal letter, containing the following:

11

12 Date.

13

14 Project title and number.

15

16 Contractor's name and address.

17

18 Title and number of each record document.

19

20 Signature of Contractor, or his authorized representative.

21

22

23

24 END OF SECTION

1 SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Division
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes the following:

14
15 Demolition and removal of selected portions of building or structure.

16
17 Related Sections:

18
19 Division 01 Section "Summary" for use of premises, and phasing, and Owner-occupancy
20 requirements.

21
22 Division 01 Section "Cutting and Patching" for cutting and patching procedures.

23
24 DEFINITIONS

25
26 Remove: Detach items from existing construction and legally dispose of them off-site, unless
27 indicated to be removed and salvaged or removed and reinstalled.

28
29 Remove and Salvage: Detach items from existing construction and deliver them to Owner's
30 Representative.

31
32 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and
33 reinstall them where indicated.

34
35 Existing to Remain: Existing items of construction that are not to be removed and that are not
36 otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

37
38 MATERIALS OWNERSHIP

39
40 Historic items, relics, and similar objects including, but not limited to, cornerstones and their
41 contents, commemorative plaques and tablets, antiques, and other items of interest or value to
42 Owner's Representative that may be encountered during selective demolition remain Owner's
43 Representative's property. Carefully remove and salvage each item or object in a manner to
44 prevent damage and deliver promptly to Owner's Representative.

45
46 SUBMITTALS

1
2 Pre-demolition Photographs or Videotapes: Show existing conditions of adjoining construction and
3 site improvements, including finish surfaces, that might be misconstrued as damage caused by
4 selective demolition operations. Submit before Work begins.

5
6 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed
7 to accept hazardous wastes.

8
9 QUALITY ASSURANCE

10
11 Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification
12 program.

13
14 Regulatory Requirements: Comply with governing EPA notification regulations before beginning
15 selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

16
17 Standards: Comply with ANSI A10.6 and NFPA 241.

18
19 PROJECT CONDITIONS

20
21 Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct
22 selective demolition so Owner's operations will not be disrupted.

23
24 Comply with requirements specified in Division 01 Section "Summary."

25
26 Conditions existing at time of inspection for bidding purpose will be maintained by Owner's
27 Representative as far as practical.

28
29 Before selective demolition, Owner's Representative will remove the following items:

30
31 Loose Furnishings

32
33 Notify Owner's Representative of discrepancies between existing conditions and Drawings before
34 proceeding with selective demolition.

35
36 Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

37
38 If materials suspected of containing hazardous materials are encountered, do not disturb;
39 immediately notify Owner's Representative. Owner's Representative will remove hazardous
40 materials under a separate contract.

41
42 Storage or sale of removed items or materials on-site is not permitted.

43
44 Utility Service: Maintain existing utilities indicated to remain in service and protect them against
45 damage during selective demolition operations.

1 Maintain fire-protection facilities in service during selective demolition operations.

2
3 WARRANTY

4
5 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged
6 during selective demolition, by methods and with materials so as not to void existing warranties.

7
8
9 PART 2 - PRODUCTS (NA)

10
11
12 PART 3 - EXECUTION

13
14 EXAMINATION

15
16 Verify that utilities have been disconnected and capped.

17
18 Survey existing conditions and correlate with requirements indicated to determine extent of
19 selective demolition required.

20
21 Inventory and record the condition of items to be removed and reinstalled and items to be removed
22 and salvaged.

23
24 When unanticipated mechanical, electrical, or structural elements that conflict with intended function
25 or design are encountered, investigate and measure the nature and extent of conflict. Promptly
26 submit a written report to Owner's Representative.

27
28 Engage a professional engineer to survey condition of building to determine whether removing any
29 element might result in structural deficiency or unplanned collapse of any portion of structure or
30 adjacent structures during selective demolition operations.

31
32 Perform surveys as the Work progresses to detect hazards resulting from selective demolition
33 activities.

34
35 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

36
37 Existing Services/Systems: Maintain services/systems indicated to remain and protect them
38 against damage during selective demolition operations.

39
40 Comply with requirements of existing services/systems interruptions specified in Division
41 1 Section "Summary"

42
43 Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility
44 services and mechanical/electrical systems serving areas to be selectively demolished.

1 Owner's Representative will arrange to shut off indicated services/systems when requested
2 by Contractor.

3
4 Arrange to shut off indicated utilities with utility companies.

5
6 If services/systems are required to be removed, relocated, or abandoned, before
7 proceeding with selective demolition provide temporary services/systems that bypass area
8 of selective demolition and that maintain continuity of services/systems to other parts of
9 building.

10
11 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal
12 remaining portion of pipe or conduit after bypassing.

13
14 Where entire wall is to be removed, existing services/systems may be removed with
15 removal of the wall.

16
17 PREPARATION

18
19 Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations
20 to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied
21 and used facilities.

22
23 Temporary Facilities: Provide temporary barricades and other protection required to prevent injury
24 to people and damage to adjacent buildings and facilities to remain.

25
26 Provide protection to ensure safe passage of people around selective demolition area and
27 to and from occupied portions of building.

28
29 Provide temporary weather protection, during interval between selective demolition of
30 existing construction on exterior surfaces and new construction, to prevent water leakage
31 and damage to structure and interior areas.

32
33 Protect walls, ceilings, floors, and other existing finish work that are to remain or that are
34 exposed during selective demolition operations.

35
36 Cover and protect furniture, furnishings, and equipment that have not been removed.

37
38 Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to
39 preserve stability and prevent movement, settlement, or collapse of construction and finishes to
40 remain, and to prevent unexpected or uncontrolled movement or collapse of construction being
41 demolished.

42
43 Strengthen or add new supports when required during progress of selective demolition.

44
45 SELECTIVE DEMOLITION, GENERAL

1 General: Demolish and remove existing construction only to the extent required by new
2 construction and as indicated. Use methods required to complete the Work within limitations of
3 governing regulations and as follows:
4

5 Proceed with selective demolition systematically, from higher to lower level. Complete
6 selective demolition operations above each floor or tier before disturbing supporting
7 members on the next lower level.
8

9 Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting
10 methods least likely to damage construction to remain or adjoining construction. Use hand
11 tools or small power tools designed for sawing or grinding, not hammering and chopping,
12 to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
13

14 Cut or drill from the exposed or finished side into concealed surfaces to avoid marring
15 existing finished surfaces.
16

17 Do not use cutting torches until work area is cleared of flammable materials. At concealed
18 spaces, such as duct and pipe interiors, verify condition and contents of hidden space
19 before starting flame-cutting operations. Maintain portable fire-suppression devices during
20 flame-cutting operations.
21

22 Maintain adequate ventilation when using cutting torches.
23

24 Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and
25 promptly dispose of off-site.
26

27 Remove structural framing members and lower to ground by method suitable to avoid free
28 fall and to prevent ground impact or dust generation.
29

30 Locate selective demolition equipment and remove debris and materials so as not to impose
31 excessive loads on supporting walls, floors, or framing.
32

33 Dispose of demolished items and materials promptly.
34

35 Removed and Salvaged Items:

36 Clean salvaged items.
37

38 Pack or crate items after cleaning. Identify contents of containers.
39

40 Store items in a secure area until delivery to Owner's Representative.
41

42 Transport items to Owner's Representative's storage area designated by Owner's
43 Representative.
44

45 Protect items from damage during transport and storage.
46

1 Removed and Reinstalled Items:
2
3 Clean and repair items to functional condition adequate for intended reuse. Paint
4 equipment to match new equipment.
5
6 Pack or crate items after cleaning and repairing. Identify contents of containers.
7
8 Protect items from damage during transport and storage.
9
10 Reinstall items in locations indicated. Comply with installation requirements for new
11 materials and equipment. Provide connections, supports, and miscellaneous materials
12 necessary to make item functional for use indicated.
13

14 Existing Items to Remain: Protect construction not indicated to be removed against damage and
15 soiling during selective demolition. When permitted by Owner's Representative, items may be
16 removed to a suitable, protected storage location during selective demolition, and cleaned and
17 reinstalled in their original locations after selective demolition operations are complete.
18

19 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

20
21 Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain
22 and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
23

24 Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using
25 power-driven saw, then remove masonry between saw cuts.
26

27 Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
28

29 Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations
30 in RFCI-WP and its Addendum.
31

32 Remove residual adhesive and prepare substrate for new floor coverings by one of the
33 methods recommended by RFCI.
34

35 Air-Conditioning Equipment: Remove equipment without releasing refrigerants.
36

37 DISPOSAL OF DEMOLISHED MATERIALS

38
39 General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise
40 indicated to remain Owner's property, remove demolished materials from Project site and legally
41 dispose of them in an EPA-approved landfill.
42

43 Do not allow demolished materials to accumulate on-site.
44

45 Remove and transport debris in a manner that will prevent spillage on adjacent surfaces
46 and areas.

1 Remove debris from elevated portions of building by chute, hoist, or other device that will
2 convey debris to grade level in a controlled descent.

3
4 Burning: Do not burn demolished materials.

5
6 Disposal: Transport demolished materials off Owner's property and legally dispose of them.

7
8 CLEANING

9
10 Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition
11 operations. Return adjacent areas to condition existing before selective demolition operations
12 began.

13
14
15
16 END OF SECTION

1 SECTION 033000 - CAST-IN-PLACE CONCRETE

2
3
4 PART 2 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions 0
9 and 1 Specifications Sections, apply to this Section.

10
11 DESCRIPTION

12
13 Basic specification: Perform work of this Section according to ACI 301-05, "Specifications for
14 Structural Concrete for Buildings", except as specifically modified herein. Numbers in parentheses
15 (0.00) indicate a related paragraph of ACI 301.

16
17 Work included: All cast-in-place concrete work shown on the Drawings and required by these
18 Specifications. Allow for the installation of cast-in items furnished under other Sections. Install
19 anchor bolts for structural steel. Provide and install grout under steel column base plates and beam
20 bearing areas.

21
22 Provide concrete pads, piers, curbs, and bases required for equipment of all trades. Coordinate
23 dimensions and details with requirements of equipment being supplied, prior to placing concrete.

24
25 Cooperate with other trades who will provide and install items of work (sleeves, piping, conduit,
26 inserts, etc.) to be cast in the concrete. Place no concrete until all such items are in place.

27
28 Dimensions of chases and openings, and details of connections and supports related to equipment
29 as shown on the Drawings are for bidding only. Verify sizes, locations, and details prior to placing
30 concrete.

31
32 Inspection and testing services required to establish mix designs are to be performed by an Agency
33 retained by the Contractor (1.6.3). Other services required by this Section are to be performed by an
34 Agency retained by the Owner (1.6.4). Provide facilities for storage and curing of specimens molded
35 by the Owner's Agency (1.6.3.2.d).

36
37 Include sample panels as specified herein.

38
39 Include cleaning allowance as specified herein.

40
41 RELATED SECTIONS:

42
43 Division 04, Section "Unit Masonry"

44
45 Division 05, Section "Structural Steel"

46
47 Division 05, Section "Steel Joists"

48
49 Division 05, Section "Metal Decking"

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QUALITY ASSURANCE

Reference standards:

- ACI 318, Building Code Requirements for Reinforced Concrete.
- ACI 315R, Details and Detailing of Concrete Reinforcement.
- ACI 347R, Guide to Formwork for Concrete.
- ACI 302.1R, Guide for Concrete Floor and Slab Construction.
- "Placing Reinforcing Bars", CRSI & WCRSI Recommended Practice.

SUBMITTALS

Submit for approval the name of the agency proposed for the required inspection and testing services. If some or all of the required testing is to be performed by personnel not employed by the proposed agency, submit letter from the agency stating that those personnel are qualified to perform the tests.

Submit a mix design for each class of concrete required (1.6.3). Concrete proportions shall be established on the basis of previous field experience or trial mixtures (4.2.3).

Submit shop drawings for all reinforcing. Indicate strength, size, and, details of all bar reinforcing, and style and specification of all welded wire fabric (3.1.1).

Submit product literature for admixtures and curing compounds proposed for use.

Submit reports of all required testing and inspection.

Submit, on request only, mill test certificates for reinforcing.

Submit test data for aggregates proposed for use, indicating source and compliance with specification requirements. Date of test to be no more than 90 days prior to submittal. Resubmit in advance of any proposed change in source.

Certification of experience: Submit, on request only, written description of personnel, projects, and equipment which document the experience and qualifications required of the post-tensioning supplier and erector.

FIELD REFERENCE MANUALS

Provide at least one copy of the ACI Field Reference Manual, SP-15 (1.3.3), and one copy of CRSI's "Placing Reinforcing Bars" in the field office at all times.

PART 2 - PRODUCTS

MATERIALS

Cement (4.2.1.1): Portland cement, ASTM C150, Type I or Type II or ASTM C1157, Type LH or GU.

1 All cement to be from the same mill.

2

3 Water: Potable.

4

5 Aggregates:

6

7 Conform to ASTM C33 (4.2.1.2).

8

9 Use size no. 57.

10

11 Combined aggregate gradation for slabs, and other designated concrete, shall be 8% - 18%
12 for large top size aggregates (1 ½ in.) or 8% - 22% for smaller top size aggregates (1 in. or
13 ¾ in.) retained on each sieve below the top size and above the no. 100 sieve.

14

15 Admixtures (where required or permitted) (4.2.1.4):

16

17 Air-entraining admixture: Required for all air-entrained concrete. ASTM C260.

18 Water-Reducing Admixture: The admixture shall conform to ASTM C494, Type A. The
19 following are acceptable:

20

21 Eucon Series by The Euclid Chemical Co.

22 Pozzolith Series by BASF The Chemical Co.

23 Plastocrete Series by Sika Chemical Corp.

24 WRDA Series by W.R. Grace Co.

25

26 Water-Reducing, Retarding Admixture: The admixture shall conform to ASTM C494, Type
27 D. The following are acceptable:

28

29 Eucon Retarder 75 by The Euclid Chemical Co.

30 Pozzolith 100-XR by BASF The Chemical Co.

31 Plastocrete 161R by Sika Chemical Corp.

32 Daratard-17 by W.R. Grace Co.

33

34 Mid-Range Water-Reducer Admixture: The admixture shall conform to ASTM C494, Type
35 A. The following are acceptable:

36

37 Eucon MR by The Euclid Chemical Co.

38 Polyheed 997 by BASF The Chemical Co.

39 Daracem 55, or 65 by W.R. Grace Co.

40

41 High-Range Water-Reducing Admixture (Superplasticizer): The admixture shall conform to
42 ASTM C494, Type F or G. The following are acceptable for addition to the mix at the site:

43

44 Eucon 37, 1037, or Plastol 341/5000 by The Euclid Chemical Co.

45 Pozzolith 400N by BASF The Chemical Co.

46

47 The following are acceptable for addition to the mix at the batch plant:

48

49 Darcem 100 or Advaflo by W.R. Grace Co.

1 Rheobuild 1000 or Glenium 3030 NS by BASF The Chemical Co.

2
3 Non-Chloride, Non-Corrosive Accelerator: The admixture shall conform to ASTM C494,
4 Type C or E (4.2.1.4). The admixture must have long term non-corrosive test data from an
5 independent testing laboratory (of at least one year's duration) using an acceptable
6 accelerated corrosion test method such as those using electrical potential measures. The
7 following are acceptable:

8
9 Accelguard 80, 90, or NCA by The Euclid Chemical Co.
10 Pozzutec 20 by BASF The Chemical Co.
11 Polarset by W.R. Grace Co.

12
13 Supplementary Cementitious Materials:

14
15 Fly Ash: ASTM C618, Type C or F, may be used up to a maximum of 25% of the
16 total cementitious content (4.2.1.1.d).

17
18 Ground Granulated Blast-Furnace Slag, GGBF Slag: ASTM C989, Grade 100 or
19 120, may be used up to a maximum of 40% of the total cementitious content
20 (4.2.1.1.e).

21
22 The exact percentages used shall be based on a successful test placement on-site.

23
24 All supplementary cementitious materials shall be extracted, processed, and
25 manufactured within a radius of 500 miles from the project site.

26
27 Calcium Chloride: Calcium chloride or admixtures containing more than 0.05% chloride ions
28 are not permitted.

29
30 Certification: Written conformance to above mentioned requirements and the chloride ion
31 content will be required from the admixture manufacturer prior to mix design review by the
32 Architect.

33
34 Upon request only, provide a qualified full-time representative to assure proper use of
35 admixtures.

36
37 Use of admixtures other than listed above will be permitted only when approved prior to mix
38 design approval.

39
40 Reinforcing (3.2.1):

41
42 Deformed bars: ASTM A615 or A706. Minimum yield strength to be 60 ksi, except where
43 required by the Drawings.

44
45 Welded Wire Fabric:

46
47 Plain welded wire reinforcement: ASTM A185. Provide in sheet form (not rolls).

48
49 Provide steel reinforcing and welded wire fabric products that have a post-consumer

1 recycled content plus one-half of pre-consumer recycled content of not less than 60 percent.

2
3 Steel for reinforcing shall be extracted, processed, and manufactured/fabricated within a
4 radius of 500 miles from the project site.

5
6 Premolded expansion joint filler: ASTM D1751 (2.2.1.4).

7
8 Curing and Sealing Compound (VOC Compliant, 700g/l): Liquid type membrane-forming curing
9 compound, clear styrene acrylate type, complying with ASTM C1315, Type I, Class B, 25% solids
10 content minimum. Moisture loss shall be not more than 0.30 Kg/m² when applied at 300 sq. ft./gal.
11 Manufacturers certification is required. Subject to project requirements, provide one of the following
12 products:

13
14 Super rez Seal by The Euclid Chemical Co.
15 Materseal 30 by BASF The Chemical Co.
16 Kure N Seal 30 by Sonneborn

17
18 Curing and Sealing Compound (VOC Compliant, 350g/l): Liquid type membrane-forming curing
19 compound, clear styrene acrylate type, complying with ASTM C1315, Type I, Class A, 25% solids
20 content minimum. Moisture loss shall be not more than 0.40 Kg/m² when applied at 300 sq. ft./gal.
21 Manufacturers certification is required. Subject to project requirements, provide one of the following
22 products:

23
24 Super Diamond Clear VOX by The Euclid Chemical Co.
25 Super Rrez SealVOX by The Euclid Chemical Co.
26 Masterkure 100w by BASF The Chemical Co.

27
28 Curing Compound (Strippable): The compound shall conform to ASTM C309 and is to be used on
29 slabs that are to receive subsequent applied finishes and where noted on the drawings. Install in
30 strict accordance with the manufacturer's recommendations and supervision. Verify compound is
31 compatible with the applied finish prior to placement, subject to approval the following are
32 acceptable:

33
34 Kurez DR VOX by The Euclid Chemical Co.
35 Kurez W VOX by The Euclid Chemical Co.

36
37 Grout for masonry core fill: ASTM C476, coarse type.

38
39 Non-Shrink, Non-Metallic Grout: The non-shrink grout shall be a factory pre-mixed grout and shall
40 conform to ASTM C1107, "Standard Specification for Package Dry, Hydraulic-Cement Grout (Non-
41 Shrink)." In addition, the grout manufacturer shall furnish test data from an independent laboratory
42 indicating the grout when placed at a fluid consistency shall achieve 95% bearing under a 4' x 4'
43 base plate. The following are acceptable:

44
45 N-S Grout by The Euclid Chemical Co.
46 Masterflow 713 by BASF The Chemical Co.
47 Five Star Grout by U.S. Grout Corp.

48
49 High Flow Grout: Where high fluidity and/or increased placing time is required, use high flow grout.

1 The factory pre-mixed grout shall conform to ASTM C1107 "Standard Specification for Packages
2 Dry, Hydraulic-Cement Grout (Non-Shrink)." IN addition, the grout manufacturer shall furnish test
3 data from an independent laboratory indicating the grout when placed at a fluid consistency shall
4 achieve a 95% bearing under a 18" x 36" base plate. The following are acceptable:

5
6 Hi-Flow Grout by The Euclid Chemical Co.
7 Masterflow 928 by BASF The Chemical Co.

8
9 All column base plates, and other locations noted on the structural drawings shall be grouted with
10 the specified non-shrink grout, with minimum 28-day strength of 9,000 psi.

11
12 Bonding and Repair Materials:

13
14 Structural Bonding Compound: Epoxy adhesive, 100% solids, two-component
15 material suitable for use on dry or damp surface. The following are acceptable:

16
17 Euco Epoxy #352 or #452 Series by The Euclid Chemical Co.
18 Sikadur Hi-Mod by Sika Chemical Co.
19 Epoxitite 2390 by A. C. Horn, Inc.

20
21 Patching Compound, Epoxy Type: 100% solids, suitable for use on dry or damp surface.
22 The following are acceptable:

23
24 Euco Epoxy #456 mortar by The Euclid Chemical Co.
25 Sikadur Lo-Mod Mortar by Sika Chemical Co.
26 Epoxitite 2390 Mortar by A. C. Horn, Inc.

27
28 Polymer Patching Mortar: The following are acceptable:

29
30 Horizontal applications:

31
32 Top Thin Supreme by The Euclid Chemical Co.
33 Concrete Top Supreme by The Euclid Chemical Co.
34 Patchwell by Kaufman Company
35 Sikatop 122 by Sika Chemical Co.

36
37 Vertical applications:

38
39 Verticoat by The Euclid Chemical Co.
40 Verticoat Supreme by The Euclid Chemical Co.
41 Sikatop 123 by Sika Chemical Co.

42
43 Underlayment compound: Free-flowing, self-leveling, pumpable cementitious base
44 compound. Compound shall have a compressive strength conforming to ASTM C109 of
45 3,600 psi at 7 days and 5,000 psi at 28 days and a bond strength conforming to ASTM
46 C1042 of 700 psi at 7 days and 1,000 psi at 28 days. The following are acceptable:

47
48 Flo-Top by The Euclid Chemical Co.
49

1 Repair Topping: Self-levleing, polymer modified high strength topping. The following are
2 acceptable:

3
4 Thin-Top Supreme by The Euclid Chemical Co.
5

6 Bonding Compound: Polyvinyl acetate, rewettable type. Use only in areas not subject to
7 moisture. The following are acceptable:

8
9 Euco Weld by The Euclid Chemical Co.
10 Weldcrete by Larson Products
11 Daraweld C by W.R. Grace Co.
12

13 Vapor Retarder:

14
15 Conform to ASTM E1745, Class A, Standard Specification for Plastic Water Vapor
16 Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
17

18 Minimum thickness of vapor retarder shall be not less than 15 mils. Include manufacturer's
19 recommended adhesive or pressure sensitive tape.
20

21 Granular fill below slabs on grade: ODOT 304 or approved equal.
22

23 MIXES
24

25 The following classes of concrete are required (4.2.2.9):
26

27 Type	28 F'c at 28 days	29 Minimum Cementitious Content	30 Maximum Water Cementitious Ratio	31 Air Content
32 Class I 33 footings, grade beams, 34 and all other below grade concrete 35	3,000 PSI	470	--	optional
36 Class II 37 interior slabs on grade 38 unless otherwise noted 39	3,500 PSI	510	0.50	optional
40 Class III 41 exterior flat work, 42 any other concrete 43 exposed to weather 44	4,500 PSI	610	0.45	5-7%
45 Class IV 46 backfill, mud slabs, 47 lean concrete 48	1,500 PSI	375	--	optional

49 Slump: All concrete containing the high-range water-reducing admixture (superplasticizer)

1 shall have a maximum slump of 8 inches unless approved by the Architect. The concrete
2 shall arrive at the job site at a slump of 2 to 3 inches, to be verified, then the high-range
3 water-reducing admixture added to increase the slump to the approved level. All other
4 concrete shall have a maximum slump of 5 inches for all members, unless otherwise noted.
5 For the high-range water-reducing admixture added at the batch plant, verification is to be
6 provided that the water-to-cement ratio has not been exceeded

7
8 Supplementary cementitious materials, fly ash and GGBF slag, are permitted in all classes.
9 Class III concrete is to meet the requirements for concrete subject to severe exposure.

10
11 Class IV concrete may be site mixed; all other concrete is to be ready-mixed (4.3.1.1 and
12 4.3.1.2).

13
14 All admixtures, except superplasticizer, are to be added at the batch plant. Superplasticizer
15 may be added at the jobsite through an approved dispenser.

16
17 Mixes intended to be pumped are to be so identified on the mix design submitted for
18 approval. All pumped mixes are to have a mid-range or high-range water-reducer.
19 Maximum slump at the pump shall be 7" for concrete containing the mid-range water-
20 reducing admixture and 9" for concrete containing the high-range water-reducing admixture.

21
22 All concrete for Classes II and III shall contain the specified water-reducing or water-
23 reducing/retarding admixture, mid-range water-reducing admixture and/or high-range water-
24 reducing admixture (superplasticizer). All concrete slabs, placed at air temperature below 50
25 degrees F shall contain the specified non-corrosive, non-chloride accelerator. All concrete
26 placed at air temperature above 90 degrees shall contain the specified water-
27 reducing/retarding admixture. All concrete required to be air-entrained shall contain an
28 approved air-entraining admixture. All pumped concrete and concrete with a
29 water-cementitious ratio below 0.50 shall contain the specified high-range water-reducing
30 admixture (superplasticizer). Concrete with a water-cementitious ratio above 0.45 may
31 contain the specified mid-range water-reducing admixture.

32 33 PRE-CONCRETE CONFERENCE:

34
35 At least 35 days prior to the start of the concrete construction schedule, the Contractor shall conduct
36 a meeting to review the proposed mix designs and to discuss the required methods and procedures
37 necessary to achieve the required concrete quality. The Contractor shall send a pre-concrete
38 conference agenda to all attendees 20 days prior to the scheduled date of the conference.

39 40 41 PART 3 - EXECUTION

42 43 SURFACE CONDITIONS

44
45 Verify that excavations are free of water and ice, are of the required dimensions, and have been
46 approved by the Soils Engineer, prior to placing concrete (5.3.1).

47
48 Determine field conditions by actual measurement.
49

1 Notify Architect no less than 24 hours in advance of placing concrete. Place concrete only when
2 Architect is present, unless this requirement is specifically waived.

3
4 FORMWORK AND REINFORCING

5
6 Footings may be cast against earth cuts when soil conditions permit.

7
8 Reinforcing:

9
10 Welding of reinforcing is prohibited, except where shown.

11
12 Use plastic-tipped or stainless steel bar supports for surfaces exposed to view in finished
13 structure.

14
15 Removal of forms and shoring:

16
17 Remove no forms within first 24 hours after placement.

18
19 VAPOR RETARDERS

20
21 Vapor retarders are required under all slabs on grade.

22
23 Vapor retarder shall be installed in accordance with ASTM E1643 Standard Practice for Installation
24 of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

25
26 Where required, the vapor retarder shall be a minimum of 15 mils thick and placed directly on the
27 granular fill, below the concrete floor slab. Granular fill shall be a well-graded granular material,
28 equivalent to ODOT 304.

29
30 Lap joints a minimum of 6 inches and seal with manufacturer's recommended tape or
31 adhesive.

32
33 DELIVERY AND PLACEMENT

34
35 Preparation before placement:

36
37 Remove all debris from forms and deck (5.3.1.3). Clean steel deck of grease, oil, and other
38 substances that would reduce bond to concrete.

39
40 Do not use additives or salts to remove ice. Non-chloride deicers may be used.

41
42 In cold weather, comply with ACI 306.1; maintain temperature of forms and reinforcing within
43 a range of 55 - 90 degrees F.

44
45 In hot weather, comply with ACI 301.

46
47 Repair all damage and holes in sheathing of post-tensioning tendons.

48
49 Delivery is to conform to ASTM C94.

1 Delivery tickets to contain the following, in addition to the information required by C94:

2
3 Reading of revolution counter at first addition of water.

4
5 Type and brand of cement and supplementary cementitious materials.

6
7 Cementitious content.

8
9 Total water content by producer.

10
11 Maximum size of aggregate.

12
13 Secure Architect's written approval if non-agitating type equipment is to be used for
14 transportation.

15
16 Water may be added at the site only with the Architect's prior approval. Secure Architect's
17 signature on the delivery ticket that indicates the quantity of water added.

18
19 ASTM C94 requires discharge within 1-1/2 hours or 300 revolutions; whichever comes first,
20 after the introduction of water to cement and aggregates, or the introduction of cement to the
21 aggregates. Architect may require an earlier discharge during hot weather, or when
22 high-early strength cement is being used.

23
24 Conveying: Keep delivery carts and buggies on runways; do not allow them to bear on reinforcing or
25 uncured concrete.

26
27 Placement:

28
29 Place within 6 feet of final position. Spreading with vibrators is prohibited.

30
31 In walls and columns, deposit concrete in uniform horizontal layers, with a maximum depth
32 of 4 feet (18 inches for architectural concrete).

33
34 Maximum free fall without chutes or elephant trunks to be 5 feet (3 feet for architectural
35 concrete).

36 Place architectural concrete continuously to a designed joint.

37
38 Records: Keep a complete log of pours, including date, location, quantity, weather, and identification
39 of test cylinders for each pour.

40 41 JOINTING

42
43 Interior slabs on grade:

44
45 Locate control (contraction) joints as shown on the Drawings. In the absence of information
46 on Drawings, locate at openings, walls, columns, grid lines, and inside corners. The
47 maximum spacing of contraction (control) joints, for slabs is to be 12 feet on center. Cut
48 joints 1/4 times the slab thickness. The Soff-Cut Saw shall be used immediately after final
49 finishing. A conventional saw shall be used as soon as possible without dislodging
50 aggregate. Schedule slab pours and saw-cutting operations such that sawing is completed

1 prior to onset of shrinkage cracking (5.3.5).

2
3 Provide isolation joints at columns (1/2 inch thick) and at walls (1/8 inch thick). Where
4 isolation joint will be exposed to view, set top of joint filler below top of slab a distance equal
5 to the filler thickness, to receive sealant. Where not exposed to view, set top of filler flush
6 with top of slab.

7
8 Exterior slabs on grade: Locate joints as shown on Drawings. In the absence of information on
9 Drawings, provide the following (sidewalks only):

10
11 Expansion joints: Full depth, with 1/2 inch joint filler, where slabs abut vertical surfaces, at
12 intersections of sidewalks, at abrupt changes in width, and at a spacing not exceeding 30
13 feet.

14
15 Control joints: Tooled, 1 inch deep, 4'-0" to 6'-0" on center between expansion joints.

16 FINISHES

17
18
19 Schedule of finishes on flatwork is as follows:

20
21 Typical interior floor areas to receive carpet, resilient floor covering, or to remain exposed -
22 troweled finish (5.3.4.2.c).

23
24 Interior floor areas to receive terrazzo, quarry tile, or ceramic tile - floated finish (5.3.4.2.b).

25
26 Exterior slabs - broom finish (5.3.4.2.d)

27
28 Surfaces of floor slabs shall be finished to the following tolerances, per ACI 117 (5.3.4.3):

29
30 Minimum flatness of F (f) 35, and a minimum levelness of F (l) 30 are required for typical
31 slabs on grade. Minimum local values (one-half bay) of F (f) 25 and F (l) 20 shall be
32 obtained.

33
34 Any bay not conforming to the above flatness and levelness requirements is subject to: repair, or
35 removal; replacement; and retesting; at no expense to the Owner (1.7.1).

36
37 "F Numbers" shall be submitted to the Owner and Architect immediately after the testing laboratory
38 determines them.

39 CURING AND PROTECTION

40
41
42 Temperature:

43
44 When air temperature during placement is less than 40 degrees, or will be within 24 hours,
45 temperature of concrete as placed is to be between 50 and 90 degrees (55 and 90 degrees
46 for sections less than 12 inches thick). Maintain concrete temperature within these limits for
47 the full curing period of 7 days. (4.2.2.8 and 5.3.1.6).

48
49 When air temperature during placement is greater than 90 degrees, a water-reducer retarder

1 admixture may be required to “normalize” initial setting.

2
3 Curing:

4
5 Interior slab areas that will receive terrazzo, ceramic tile, or quarry tile finishes, or a liquid
6 sealer/densifier, are to be moist-cured, without the use of a curing compound (5.3.6.4.a
7 through 5.3.6.4.c).

8
9 All other slab areas may be either moist-cured or receive an application of specified
10 strippable curing compound (5.3.6.4.e). When the air temperature exceeds 90 degrees, the
11 concrete may be required to be moist-cured for the first 24 hours.

12
13 Whichever curing method is used, it is to commence immediately after disappearance of
14 water sheen, and continue for at least 7 days (5.3.6.1). Do not allow curing to be delayed
15 overnight.

16
17 Prevent excessive moisture loss from formed surfaces (5.3.6.3). If forms are removed before
18 7 days have elapsed, cure the formed surfaces by moist-curing or application of curing
19 compound for the remainder of the curing period.

20
21 CLEANING AND REPAIR

22
23 Repair any slabs that do not meet the finish requirements. The Architect will determine whether
24 grinding, filling of cracks, or patching and leveling procedures are required.

25
26 For slabs that are dusting, or showing other signs of improper curing, any corrective measures
27 attempted will be subject to prior approval of the Architect, and will be performed at Contractor's
28 expense. These may include additional applications of sealer/densifier, or grinding, or covering with
29 specified repair topping.

30
31 Immediately prior to final acceptance, remove from all interior and exterior surfaces that are exposed
32 to view, any stain-producing elements, such as pyrites, nail, wire, reinforcing steel, and form ties.

33
34 Remove all stains completely. Use of weak acids or patented cleaners is acceptable, but surface is
35 to be completely neutralized after use.

36
37 All repairs shall conform to ACI 301, Section 5.3.7 except that the specified bonding compounds,
38 cementitious, or epoxy repair materials must be used. Repair procedures must be submitted and
39 reviewed by the Structural Engineer.

40
41 ACCEPTANCE

42
43 Concrete work with serious honeycombing, form misalignment, or other deviation from Contract
44 requirements is subject to rejection (1.7.1.2).

45
46 When observations or tests indicate that the Contract requirements have not been met, the
47 Contractor is to bear the costs of any additional testing and analysis to determine acceptability, and
48 also the cost of removal and replacement, if such is required (1.6.5.1, 1.7.1.5, 1.7.4, and 1.7.5).

1 FIELD QUALITY CONTROL

2
3 Obtain concrete for required tests at point of placement. If concrete is pumped, obtain concrete for
4 tests at discharge end (1.6.4.3).

5
6 For each concrete class, except Class IV, perform one compressive strength test for each 100 yards
7 or fraction thereof placed in any one day (1.6.4.2.d).

8
9 Determine slump and water content for each strength test (1.6.4.2.f).

10
11 Air content:

12
13 At first strength test of Class III concrete in the project, determine air content by the pressure
14 method or the volumetric method (1.6.4.2.h). At each subsequent strength test, and at least
15 twice each day, monitor the air content.

16
17 Determine concrete temperature for each strength test (1.6.4.2.g).

18
19 Do not place concrete when water content, slump, air content, or temperature vary from allowable
20 (1.6.8).

21
22 Determination of the flatness and levelness of a concrete slab shall be made on the day following
23 placement of the first concrete pour. Tests shall be made in accordance with ASTM E1155. After it
24 is established that proper procedures are being utilized to obtain the desired results,
25 flatness/levelness tests shall be conducted only as directed by the Owner.

26
27 Test cylinders shall be stored at the jobsite for the first 20 hours, plus or minus 4 hours, in a
28 protected location, with the temperature maintained between 60 and 80 degrees, or the results of
29 the strength tests shall be considered unacceptable.

30
31 Maintain records of all tests, indicating exact location of the structure represented by each test.

32
33 All field-testing and inspections shall be performed by an ACI Concrete Field Testing Technician
34 Grade 1, or equivalent (1.6.2).

35
36
37
38 END OF SECTION

1 SECTION 042000 - UNIT MASONRY

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes unit masonry assemblies consisting of the following:

- 14
- 15 Concrete Masonry Units (CMUs).
- 16 Face brick.
- 17 Stone trim units.
- 18 Mortar and grout.
- 19 Masonry joint reinforcement.
- 20 Ties and anchors.
- 21 Embedded flashing.
- 22 Miscellaneous masonry accessories.
- 23

24 RELATED SECTIONS

25
26 Division 07 Section "Thermal Insulation" for cavity-wall insulation.

27
28 Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.

29
30 Division 07 Section "Penetration Firestopping" for firestopping at penetrations and heads
31 of masonry walls.

32
33 Division 07 Section "Joint Sealants" for sealing control and expansion joints in unit
34 masonry.

35
36 DEFINITIONS

37
38 Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

39
40 PERFORMANCE REQUIREMENTS

41
42 Determine net-area compressive strength (f'_m) of masonry by testing masonry prisms according
43 to ASTM C 1314.

44
45 SUBMITTALS

46
47 Product Data: For each type of product indicated.

48
49 Shop Drawings: For the following:

- 1 Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2
3 Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
4
5 Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply
6 with ACI 315, "Details and Detailing of Concrete Reinforcement."
7
8 Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
9
10 Samples for Initial Selection: For the following:
11
12 Face brick, in the form of straps of five or more bricks.
13
14 Colored mortar.
15
16 Weep holes/vents.
17
18 Stone trim.
19
20 Accessories embedded in masonry.
21
22 Qualification Data: For testing agency.
23
24 Material Certificates: Include statements of material properties indicating compliance with
25 requirements including compliance with standards and type designations within standards. Provide
26 for each type and size of the following:
27
28 Masonry units.
29
30 Include material test reports substantiating compliance with requirements.
31
32 For bricks, include size-variation data verifying that actual range of sizes falls within
33 specified tolerances.
34
35 For exposed brick, include material test report for efflorescence according to ASTM
36 C 67.
37
38 For masonry units used in structural masonry, include data and calculations
39 establishing average net-area compressive strength of units.
40
41 Cementitious materials. Include brand, type, and name of the manufacturer.
42
43 When utilized, pre-blended, dry mortar mixes. Include description of type and proportions
44 of ingredients.
45
46 Mortar and grout mixes: Include description of type and proportions of ingredients.
47
48 Reinforcing bars.
49

1 Joint reinforcement.

2
3 Anchors, ties, and metal accessories.

4
5 Mix Designs: For each type of mortar and grout. Include description of type and quantity of
6 ingredients to obtain the specified properties.

7
8 Submit test reports indicating conformance of mortar materials to property specifications
9 of ASTM C270. Require comparison of laboratory prepared mortars to establish
10 proportions of field-mixed mortar when the property specifications are used.

11
12 Submit design for grout indicating conformance of grout to requirements of ASTM C476.

13
14 Test Reports for each type of mortar and grout:

15
16 Submit test reports of preconstruction tests of mortar for consistency, mortar aggregate
17 ratio, water content, and compressive strength in conformance with ASTM C7890.

18
19 Submit test reports of grout test in conformance with ASTM C1019.

20
21 Statement of Compressive Strength of Masonry: For each combination of masonry unit type and
22 mortar type, provide statement of average net-area compressive strength of masonry units, mortar
23 type, and resulting net-area compressive strength of masonry determined according to Tables 1
24 and 2 in ACI 530.1/ASCE 6/TMS 602.

25
26 Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used
27 to comply with cold-weather requirements.

28 29 QUALITY ASSURANCE

30
31 Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and
32 color, or a uniform blend within the ranges accepted for these characteristics, through one source
33 from a single manufacturer for each product required.

34
35 Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including
36 color for exposed masonry, from a single manufacturer for each cementitious component and from
37 one source or producer for each aggregate.

38
39 Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those
40 of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting
41 agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities
42 having jurisdiction.

43
44 Mockups: Build mockups to verify selections made under sample submittals and to demonstrate
45 aesthetic effects.

46
47 Build mockups for each type of exposed unit masonry construction in sizes approximately
48 48 inches long by 48 inches high by full thickness, including face and backup wythes and
49 accessories.

1 Include a sealant-filled joint at least 16 inches long in each mockup.

2
3 Where masonry is to match existing, erect mockups adjacent and parallel to existing
4 surface.

5
6 Clean exposed faces of mockups with masonry cleaner as indicated.

7
8 Protect accepted mockups from the elements with weather-resistant membrane.

9
10 Approval of mockups is for color, texture, and blending of masonry units; relationship of
11 mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities
12 of workmanship.

13
14 Approval of mockups does not constitute approval of deviations from the Contract
15 Documents contained in mockups unless such deviations are specifically approved
16 by Owner's Representative in writing.

17
18 Pre-installation Conference: Conduct conference at Project Site to comply with requirements in
19 Division 01 Section "Project Management and Coordination."

20 21 DELIVERY, STORAGE, AND HANDLING

22
23 Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed
24 location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become
25 wet, do not install until they are dry.

26
27 Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use
28 cementitious materials that have become damp.

29
30 Store aggregates where grading and other required characteristics can be maintained and
31 contamination avoided.

32
33 When utilized, deliver pre-blended, dry mortar mix in moisture-resistant containers designed for
34 lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers
35 on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with
36 weatherproof cover.

37
38 Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and
39 oil.

40 41 PROJECT CONDITIONS

42
43 Protection of Masonry: During construction, cover tops of walls, projections, and sills with
44 waterproof sheeting at end of each day's work. Cover partially completed masonry when
45 construction is not in progress.

46
47 Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
48

1 Where one (1) wythe of multi-wythe masonry walls is completed in advance of other wythes,
2 secure cover a minimum of 24 inches down face next to un-constructed wythe and hold
3 cover in place.

4
5 Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least
6 three (3) days after building masonry walls or columns.

7
8 Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be
9 left exposed or painted. Immediately remove grout, mortar, and soil that come in contact
10 with such masonry.

11
12 Protect base of walls from rain-splashed mud and from mortar splatter by spreading
13 coverings on ground and over wall surface.

14
15 Protect sills, ledges, and projections from mortar droppings.

16
17 Protect surfaces of window and door frames, as well as similar products with painted and
18 integral finishes, from mortar droppings.

19
20 Turn scaffold boards near the wall on edge at the end of each day to prevent rain from
21 splashing mortar and dirt onto completed masonry.

22
23 Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or
24 frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or
25 by freezing conditions. Comply with cold-weather construction requirements contained in ACI
26 530.1/ASCE 6/TMS 602.

27
28 Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg
29 F and above and will remain so until masonry has dried, but not less than 7 days after
30 completing cleaning.

31
32 Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI
33 530.1/ASCE 6/TMS 602.

34
35
36 PART 2 - PRODUCTS

37
38 MASONRY UNITS, GENERAL

39
40 Defective Units: Referenced masonry unit standards may allow a certain percentage of units to
41 exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the
42 standard. Do not use units where such defects, including dimensions that vary from specified
43 dimensions by more than stated tolerances, will be exposed in the completed Work or will impair
44 the quality of completed masonry.

45
46 CONCRETE MASONRY UNITS (CMUs)

47
48 Shapes: Provide shapes indicated and as follows:
49

1 Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers,
2 bonding, and other special conditions.

3
4 Provide bullnose units for outside corners, unless otherwise indicated.

5
6 Integral Water Repellent: Provide units made with integral water repellent for exterior units exposed
7 to uncontrolled weather conditions.

8
9 Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not
10 reduce flexural bond strength. Units made with integral water repellent, when tested as a
11 wall assembly made with mortar containing integral water-repellent manufacturer's mortar
12 additive according to ASTM E 514, with test period extended to 24 hours, show no visible
13 water or leaks on the back of test specimen.

14
15 Products:

16
17 Addiment Incorporated; Block Plus W-10.

18
19 Grace Construction Products, a unit of W. R. Grace & Co. - Conn.;

20 Dry-Block.

21
22 Master Builders, Inc.; Rheopel.

23
24 Concrete Masonry Units: ASTM C 90 for hollow block and ASTM C145 for solid block unless noted
25 otherwise.

26
27 Unit Compressive Strength: Indicated on Drawings.

28
29 Weight Classification: Normal weight, unless otherwise indicated on drawings to be
30 lightweight.

31
32 Size (Width): Manufactured to dimensions $\frac{3}{8}$ inch less than nominal dimensions.

33
34 Exposed Faces: Provide manufacturer's standard color and texture unless otherwise
35 indicated.

36
37 Faces to Receive Plaster: Where units are indicated to receive a direct application of
38 plaster, provide textured-face units made with gap-graded aggregates.

39
40 General: Provide shapes indicated and as follows:

41
42 For ends of sills and caps and for similar applications that would otherwise expose
43 unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces
44 finished.

45
46 Provide special shapes for applications where stretcher units cannot accommodate special
47 conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

48

1 Provide special shapes for applications requiring brick of size, form, color, and texture on
2 exposed surfaces that cannot be produced by sawing.

3
4 Provide special shapes for applications where shapes produced by sawing would result in
5 sawed surfaces being exposed to view.

6
7 Face Brick: ASTM C 216, Grade SW.

8
9 Unit Compressive Strength: Provide units with minimum net-area compressive strength of
10 3000 psi taken over the average of five brick and 2500 psi for any individual brick unit.

11
12 Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.

13
14 Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not
15 effloresced."

16
17 Application: Use where brick is exposed, unless otherwise indicated.

18
19 Where shown to "match existing," provide face brick matching color range, texture, and size
20 of existing adjacent brickwork.

21
22 Insert information on existing brick if known.

23
24 STONE TRIM UNITS

25
26 Limestone: ASTM C 568, Classification II Medium Density.

27
28 Grade, Color and Finish: According to classifications established by ILI.

29
30 Grade: Select

31
32 Color: Buff

33
34 Finish: Smooth

35
36 Varieties and Sources: Subject to compliance with requirements, provide the following:

37
38 Architectural Stone Sales, Inc., Bedford, Indiana

39
40 Valders Stone and Marble Inc., Valders, WI

41
42 Mankato - Kasota Sontе, Mankato, Minnesota

43
44 Finish: Smooth.

45
46 Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints
47 at right angles to faces.

48
49 For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

1 MORTAR MATERIALS

2

3 **Off site, pre-mixed, bulk mortar is not permitted - do not submit a substitution request as**
4 **it will not be approved.**

5

6 Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather
7 construction. Provide natural color or white cement as required to produce mortar color indicated.

8

9 Masonry Cement: ASTM C 91

10

11 Aggregate for Mortar: ASTM C 144.

12

13 For mortar that is exposed to view, use washed aggregate consisting of natural sand or
14 crushed stone.

15

16 For joints less than ¼ inch thick, use aggregate graded with 100 percent passing the No. 16
17 sieve.

18

19 White-Mortar Aggregates: Natural white sand or crushed white stone.

20

21 Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce
22 required mortar color.

23

24 Products: Masonry Cement:

25

26 Cemex (US Operations); Masonry Cement.

27

28 Essroc, Italcementi Group; Brixment.

29

30 Holcim (US) Inc.; Mortamix Masonry Cement.

31

32 Lafarge North America Inc.; Lafarge Masonry Cement.

33

34 Lehigh Cement Company; Lehigh Masonry Cement.

35

36 Colored Cement Product: Packaged blend made from masonry cement and mortar pigments, all
37 complying with specified requirements, and containing no other ingredients.

38

39 Formulate blend as required to produce color as selected from manufacturer's standard
40 colors.

41

42 Pigments shall not exceed 10 percent of portland cement by weight.

43

44 Pigments shall not exceed 5 percent of masonry cement by weight.

45

46 Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with
47 ASTM C 494, Type C, and recommended by manufacturer for use in masonry mortar of composition
48 indicated.

1 Products:
2
3 Addiment Incorporated; Mortar Kick.
4
5 Euclid Chemical Company (The); Accelguard 80.
6
7 Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
8
9 Sonneborn, Div. of ChemRex; Trimix-NCA.
10
11 Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete
12 masonry units, containing integral water repellent by same manufacturer.

13
14 Products:
15
16 Addiment Incorporated; Mortar Tite.
17
18 Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar
19 Admixture.
20
21 Master Builders, Inc.; Color Cure Mortar Admix or Rheomix Rheopel.

22
23 Water: Potable.

24 25 GROUT MATERIALS

26 27 Cementitious Materials:

28
29 Portland Cement: ASTM C 150, Type II or III.
30
31 Hydrated Lime: ASTM C 207, Type S
32
33 Blended Hydraulic Cement: ASTM 595, Type IS, IP, I(PM).
34
35 Aggregates Fine and Coarse Aggregate: ASTM C404

36
37 Water: Clean and potable.

38
39 Admixtures: Admixtures used to decrease grout shrinkage, aid in pumping grout, or for other
40 reasons must be approved by Owner's Representative prior to use. The use of such admixtures
41 should not adversely affect the performance of the grout.

42 43 REINFORCEMENT

44
45 Un-coated Steel Reinforcing Bars: ASTM A 615, Grade 60.
46
47 Masonry Joint Reinforcement, General: ASTM A 951
48
49 Interior Walls: Hot-dip galvanized, carbon steel.

1 Exterior Walls: Hot-dip galvanized, carbon steel.
2
3 Wire Size for Side Rods: W1.7 or 0.148-inch diameter - 9 gauge.
4
5 Wire Size for Cross Rods: W1.7 or 0.148-inch diameter - 9 gauge.
6
7 Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter - 9 gauge.
8
9 Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches on-center.
10
11 Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
12
13 Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder type with single pair of side
14 rods.
15
16 Masonry Joint Reinforcement for Multiwythe Masonry:
17
18 Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches
19 in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.
20
21 Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing
22 wythe and with separate ties that extend into facing wythe. Ties have two hooks that
23 engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties
24 extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
25
26 Manufacturers: Subject to compliance with requirements, manufacturers offering products which
27 may be incorporated in the work include:
28
29 AA Wire Products Co.
30 Dur-O-Wall, Inc.
31 Heckman Building Products, Inc.
32 Hohmann & Barnard, Inc.
33 Masonry Reinforcing Corp of America
34 National Wire Products Corp.
35

36 TIES AND ANCHORS

37
38 Materials: Provide ties and anchors specified in subsequent paragraphs that are made from
39 materials that comply with subparagraphs below, unless otherwise indicated.
40
41 Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
42
43 Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel,
44 hot-dip galvanized after fabrication to comply with ASTM A 153.
45
46 Corrugated Metal Ties (**only for use in attaching new veneer to existing backup**): Metal strips
47 not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5-inch and an amplitude

1 of 0.06 to 0.10-inch made from steel sheet, galvanized after fabrication not less than 0.067 inch
2 thick.

3

4 Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through
5 veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees
6 and extend 2 inches parallel to face of veneer.

7

8 Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

9

10 Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may
11 be used for masonry constructed from solid units or hollow units laid with cells horizontal.

12

13 Where wythes do not align or are of different materials, use adjustable ties with
14 pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.

15

16 Wire: Fabricate from 3/16-inch diameter, hot-dip galvanized steel wire.

17

18 Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal
19 adjustment but resist tension and compression forces perpendicular to plane of wall.

20

21 Anchor Section for Welding to Steel Frame: Crimped 1/4-inch diameter, hot-dip galvanized
22 steel wire.

23

24 Tie Section for Steel Frame: Triangular-shaped wire ties, sized to extend within 1 inch of
25 masonry face, made from 0.188-inch diameter, hot-dip galvanized steel wire.

26

27 Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete
28 and attached to tie section; formed from 0.097-inch thick, steel sheet, galvanized after
29 fabrication.

30

31 Tie Section for Concrete: Corrugated metal ties with dovetail tabs for inserting into dovetail
32 slots in concrete and sized to extend to within 1 inch of masonry face.

33

34 Partition Top anchors: 0.097-inch thick metal plate with 3/8-inch diameter metal rod 6 inches long
35 welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out
36 of tube. Fabricate from steel, hot-dip galvanized after fabrication.

37

38 Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with
39 ends turned up 2 inches or with cross pins, unless otherwise indicated.

40

41 Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153.

42

43 Stone Anchors: Fabricate dowels, cramps, and other stone anchors from stainless steel.

44

45 Adjustable Masonry-Veneer Anchors:

46

47 General: Provide anchors that allow vertical adjustment but resist tension and compression forces
48 perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

49

1 Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both
2 tension and compression without deforming or developing play in excess of 0.05 inch.

3
4 Unless otherwise indicated, provide any of the following types of anchors:

5
6 Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor
7 section.

8
9 Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4
10 inches wide by 3 inches high; with projecting tabs having slotted holes for inserting vertical
11 legs of wire ties specially formed to fit anchor section.

12
13 Anchor Section: Sheet metal plate, 1-1/4 inches wide by 9 inches long, with screw holes top
14 and bottom and with raised rib-stiffened strap, 5/8 inch wide by 5-1/2 inches long, stamped
15 into center to provide a slot between strap and plate for inserting wire ties.

16
17 Anchor Section: Gasketed sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw
18 holes top and bottom; top and bottom ends bent to form pronged legs of length to match
19 thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch wide by 6 inches
20 long, stamped into center to provide a slot between strap and plate for inserting wire ties.
21 Provide anchor manufacturer's standard, self-adhering, modified bituminous gaskets
22 manufactured to fit behind anchor plate and extend beyond pronged legs.

23
24 Anchor Section: Zinc-alloy barrel section with flanged head with eye and corrosion-resistant,
25 self-drilling screw. Eye designed to receive wire ties and to serve as head for drilling
26 fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat
27 directly against framing with flanged head covering hole in sheathing.

28
29 Fabricate sheet metal anchor sections and other sheet metal parts from 0.097-inch thick,
30 steel sheet, galvanized after fabrication.

31
32 Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.25-inch
33 diameter, hot-dip galvanized steel wire.

34
35 Products:

36
37 Dayton Superior Corporation, Dur-O-Wal Division; D/A 213 or D/A 210 with D/A
38 700-708.

39
40 Heckmann Building Products Inc.; 315-D with 316 or Pos-I-Tie.

41
42 Hohmann & Barnard, Inc.; DW-10, DW-10HS or DW-10-X.

43
44 Wire-Bond; 1004, Type III or RJ-711.

45
46 Slip-in, Masonry-Veneer Anchors: Units consisting of a wire tie section and an anchor
47 section designed to interlock with metal studs and be slipped into place as sheathing is
48 installed.

1 Wire-Type Anchor: Bent wire anchor section with an eye to receive the wire tie. Wire tie
2 has a vertical leg that slips into the eye of anchor section and allows vertical adjustment.
3 Both sections are made from 3/16-inch, hot-dip galvanized wire.
4

5 Strap-and-Wire Type Anchor: Flat metal strap with notch to interlock with flange of metal
6 stud and two holes for inserting vertical legs of wire tie specially formed to fit anchor section.
7 Strap is made from 0.067-inch thick, steel sheet, galvanized after fabrication; anchor wire
8 tie is made from 3/16-inch, hot-dip galvanized wire.
9

10 Products:

11
12 BLOK-LOK Limited; STUD-LOK.

13
14 Hohmann & Barnard, Inc.; AA308.
15

16 Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with
17 hex washer head and neoprene washer, No. 10 diameter by length required to penetrate
18 steel stud flange with not less than 3 exposed threads, and with organic polymer coating with
19 salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
20

21 Products:

22
23 ITW Buildex; Teks Maxiseal with Climaseal finish.
24

25 Textron Inc., Textron Fastening Systems; Elco Dril-Flex with Stalgard finish.
26

27 EMBEDDED FLASHING MATERIALS

28
29 Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise
30 indicated:
31

32 Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded with asphalt between 2
33 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
34

35 Products:

36
37 Advanced Building Products Inc.; Copper Fabric Flashing.

38 AFCO Products Inc.; Copper Fabric.

39 Hohmann & Barnard, Inc.; H & B C-Fab Flashing.

40 Phoenix Building Products; Type FCC-Fabric Covered Copper.

41 Polytite Manufacturing Corp.; Copper Fabric Flashing.

42 Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.

43 York Manufacturing, Inc.; York Copper Fabric Flashing.
44

45 MISCELLANEOUS MASONRY ACCESSORIES

46
47 Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1;
48 compressible up to 35 percent; of width and thickness indicated; formulated from neoprene,
49 urethane or PVC .

1 Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with
2 ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain
3 lateral stability in masonry wall; size and configuration as indicated.

4

5 Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I
6 (No. 15 asphalt felt).

7

8 Weep/Vent Products: Use the following, unless otherwise indicated:

9

10 Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches
11 long.

12

13 Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade
14 within the wall cavity.

15

16 Provide one of the following configurations:

17

18 Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches
19 deep that prevent mesh from being clogged with mortar droppings.

20

21 Strips, not less than 1-1/2 inches thick and 10 inches wide, with dimpled surface
22 designed to catch mortar droppings and prevent weep holes from being clogged with
23 mortar.

24

25 Products:

26

27 Advanced Building Products Inc.; Mortar Break II.

28

29 Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.

30

31 Mortar Net USA, Ltd.; Mortar Net.

32

33 Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit
34 cells with loops for holding reinforcing bars in center of cells, unless drawing details require a
35 different location. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.
36 Provide units with either two loops or four loops as needed for number of bars indicated.

37

38 Products:

39

40 Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.

41

42 Heckmann Building Products Inc.; No. 376 Rebar Positioner.

43

44 Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.

45

46 Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

47

48 FOAM PLASTIC BOARD INSULATION

49

1 Extruded-Polystyrene Board Insulation: Ridge, cellular thermal insulation with closed cell and
2 integral high density skin, formatted by the expansion of polystyrene based resin in an extrusion
3 process to comply with ASTM C 578, Type X with maximum flame-spread and smoke-developed
4 indexes of 75 and 450, respectively, per ASTM E 84 with 5 year aged R-values of 5.4 and 5.0 at 40
5 and 75 degree respectively.

6
7 Manufacturers: Subject to compliance with requirements, available manufacturers offering
8 products that may be incorporated into the Work include the following:

9
10 DiversiFoam Products. "CertiFoam 15".
11 Dow Chemical U.S.A. "Styrofoam Cavitymate"
12 Owens Corning.; "Formular 150".
13 Pactiv Corporation; GreenGuard Insulation Board.
14

15 MASONRY CLEANERS

16
17 Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing
18 mortar/grout stains, efflorescence, and other new construction stains from new masonry without
19 discoloring or damaging masonry surfaces. Use product expressly approved for intended use by
20 cleaner manufacturer and manufacturer of masonry units being cleaned.

21
22 Manufacturers:

23
24 Diedrich Technologies, Inc.
25 EaCo Chem, Inc.
26 ProSoCo, Inc.
27

28 MORTAR MIXES

29
30 General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders,
31 water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

32
33 Do not use calcium chloride in mortar.

34
35 Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view,
36 regardless of weather conditions, to ensure that mortar color is consistent.

37
38 Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following
39 types of mortar for applications stated unless another type is indicated or needed to provide required
40 compressive strength of masonry.

41
42 For masonry below grade or in contact with earth, use Type M or S.

43
44 For reinforced masonry, use Type S or N.

45
46 For mortar parge coats, use Type S or N.
47

1 For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for
2 interior load-bearing walls; for interior non-load-bearing partitions; and for other applications
3 where another type is not indicated, use Type N.

4
5 For interior non-load-bearing partitions, Type N.

6
7 Pre-blended, Dry Mortar Mix: **Are acceptable for use on project, however, the proportion mixed**
8 **mortar must comply with the above property specification.** Furnish dry mortar ingredients in
9 form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and
10 thoroughly blend ingredients before delivering to Project site.

11 12 GROUT MIXES

13
14 General: Do not use admixtures, air-entraining agents, accelerators, retarders, antifreeze
15 compounds, or other admixtures, unless approved by Owner's Representative.

16
17 Do not use calcium chloride in grout.

18
19 Grout for Unit Masonry: Comply with ASTM C 476 having a minimum 3000 psi strength at 28 days.

20
21 Use grout of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE
22 6/TMS 602 for dimensions of grout spaces and pour height.

23
24 General Practices:

25
26 Use fine grout for filling general practices cells of concrete masonry units where the
27 smallest dimension is 2 inches or less.

28
29 Use either fine grout or coarse grout for filling cells of concrete masonry units where
30 the smallest dimension is greater than 2 inches.

31
32 Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

33 34 35 PART 3 - EXECUTION

36 37 EXAMINATION

38
39 Examine conditions, with Installer present, for compliance with requirements for installation
40 tolerances and other conditions affecting performance of work.

41
42 For the record, prepare written report, endorsed by Installer, listing conditions detrimental
43 to performance of work.

44
45 Verify that foundations are within tolerances specified.

46
47 Verify that reinforcing dowels are properly placed.

1 Before installation, examine rough-in and built-in construction for piping systems to verify actual
2 locations of piping connections.

3

4 Proceed with installation only after unsatisfactory conditions have been corrected.

5

6 INSTALLATION, GENERAL

7

8 Thickness: Build cavity and composite walls and other masonry construction to full thickness
9 shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

10

11 Build chases and recesses to accommodate items specified in this and other Sections.

12

13 Leave openings for equipment to be installed before completing masonry. After installing
14 equipment, complete masonry to match the construction immediately adjacent to opening.

15

16 Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern
17 or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, un-chipped
18 edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut
19 surfaces and, where possible, cut edges concealed.

20

21 Select and arrange units for exposed unit masonry to produce a uniform blend of colors and
22 textures.

23

24 Mix units from several pallets or cubes as they are placed.

25

26 Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

27

28 Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per
29 minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at
30 time of laying.

31

32 Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

33

34 For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion
35 and control joints, do not vary from plumb by more than ¼ inch in 20 feet, or ½ inch
36 maximum.

37

38 For vertical alignment of exposed head joints, do not vary from plumb by more than ¼ inch
39 in 10 feet maximum.

40

41 For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary
42 from level by more than ⅛ inch in 10 feet maximum.

43

44 For exposed bed joints, do not vary from thickness indicated by more than plus or minus ⅛
45 inch, with a maximum thickness limited to ½ inch. Do not vary from bed-joint thickness of
46 adjacent courses by more than ⅛ inch.

47

1 For exposed head joints, do not vary from thickness indicated by more than plus or minus
2 $\frac{1}{8}$ inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than $\frac{1}{8}$
3 inch.

4
5 For faces of adjacent exposed masonry units, do not vary from flush alignment by more than
6 $\frac{1}{16}$ inch except due to warpage of masonry units within tolerances specified for warpage
7 of units.

8
9 For exposed bed joints and head joints of stacked bond, do not vary from a straight line by
10 more than $\frac{1}{16}$ inch from one masonry unit to the next.

11
12 MORTAR MIXING

13
14 Measure sand by volume or equivalent weight; do not measure by shovel.

15
16 In clean mortar mixer, mix ingredients for 3 to 5 minutes with appropriate amount of water to
17 produce proper workability.

18
19 Re-temper mortar as needed within 1 hour after initial mixing.

20
21 Discard mortar that has begun to set or unused mortar 2 hours after initial mixing.

22
23 GROUT MIXING

24
25 Control batching procedure to ensure proper volume proportions of grout materials and achieve
26 grout slump.

27
28 Ready mixed grout shall be prepared in accordance with ASTM C94.

29
30 Measure grout materials mixed at job site by volume and mix all ingredients in mechanical mixer for
31 minimum of five minutes.

32
33 LAYING MASONRY WALLS

34
35 Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint
36 thicknesses and for accurate location of openings, movement-type joints, returns, and offsets.
37 Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other
38 locations.

39
40 Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond
41 pattern indicated on Drawings; do not use units with less than nominal 4-inch horizontal face
42 dimensions at corners or jambs.

43
44 Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than
45 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than
46 nominal 4-inch horizontal face dimensions at corners or jambs.

47

- 1 Stopping and Resuming Work: Stop work by racking back units in each course from those in course
2 below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar,
3 remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
4
5 Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill
6 in solidly with masonry around built-in items.
7
8 Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
9
10 Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal
11 lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
12
13 Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels,
14 posts, and similar items, unless otherwise indicated.
15
16 Build non-load-bearing interior partitions full height of story to underside of solid floor or roof
17 structure above, unless otherwise indicated.
18
19 Install compressible filler in joint between top of partition and underside of structure above.
20
21 Fasten partition top anchors to structure above and build into top of partition. Grout cells of
22 CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide ½
23 inch clearance between end of anchor rod and end of tube. Space anchors 48 inches on
24 center, unless otherwise indicated.
25
26 Wedge non-load-bearing partitions against structure above with small pieces of metal. Fill
27 joint with mortar after dead-load deflection of structure above approaches final position.
28
29 At fire-rated partitions, treat joint between top of partition and underside of structure above
30 to comply with Division 07 Section "Penetration Firestopping"
31

32 MORTAR BEDDING AND JOINTING

33
34 Lay hollow brick and concrete masonry units as follows:

- 35
36 With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
37
38 With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
39
40 With webs fully bedded in mortar in grouted masonry, including starting course on footings.
41
42 With entire units, including areas under cells, fully bedded in mortar at starting course on
43 footings where cells are not grouted.
44
45 Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar
46 to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
47
48 Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
49

1 Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear
2 water.

3
4 Allow cleaned surfaces to dry before setting.

5
6 Wet joint surfaces thoroughly before applying mortar.

7
8 Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint
9 thickness, unless otherwise indicated. All joints shall be tooled to a consistent and uniform depth
10 and concave radius.

11
12 For glazed masonry units, use a nonmetallic jointer $\frac{3}{4}$ inch or more in width.

13
14 Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint),
15 unless otherwise indicated.

16 17 GROUTING

18
19 Grouting of hollow block construction requires masonry units be aligned to form an unobstructed,
20 continuous series of vertical spaces within the wall framework. Spaces that contain reinforcement
21 shall have a minimum width of 2 inches.

22
23 All mortar droppings and debris shall be removed through clean-out openings or by other approved
24 methods. Mortar that protrudes more than about $\frac{3}{8}$ inch into the grout space shall be removed so
25 that grout will not bridge at these locations causing incomplete filling of cores.

26
27 Where low-lift grouting is to be used, mortar projection removal is to be used, done during erection
28 and checked prior to grouting. If high-lift grouting is to be used, protrusions can be knocked off and
29 removed through the clean-out openings.

30
31 After grout spaces are checked for cleanliness and reinforcement positioned, closed clean-outs by
32 inserting face shells of masonry units. Where clean-out will not be visible after construction is
33 complete, form over the openings to allow grouting to the plane of the walls. Face shell plugs or
34 mortared units shall be adequately braced to resist the fluid pressure of the grout.

35
36 Mortar should be permitted to cure sufficient before grouting, prevent mortar joints from being blown
37 out by fluid pressure from the grout.

38 39 LOW LIFT GROUTED CONSTRUCTION

40
41 Low lift grouting is not to exceed 5'-0" height when the grout is poured as the wall is constructed.
42 Joints should be wide enough to provide proper steel clearance; with a minimum of $\frac{3}{4}$ " wide.

43
44 The last grout pour of the day shall stop a minimum of one inch below the top of an unfinished wall.
45 To provide a cold joint key.

46
47 All grout shall be puddled with a stick or vibrator immediately after pouring. To integrate the grout,
48 remove any air bubbles or voids and help grout penetrate any unfilled mortar joints. No clean-outs
49 are required when low lift grouting is utilized.

1
2 CAVITY WALLS
3

4 Bond wythes of cavity walls together using one of the following methods:

5
6 Masonry Joint Reinforcement: Installed in horizontal mortar joints.

7
8 Where bed joints of both wythes align, use ladder-type reinforcement extending
9 across both wythes.

10
11 Where bed joints of wythes do not align, use adjustable (two-piece) type
12 reinforcement with continuous horizontal wire in facing wythe attached to ties.

13
14 Where one wythe is of clay masonry and the other of concrete masonry, use
15 adjustable (two-piece) type reinforcement with continuous horizontal wire in facing
16 wythe attached to ties to allow for differential movement regardless of whether bed
17 joints align.

18
19 Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

20
21 Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away
22 from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar
23 fins protruding into cavity.

24
25 Installing Cavity-Wall Board Insulation: At limited areas where cavity board insulation exists, place
26 small dabs of adhesive, spaced approximately 12 inches on center both ways, on inside face of
27 insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation
28 between wall ties and other confining obstructions in cavity, with edges butted tightly both ways.
29 Press units firmly against inside wythe of masonry or other construction as shown.

30
31 Fill cracks and open gaps in insulation with crack sealer compatible with insulation and
32 masonry.

33
34 Reference Division 7, Section "Spray Foam Insulation Barrier" for installation of spray cavity
35 insulation and barrier.

36
37 INSTALLATION OF CAVITY WALL INSULATION:
38

39 On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" on-center
40 both ways on inside face, as recommended by manufacturer. Fit courses of insulation between wall
41 ties and other confining obstructions in the cavity, with edges butted tightly both ways. Press units
42 firmly against inside wythe of masonry or other construction as shown.

43
44 MASONRY JOINT REINFORCEMENT
45

46 General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on
47 exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1 Space reinforcement not more than 16 inches on center in exterior walls and 24" on center
2 in interior walls.

3
4 Provide reinforcement not more than 8 inches above and below wall openings and extending
5 12 inches beyond openings.

6
7 Reinforcement above is in addition to continuous reinforcement.

8
9 Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

10
11 Provide continuity at wall intersections by using prefabricated T-shaped units.

12
13 Provide continuity at corners by using prefabricated L-shaped units.

14
15 Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column
16 fireproofing, pipe enclosures, and other special conditions.

17
18 ANCHORING MASONRY TO STRUCTURAL MEMBERS

19
20 Anchor masonry to structural members where masonry abuts or faces structural members to comply
21 with the following:

22
23 Provide an open space not less than 1 inch in width between masonry and structural
24 member, unless otherwise indicated. Keep open space free of mortar and other rigid
25 materials.

26
27 Anchor masonry to structural members with anchors embedded in masonry joints and
28 attached to structure.

29
30 Space anchors as indicated, but not more than 24 inches on center vertically and 36 inches
31 on center horizontally.

32
33 ANCHORING MASONRY VENEERS

34
35 Anchor masonry veneers to wall framing, concrete and masonry backup with masonry-veneer
36 anchors to comply with the following requirements:

37
38 Fasten screw-attached anchors through sheathing to wall framing and to concrete and
39 masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor
40 design only uses one fastener.

41
42 Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each
43 stud in each horizontal joint between sheathing boards.

44
45 Embed tie sections in masonry joints. Provide not less than 2 inches of air space between
46 back of masonry veneer and face of sheathing.

47
48 Locate anchor sections to allow maximum vertical differential movement of ties up and down.
49

1 Space anchors as indicated, but not more than 16 inches on center vertically and 32 inches
2 on center horizontally with not less than 1 anchor for each 3.5 sq. ft. of wall area. Install
3 additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches,
4 around perimeter.

5 6 CONTROL AND EXPANSION JOINTS 7

8 General: Install control and expansion joint materials in unit masonry as masonry progresses. Do
9 not allow materials to span control and expansion joints without provision to allow for in-plane wall
10 or partition movement.

11
12 Form control joints in concrete masonry as follows:

13
14 Install preformed control-joint gaskets designed to fit standard sash block.

15
16 Form expansion joints in brick made from clay or shale as follows:

17
18 **Build in compressible joint fillers where indicated.**

19
20 Form open joint full depth of brick wythe and of width indicated, but not less than $\frac{3}{8}$ inch for
21 installation of sealant and backer rod specified in **Division 07 Section "Joint Sealants."**

22
23 Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a
24 compressible filler of width required for installing sealant and backer rod specified in **Division 07**
25 **Section "Joint Sealants,"** but not less than $\frac{3}{8}$ inch.

26
27 Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

28 29 LINTELS 30

31 Install steel lintels where indicated.

32
33 Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

34 35 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS 36

37 General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other
38 obstructions to downward flow of water in wall, and where indicated.

39
40 Install flashing as follows, unless otherwise indicated:

41
42 Prepare masonry surfaces so they are smooth and free from projections that could puncture
43 flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed
44 of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing
45 with adhesive, sealant, or tape as recommended by flashing manufacturer.

46
47 At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe,
48 turned up a minimum of 8 inches, and extend a minimum of 2 inches past the outer face of

1 the inner wythe. Where interior face of wall is to receive furring or framing, carry flashing
2 completely through inner wythe and turn flashing up approximately 2 inches on interior face.
3
4 At masonry-veneer walls, extend flashing through veneer, across air space behind veneer,
5 and up face of sheathing at least 8 inches; with upper edge tucked under building paper or
6 building wrap, lapping at least 4 inches.
7
8 At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end.
9 At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to
10 form end dams.
11
12 Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
13
14 Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with
15 manufacturer's written instructions. Install CMU cell pans with upturned edges located below face
16 shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web
17 covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face
18 shell to face shell.
19
20 Install reglets and nailers for flashing and other related construction where they are shown to be built
21 into masonry.
22
23 Install weep holes in head joints in exterior wythes of first course of masonry immediately above
24 embedded flashing and as follows:
25
26 Use specified weep/vent products to form weep holes.
27
28 Use wicking material to form weep holes above flashing under brick sills. Turn wicking down
29 at lip of sill to be as inconspicuous as possible.
30
31 Space weep holes 24 inches on center, unless otherwise indicated.
32
33 Trim wicking material flush with outside face of wall after mortar has set.
34
35 Cover cavity side of weep holes with plastic insect screening at cavities insulated with
36 loose-fill insulation.
37
38 Place cavity drainage material in cavities to comply with configuration requirements for cavity
39 drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

40 REINFORCED UNIT MASONRY INSTALLATION

43 Temporary Form-work and Shores: Construct form-work and shores as needed to support
44 reinforced masonry elements during construction.
45
46 Construct form-work to provide shape, line, and dimensions of completed masonry as
47 indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie,
48 and support forms to maintain position and shape during construction and curing of
49 reinforced masonry.

1 Do not remove forms and shores until reinforced masonry members have hardened
2 sufficiently to carry their own weight and other temporary loads that may be placed on them
3 during construction.
4

5 Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
6

7 Grouting: Do not place grout until entire height of masonry to be grouted has attained enough
8 strength to resist grout pressure.
9

10 Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for clean-outs and for grout
11 placement, including minimum grout space and maximum pour height.
12

13 REPAIRING, POINTING, AND CLEANING

14
15 Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged
16 or that do not match adjoining units. Install new units to match adjoining units; install in fresh
17 mortar, pointed to eliminate evidence of replacement. Note that the above text will be used to evaluate
18 and determine the acceptance of the masonry installation and that the above text exceeds the finish
19 and appearance standards set forth in Section 7 of ASTM C-90.
20

21 Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely
22 fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide
23 a neat, uniform appearance. Prepare joints for sealant application, where indicated.
24

25 In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar
26 fins and smears before tooling joints.
27

28 Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
29

30 Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes
31 or chisels.
32

33 Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for
34 comparison purposes. Obtain Owner's Representative's approval of sample cleaning before
35 proceeding with cleaning of masonry.
36

37 Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering
38 them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
39

40 Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing
41 surfaces thoroughly with clear water.
42

43 Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes
44 20.
45

46 Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written
47 instructions.
48

1 Clean concrete masonry by cleaning method indicated in NEMA TEK 8-2A applicable to type
2 of stain on exposed surfaces.

3
4 Clean stone trim to comply with stone suppliers' written instructions.

5
6 Clean limestone units to comply with recommendations in ILI's "Indiana Limestone
7 Handbook."

8
9 MASONRY WASTE DISPOSAL

10
11 Salvageable Materials: Unless otherwise indicated, excess face brick and special project specific
12 concrete masonry units (ground-face, split-faced, pre-faced units and SGFT) are Owner's Property.
13 Owner reserves the right to have General Contractor dispose of. Excess masonry materials are
14 Contractor's property. At completion of unit masonry work, remove from the Project Site.

15
16 Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or
17 soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill
18 material as fill is placed.

19
20 Crush masonry waste to less than 4 inches in each dimension.

21
22 Mix masonry waste with at least two parts of specified fill material for each part of masonry
23 waste.

24
25 Do not dispose of masonry waste as fill within 18 inches of finished grade.

26
27 Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as
28 described above, and other masonry waste, and legally dispose of it off Owner's Representatives
29 property.

30
31
32
33 END OF SECTION

1 SECTION 051200 - STRUCTURAL STEEL

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and
9 Divisions 0 and 1 Specifications Sections, apply to this Section.

10
11 DESCRIPTION

12
13 Work included: All labor and materials required to furnish and install the structural steel work
14 shown on the Drawings and required by these Specifications, including that shown on
15 mechanical or electrical Drawings, or required in their specification Sections.

16
17 RELATED SECTION

18
19 Division 03, Section "Cast-in-Place Concrete"

20
21 Division 04, Section "Unit Masonry"

22
23 Division 05, Section "Steel Joists"

24
25 Division 05, Section "Metal Decking"

26
27 Work furnished but installed under other Sections: Anchor bolts, loose bearing and base plates,
28 loose lintels, and connection hardware to be cast into precast concrete.

29
30 Work affected by others: Mechanical framing, loads, openings, and structure in any way related
31 to mechanical requirements is shown for bidding purposes only. Responsibility for coordinating
32 the work of this Section with these requirements is solely that of the Contractor. Contractor's
33 review of shop drawings will be taken to indicate that this coordination has been accomplished.

34
35 Inspection and testing required by this Section to be at Owner's expense.

36
37 QUALITY ASSURANCE

38
39 Reference standards:

40
41 By the American Institute of Steel Construction (AISC):
42 Specification for Structural Steel Buildings.
43 Specification for Structural Joints Using ASTM A325 or A490 bolts.
44 Code of Standard Practice for Steel Buildings and Bridges.

45
46 By the American Welding Society (ANSI/AWS):

47
48 Structural Welding Code-Steel (D1.1).
49 Symbols for Welding and Non-Destructive Testing (A2.4).

1 Fabricator's qualifications:

2
3 Minimum five years' continuous experience in the fabrication of steel for projects of
4 similar quality and scope.

5
6 Membership in the American Institute of Steel Construction, or approval of the Architect
7 at least ten days prior to bid.

8
9 Erector's qualifications: Minimum five years' continuous experience in similar steel erection.

10
11 Welders' qualifications: Personnel and procedures are to be qualified in accordance with
12 ANSI/AWS D1.1.

13
14 Inspection agency's qualifications: Minimum three years' experience in similar steel inspection,
15 and approval of the Architect.

16
17 SUBMITTALS

18
19 Certification of experience: Submit, on request only, written description of personnel, projects,
20 and equipment which document the experience and qualifications required of the fabricator,
21 erector, welders, and inspection agency.

22
23 Shop drawings: Provide dimensioned erection plans with appropriate sections and details,
24 including member piece details that include the following:

25
26 Indicate all shop and erection details, including cuts, copes, cambers, connections,
27 holes, threaded fastener types, sizes and lengths, washers, and weld types, sizes and
28 lengths.

29
30 Include embedment layout drawings.

31
32 Indicate material specifications and finishes.

33
34 Indicate shop and field welds with symbols per ANSI/AWS A2.4.

35
36 Proof of compliance for materials: Submit, on request only, the following:

37
38 Mill reports for properly identified material.

39
40 Certificates of compliance for:

41
42 Structural steel shapes.

43 Shear studs.

44 High strength threaded fasteners.

45
46 Inspection reports: Submit reports for the inspection specified.

47
48 PRODUCT DELIVERY AND STORAGE

49
50 Delivery:

1
2 Comply with ASTM A6. Non-compliance will be cause for rejection.

3
4 Deliver anchor bolts and other items to be embedded in cast-in-place concrete or
5 masonry prior to the start of that work. Provide setting drawings, templates, or
6 instructions required for the installation of such items.

7
8 Storage:

9
10 Store steel at site above ground on platforms, skids, or other supports.

11
12 Protect steel from corrosion.

13
14 Store packaged materials in their original unbroken packages.

15
16
17 PART 2 - PRODUCTS

18
19 MATERIALS

20
21 Structural steel wide flange shapes:

22
23 Fy=50 ksi steel: ASTM A992 or ASTM A572.

24
25 Structural steel M, S, HP shapes, channels, angles, plates, bars, etc.:

26
27 Fy=36 ksi steel: ASTM A36.

28
29 Structural steel tubing:

30
31 Fy=35 ksi round steel tubing: ASTM A53, Type E or S, Grade B.

32
33 Fy=46 ksi square and rectangular HSS: ASTM A500, Grade B.

34
35 Sustainability Requirements:

36
37 All Structural Steel shapes shall have a minimum 90% post-consumer recycled content.

38
39 All Structural Steel shapes shall be extracted, processed, and manufactured/fabricated
40 within a radius of 500 miles from the project site.

41
42 Anchor Bolts, standard bolts and nuts: ASTM F1554. Provide heavy washers for anchor bolts.

43
44 High strength threaded fasteners: ASTM A325 or A490.

45 Provide hot-dip zinc coating for exterior exposed fasteners: ASTM A153.

46
47 Direct-Tension Indicators compressible-washer-type: ASTM F959, Type 325 or 490.

48
49 High strength twist-off-type tension-control bolts: ASTM F1852, Type 1 with round or heavy hex
50 head.

1
2 Expansion Anchors:

3
4 Wedge anchors shall have a one-piece anchor body with an expansion mechanism of
5 interlocking wedges. Carbon steel components shall be zinc plated according to ASTM
6 B633, galvanized according to ASTM B695, or stainless steel conforming to ASTM A276
7 or ASTM A493 of material meeting AISI 304 or 316. The following are acceptable:

8
9 Kwik Bolt III by Hilti Fastening Systems
10 Wedge-All by Simpson Strong-Tie Anchors
11 Rawl-Stud by Rawlplug Company
12

13 Sleeve anchors shall be flush or shell type which meet Federal Specification FF-S-325,
14 Group II, and Type 3. Carbon steel components shall be zinc plated according to ASTM
15 B633, galvanized according to ASTM B695, or stainless steel conforming to ASTM A276
16 or ASTM A493 of material meeting AISI 304 or 316. The following are acceptable:

17
18 Sleeve Anchor by Hilti Fastening Systems
19 Sleeve-All by Simpson Strong-Tie Anchors
20 Lok/Bolt by Rawlplug Company
21

22 Install expansion anchors in holes drilled with carbide tipped drill bits and in accordance with the
23 manufacturers recommendations.
24

25 Welding electrodes: Conform to requirements of ANSI/AWS D.1, using Series E70 electrodes,
26 appropriate for the materials being welded.
27

28 Headed stud shear connectors: Conform to the requirements of ANSI/AWS D1.1, Chapter 7,
29 Type B, and ASTM A108, minimum 60 ksi.
30

31 Clevises and Turnbuckles: ASTM A108, Grade 1035, cold finish carbon steel.
32

33 Shop paint primer:

34
35 Interior exposure: SSPC Paint 25, or Federal Specification TT-P-636c, or TT-P-31c.
36

37 Primer is to be compatible with finish paint.
38

39 Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing field welds and repairs
40 containing not less than 93 percent zinc dust by weight: SSPC Paint 20.
41

42 Low-friction bearing pads: "Riload" pads, as manufactured by the Modern Industrial Plastics
43 Inc., Dayton, Ohio.
44

45 FABRICATION

46
47 Conform to applicable provisions of the reference standards listed in Part 1 of this Section, as
48 modified herein.
49

50 Connection design:

1
2 Design connections per AISC standards for forces and moments given on the Drawings.
3 Where none are given design for the following:

4
5 Use 1/2 of the Allowable Uniform Load on pages 3-33 through 3-95 of the
6 Thirteenth Edition of the AISC Steel Construction Manual.

7
8 Connection type is to be:

9
10 Snug-tight unless noted otherwise.

11
12 Slip-critical where specifically shown on the Construction Drawings. Provide
13 twist-off tension control bolts or direct-tension indicating washers at all locations.

14
15 Connection details on Drawings are to illustrate location, type, the general arrangement
16 only, and to establish minimum requirements.

17
18 Shop connections may be welded or bolted, unless shown otherwise.

19
20 Field connections shall be bolted, unless shown otherwise.

21
22 Standard bolts and nuts are permitted only for connections of secondary members,
23 unless noted otherwise. High strength threaded fasteners are required for all other
24 bolted connections.

25
26 Finishing: Ends of members in direct contact bearing, such as columns at their bases and
27 splices, are to be "finished", as defined in the Code of Standard Practice.

28
29 Bearing and base plates: Column base plates are to be shop attached. Beam bearing plates
30 may be attached or loose.

31
32 Holes: Drill or punch holes in members as required for passage of conduit and piping, and
33 attachment of joists, nailers, etc. Burning such holes is not permitted. If opening is not shown
34 on structural drawings, obtain prior approval.

35
36 Low-friction bearing pads: Attach to steel per manufacturer's requirements.

37
38 Cleaning:

39
40 Remove oil, dirt, loose mill scale, or other material that would impair welding,
41 performance of friction-type connections, or adherence of concrete or sprayed-on
42 fireproofing.

43
44 For steel that is to be painted, cleaning techniques are to be as required by the
45 appropriate SSPC paint specification.

46
47 Shop painting: Steel not exposed to view in the finished structure need not be painted. Steel
48 exposed to view, except that to be galvanized, is to be painted as follows:

1 Interior exposure: Apply one-coat shop paint system in accordance with SSPC-PS 7.01.
2 Apply two coats to surfaces inaccessible after assembly.

3
4 Do not paint surfaces to be encased in concrete or to receive sprayed-on fireproofing, or
5 contact surfaces in friction-type connections, or surfaces to be field welded.

6
7 Galvanizing: Where required, galvanizing is to conform to ASTM A153. Except for bolts, nuts,
8 and anchors, all galvanizing is to be done after fabrication.

9
10
11 PART 3 - EXECUTION

12
13 SURFACE CONDITIONS

14
15 Prior to beginning work of this Section, verify that the installed work of other trades is complete
16 and correct to the extent necessary for the proper execution of the work of this Section. This
17 includes locations of anchor bolts, and lines and grades of bearing areas.

18
19 In the event of discrepancies, immediately notify the Architect. Do not proceed with work
20 affected by the discrepancies until they have been resolved.

21
22 ERECTION

23
24 Conform to the applicable provisions of the reference standards listed in Part 1 of this Section,
25 as modified herein.

26
27 This structure is designed to be self-supporting and stable after the building is fully completed.
28 It is solely the Contractor's responsibility to determine erection procedure and sequence; and to
29 ensure the stability of the building and its component parts, and of the adequacy of temporary or
30 incomplete connections, during erection. This includes the addition or whatever temporary
31 bracing, guys, or tie-downs that might be necessary. Such material is not shown on the
32 Drawings. If applied, they shall be removed as conditions permit, and shall remain the
33 Contractor's property.

34
35 Safety: It is solely the Contractor's responsibility to follow all applicable safety codes and
36 regulations governing this work.

37
38 Clean bearing surfaces and other surfaces in permanent contact, prior to assembly.

39
40 Splices are permitted only where indicated.

41
42 Tolerances: Per AISC Code of Standard Practice.

43
44 Field corrections of fabrication errors by gas cutting is not permitted in major members without
45 prior approval of the Architect.

46
47 Welds that are exposed to view in the finished structure are to be ground smooth and flush with
48 adjacent surfaces.

1 Touch-up painting: After erection, touch-up field connections and abrasions in the shop coat
2 with same paint used for shop coat. Do not paint welds until they have been cleaned in
3 accordance with AWS D1.1.

4
5 FIELD QUALITY CONTROL
6

7 Inspection agency shall perform the following:

8 Review qualifications of welders, operators, and welding procedures submitted by the
9 Contractor.

10 Review materials' proofs of compliance, if such are required.

11 Inspect bolted connections, including pre-installation verification testing when required,
12 per the requirements of the AISC Specification for Structural Joints.

13 Inspect welded connections per the requirements of ANSI/AWS D1.1, Chapter 6. All
14 fillet welds that the visual inspection has deemed suspect and all full penetration field
15 welds are to be non-destructive tested. Additional welds that require non-destructive
16 tests are indicated on the Drawings. Testing agency, at their option, is to use one of the
17 following inspection procedures:

18 Liquid Penetrant Inspection: ASTM E165.

19 Magnetic Particle Inspection: ASTM E709.

20 Radiographic Inspection: ASTM E94 and ASTM E142.

21 Ultra Sonic Inspection: ASTM E164.

22 Inspect connections of steel joists.

23 Visually inspect connections using twist-off tension-control bolts to verify that ends of
24 bolts have been properly twisted-off. Verify gaps of direct tension indicators comply with
25 ASTM F959, Table 2.

26
27 Inspection agency shall be directly responsible to the Architect.
28
29
30
31
32

33
34
35
36
37 END OF SECTION

1 SECTION 052100 - STEEL JOISTS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and
9 Divisions 0 and 1 Specifications Sections, apply to this Section.

10
11 DESCRIPTION

12
13 Work included: All labor and materials required to furnish and install the steel joist work shown
14 on the Drawings and required by these Specifications. Include all bridging, ceiling extensions,
15 anchors, extended ends, bearing plates and other accessories required for a complete
16 installation.

17
18 RELATED SECTIONS:

19
20 Division 05, Section "Structural Steel"

21
22 Division 05, Section "Metal Decking"

23
24 QUALITY ASSURANCE

25
26 Reference standards, by the Steel Joist Institute (SJI) and the American Institute of Steel
27 Construction (AISC):

28
29 Standard Specifications for Open Web Steel Joists (K-Series).

30
31 Manufacturer's qualifications: A manufacturer certified by Steel Joist Institute, SJI, to
32 manufacture joists complying with applicable standard specifications and load tables of SJI
33 "Specifications".

34
35 Welders' qualifications: Personnel and procedures are to be qualified per the requirements of
36 the American Welding Society, as given in ANSI/AWS D1.1.

37
38 Tolerances:

39
40 Sweep: Maximum 1/480 of joist length.

41 Spacing: Maximum 1" variation, throughout full joist length.

42 Plumbness: 1/4 inch per foot of joist depth.

43
44 SUBMITTALS

45
46 Shop drawings:

47
48 Provide a dimensioned layout or erection drawing that Indicates mark, number, type, and
49 location of all joists.

1 Indicate all bridging, including size, attachment to the joists, and anchorage of bridging
2 at the ends of each line.

3
4 Indicate connection details including locations and details of bearing plates.

5
6 Indicate paint type, and all accessories required for the proper and complete installation
7 of joists. Include handling and erection instructions.

8
9 For K-series special joists, provide load diagrams stating all distributed and concentrated
10 loads applied to the joist. These loads shall correspond to the loads shown on the
11 structural contract drawing.

12
13 Shop drawings are to be sealed by a professional engineer registered in the same state
14 as the project site.

15
16 Certification: Submit, on request only, the following:

17
18 Certified copies of mill test reports.

19
20 Inspection reports for field connections, including splices.

21
22 PRODUCT DELIVERY, STORAGE, AND HANDLING

23
24 Deliver, store, and handle joists as recommended in SJI's "Specifications".

25
26 Deliver anchor bolts, bearing plates and other items to be embedded in cast-in-place concrete
27 or masonry prior to the start of that work. Provide setting drawings, templates, or instructions
28 for the installation of such items.

29
30 Provide tags on joists for ready identification.

31
32 Store joists off ground, in upright position. Protect from corrosion and keep free of dirt and other
33 detrimental substances.

34
35 Store and handle so as to avoid damage to the joists. Repair or replace damaged joists.

36
37
38 PART 2 - PRODUCTS

39
40 MATERIALS

41
42 Joist: Comply with requirements of SJI "Specifications".

43
44 Bearing plates, bridging, accessories: ASTM A36, Fy=36 ksi.

45
46 Paint: SSPC-Paint 15, or manufacturer's standard red oxide or gray complying with
47 performance requirements of SSPC-Paint 15, except that black asphalt is not permitted.

48
49 Welding electrodes: Conform to requirements of ANSI/AWS D1.1 using Series E70 electrodes,
50 appropriate for the material being welded.

1
2 DESIGN CRITERIA
3

4 Round bar chords are not permitted.
5

6 Extended ends are to be designed for loads on Drawings. If none are given, design for the
7 same load (lbs. /lin. ft.) as the joist.
8

9 Provide ceiling extensions in areas scheduled to receive contact or suspended ceilings.
10

11 **Bridging:**

12
13 For K-Series joists, use horizontal bridging, except where diagonal bridging is
14 specifically shown on Drawings. Connections to joists and to each other at points of
15 intersection to be welded.
16

17 Detail, fabricate, and install bridging in accordance to SJI requirements. Provide
18 additional erection bridging if required for stability.
19

20 Design roof joists and bridging for a net uplift of 10 psf, provide additional bridging as
21 required.
22
23
24

25 PART 2 EXECUTION
26

27 SURFACE CONDITIONS
28

29 Prior to beginning work of this Section, verify that the installed work of other trades is complete
30 and correct to the extent necessary for the proper execution of the work of this Section.
31

32 In the event of discrepancies, immediately notify the Architect. Do not proceed with work
33 affected by the discrepancies until they have been resolved.
34

35 ERECTION
36

37 General: Install joists and accessories plumb, square, and true to line and in conformance with
38 the requirements of SJI "Specifications".
39

40 Install temporary and permanent bridging with joist erection before joist support construction
41 loads. Comply with Erection Stability and Erection requirements of SJI "Specifications".
42

43 Concentrated loads: Provide reinforcing for chords or webs as required at points of
44 concentrated load.
45

46 Touch-up painting: After installation, touch up unpainted areas, connections, and abrasions in
47 the shop coat, with the same paint used for the shop coat.
48

49 FIELD QUALITY CONTROL
50

- 1 Inspection to include visual examination of joists and their connections.
- 2
- 3 Inspection agency to be same agency retained under Structural Steel Section.
- 4
- 5
- 6
- 7 END OF SECTION

1 SECTION 053100 - METAL DECKING

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and
9 Divisions 0 and 1 Specifications Sections, apply to this Section.

10
11 DESCRIPTION

12
13 Work included: All labor and materials required to furnish and install metal decking and
14 accessories including closures, hangers tabs, edge filler plates, ridge and valley plates, end
15 closure angles, and roof sump pans, where shown on the Drawings and/or required for a
16 complete installation.

17
18 RELATED SECTIONS:

19
20 Division 05 Section "Structural Steel"

21
22 Division 05 Section "Steel Joists"

23
24 QUALITY ASSURANCE

25
26 Reference standards:

27
28 Specification for the Design of Cold-Formed Steel Structural Members, current edition,
29 by the American Iron and Steel Institute.

30
31 Design Manual for Floor Decks and Roof Decks, by the Steel Deck Institute, SDI.

32
33 Manufacturer's qualifications: Regularly engaged in the manufacture of similar decking.

34
35 Erector's qualifications: Minimum five years' experience in installation of similar decking.

36
37 Welders' qualifications: Personnel and procedures are to be qualified per the requirements of
38 the American Welding Society, as given in AWS D1.1.

39
40 SUBMITTALS

41
42 Certification of experience: Submit, on request only, written description of personnel, projects,
43 and equipment which document the experience and qualifications required of the manufacturer,
44 erector, and welders.

45
46 Shop drawings:

47
48 Provide deck placement plan that Indicates mark, number, type, finish, dimensions, and
49 location of all deck units. Include details and locations of sump pans, openings, and all
50 accessories.

- 1
- 2 Indicate method of attachment to supporting members.
- 3
- 4 Indicate details and installation instructions for all types of decking and all accessories.
- 5
- 6 Indicate sequence of installation, where critical.
- 7

8 Manufacturer's certification:

- 9
- 10 Certify compliance with structural criteria. Published load tables and literature are
- 11 usually acceptable. Provide design calculations on request only.
- 12
- 13 Certify compliance with finish criteria with test reports as required.
- 14
- 15 Furnish evidence of listing by Underwriters' Laboratory for the specified U.L. Design
- 16 Assembly.
- 17

18 PRODUCT, DELIVERY, STORAGE, AND HANDLING

- 19
- 20 Prevent damage to deck or finish during delivery, handling, and storage. Store on blocking or
- 21 platforms, off the ground, with one end elevated for drainage.
- 22
- 23 Protect from rusting with waterproof covering, or storage under roof. Follow manufacturer's
- 24 instructions for storage and protection of deck surfaces that are not painted or galvanized.
- 25

26

27 PART 2 - PRODUCTS

28

29 DESIGN CRITERIA

30

31 Roof deck:

- 32
- 33 Type: 1-1/2 inches deep, 22 ga. minimum, wide rib (per SDI).
- 34
- 35 Finish: Galvanized.
- 36
- 37 Other: Structural requirements as given on Drawings.
- 38

39 Acoustical roof deck:

- 40
- 41 Type: 3 inches deep, 20 ga. minimum, wide rib. Holes to be 1/8 inch minimum on 3/8
- 42 inch centers, staggered pattern.
- 43
- 44 Finish: Galvanized.
- 45
- 46 Other: Structural requirements as given on Drawings.
- 47

48 MATERIALS AND FINISHES

49

1 Materials: Steel sheet conforming to ASTM A653 or A611, with minimum yield strength of 33
2 ksi.

3
4 Finishes:

5
6 Galvanized: Conform to ASTM A653, G60.

7
8 Phosphatized/painted: After sheet is phosphatized, apply flexible primer paint, baked on
9 the underside. Minimum dry film thickness to be 0.5 mil. Painted: Clean units of scale
10 and rust, phosphatize or bonderize, then apply coat of enamel, vinyl, or epoxy paint.
11 Paint to meet the following criteria:

12
13 Exposure to salt spray, per ASTM B117, for 72 hours. After exposure, there is to
14 be no evidence of rusting, the degree of blistering is to be not worse than No. 8F
15 per ASTM D714, and undercutting at the scribe to be not worse than No. 10, per
16 ASTM D1654.

17
18 Water immersion, per ASTM D870, for 250 hours. After immersion, degree of
19 blistering is to be not worse than No. 8 per ASTM D714.

20
21 Accessories: Same material and finish as deck units, except that interior closures may be of
22 compressible material.

23
24 Sound insulation: Glass fiber type. Required in areas with acoustical roof deck.

25
26 Field touch-up paint:

27
28 For painted deck, use air-drying paint similar to shop coat.

29
30 For galvanized deck, use zinc chromate paint.

31
32 FABRICATION

33
34 Units are to be continuous over at least three spans, where possible. Where units are single- or
35 double-span, use heavier gage if required for stress or deflection control. End laps are to occur
36 over supports.

37
38 Units are to have nested side laps.

39
40 Decking shall be finished such that field paint or sprayed fireproofing can be applied without
41 further preparation.

42
43
44 PART 3 - EXECUTION

45
46 SURFACE CONDITIONS

47
48 Prior to beginning work of this Section, verify that the installed work of other trades is complete
49 and correct to the extent necessary for the proper execution of the work of this Section.

1 In the event of discrepancies, immediately notify the Architect. Do not proceed with work
2 affected by the discrepancies until they have been resolved.

3
4 ERECTION

5
6 Install decking in accordance with approved placement drawings.

7
8 Tolerance: Align adjacent units within 1/4 inch in 40 feet.

9
10 Attachment to supporting members: Attach to supports by welding from topside only. Welds
11 that burn hole in decking or supporting member will be rejected. Minimum size and spacing of
12 welds to be as recommended by the manufacturer or as shown on the drawings; additional
13 requirements are as follows:

14
15 Roof deck: Attach to resist a gross uplift of 45 pounds per square foot in eave overhang
16 areas, 30 pounds per square foot in all other areas. Minimum attachment is to be 1/2-
17 inch diameter fusion welds spaced at 6 inches at end laps, and at 12 inches at
18 intermediate supports, including all side laps.

19
20 Sidelap fastening: Method as recommended by manufacturer; spacing not to exceed 3 feet.

21
22 Closures: Install in deck flutes over supports or other construction at building perimeter and at
23 perimeters of interior rooms. Set in a true even line, flush with construction below, eliminating
24 any shelf or pocket. Closures are to be accurately shaped and installed, to provide a tight fit.

25
26 Openings: Field cut small openings, bevels, miters, etc. as required. Provide additional support
27 for openings exceeding 12 inches in width.

28
29 Hanging loads: Do not hang items other than suspended ceilings from the underside of metal
30 decks, unless specifically approved by the Architect.

31
32 Construction loads: Do not use deck as storage or working platform until it has been
33 permanently attached to supports. Assure that construction loads do not exceed the carrying
34 capacity of the deck.

35
36 Repair and touch-up:

37
38 At areas where deck will be exposed to view, remove and replace any units with damage
39 or defect that cannot be concealed by painting.

40
41 Where deck will not be exposed to view, repair any cuts and holes with plate of same
42 gage as deck.

43
44 Touch up all damaged areas of finish, on both top and bottom sides of deck.

45
46
47
48 END OF SECTION

1 SECTION 054000 - COLD-FORMED METAL FRAMING

2
3
4 PART 2 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and
9 Divisions 0 and 1 Specifications Sections, apply to this Section.

10
11 DESCRIPTION

12
13 Work included: All labor and materials required to design furnish and install the cold-formed
14 metal framing as shown on the drawings and required by these specifications. Cold-formed
15 metal framing includes:

16
17 Exterior non-load-bearing curtain-wall and soffit framing.

18
19 Related accessories and necessary fasteners to complete the system.

20
21 RELATED SECTIONS:

22
23 Division 05 Section "Structural Steel"

24
25 Division 06 Section "Miscellaneous Rough Carpentry"

26
27 Division 09 Section "Gypsum Board Assemblies"

28
29 Provide Openings and special framing required by other trades. Equipment framing, loads,
30 openings, and structure are shown for bidding purposes only. Obtain approval of other trades
31 before proceeding with such work. Coordinate work with mechanical and electrical
32 requirements.

33
34 Field measurement of the existing construction shall be conducted when required to ensure the
35 proper coordination and fit of new work.

36
37 QUALITY ASSURANCE

38
39 Standards: Comply with American Iron and Steel Institute (AISI) "Specification for the Design of
40 Cold-Formed Structural Steel Members", except as otherwise indicated.

41
42 The minimum uncoated thickness of the cold-formed framing delivered to the project
43 shall not be less than 95 percent of the design thickness indicated. Lesser thicknesses
44 shall be permitted at the bends due to cold forming.

45
46 Welding: Comply with American Welding Society, AWS D1.1 "Structural Welding Code - Steel"
47 and AWS D1.3 "Structural Welding Code – Sheet Steel." Qualify welding processes and
48 welding operators in accordance with AWS "Standard Qualification Procedure."
49

1 Inspection Agency Qualifications: Minimum three years' experience in similar inspection,
2 qualified according to ASTM E329 to conduct the testing indicated.

3
4 Provide each type of cold-formed metal framing required produced by one manufacturer.

5
6 REFERENCE STANDARDS:

7
8 American Society for Testing and Materials (ASTM):

9
10 ASTM A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized)
11 or Zinc Iron Alloy Coated (Galvannealed) by the Hot-Dip Process."

12 ASTM A780 "Standard Practice for Repair of Damaged and Uncoated Areas of
13 Hot Dip Galvanized Coatings."

14 ASTM A924 "Standard Specification for General Requirements for Steel Sheet,
15 Metallic-Coated by the Hot-Dip Process."

16 ASTM A1003 "Standard Specification for Steel Sheet, Carbon, Metallic- and
17 Nonmetallic-Coated for Cold-Formed Framing Members."

18 ASTM C955 "Standard Specification for Load Bearing (Transverse and Axial)
19 Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of
20 Gypsum Board and Metal Plaster Bases."

21 ASTM C1007 "Standard Specification for Installation of Load Bearing
22 (Transverse and Axial) Steel Studs and Related Accessories."

23
24 American Welding Society (AWS):

25
26 AWS A2.4 "Symbols for Welding and Nondestructive Testing."

27 AWS D1.1 "Structural Welding Code-Steel."

28 AWS D1.3 "Structural Welding Code-Sheet Steel."

29
30 Association of Wall and Ceiling Industries-International (AWCI) and Metal Lath/Steel
31 Framing Association (ML/SFA):

32
33 AWCI-ML/SFA "Steel Framing Systems Manual."

34
35 SUBMITTALS

36
37 Submit manufacturer's product data and installation instructions for each type of cold-formed
38 metal framing and accessory required.

39
40 Shop Drawings: Submit drawings for approval that include the following minimum information.

41
42 Fully dimensioned plans and elevations with cross sections and details depicting all
43 component member locations, orientations, and layout.

44
45 Wall, Floor and/or Roof member sizes and gage designations, number, type, and
46 spacing.

47
48 Supplemental strapping, bracing, bridging accessories and details required for proper
49 installation.

1 Details of connections that indicate screw types, quantities, locations, weld size and
2 locations, and any other fastener requirements.
3

4 Stud size and details shown on Drawings indicate general installation and connection methods.
5 Complete detailing of components for all loads and forces is to be shown on the Shop Drawings.
6 No changes from sizes and installation methods shown on the Construction Drawings will be
7 permitted without verification that the design criteria are met and without the express written
8 consent of the Architect and the Structural Engineer.
9

10 The supplier of the cold-formed metal framing shall submit written evidence of having a
11 minimum of five years experience on projects of similar type and scope, including a description
12 of physical facilities, quality control, methods, personnel experience, and erection capabilities.
13

14 Welding of cold-formed metal components shall only be performed by operators qualified per
15 AWS D1.1, and D1.3 for the thickness of materials being used. Submit copies of welder
16 certificates upon request only.
17

18 Upon request only, submit mill certificates from the steel producer.
19

20 DELIVERY, STORAGE AND HANDLING

21
22 Deliver materials in manufacturer's unopened containers or bundles fully identified by name,
23 brand, type, and grade. Exercise care to avoid damage during unloading, storing and erection.
24

25 Protect cold-formed metal framing members and accessories from corrosion, deformation,
26 damage, and deterioration when stored at job site, as required in AISI's Code of Standard
27 Practice. Store cold-formed metal framing off the ground on pallets, platforms or other supports,
28 and provide a waterproof covering. Keep cold-formed metal framing free of dirt and other
29 foreign material.
30

31 PROJECT CONDITIONS

32
33 Coordinate metal frame positioning with trades furnishing items for attachment of built-in
34 members.
35

36 Promptly furnish anchors, bolts, inserts, clips, and other items required under this section but
37 built in with work of other trades.
38
39

40 PART 2 - PRODUCTS

41 42 ACCEPTABLE MANUFACTURERS

43
44 Cold-formed metal framing products by the following manufacturers are approved for use on this
45 project: Clark Steel Framing Systems Inc.; Dietrich Metal Framing, a Worthington Industries
46 Company; Marino Ware, a division of Ware Industries; and The Steel Network, Inc.
47

48 Connection component and fastener products by the following manufacturers are approved for
49 use on the project: Clark Steel Framing Systems, Inc.; Dietrich Metal Framing, a Worthington
50 Industries Company; Marino Ware, a division of Ware Industries; and The Steel Network, Inc.

1
2 Alternate manufacturers of cold-formed metal framing, connection components, and fasteners
3 are to be submitted for review and approval 2 weeks before submitting bids.
4

5 MATERIALS

6
7 Sheet Steel: ASTM A1003, Structural Grade, Type H, metallic coated, of thickness and grade
8 as follows:
9

10 Design Thickness:

11
12 33 mils – 0.0346 inches – 20 gage.

13 43 mils – 0.0451 inches – 18 gage.

14 54 mils – 0.0566 inches – 16 gage.

15 68 mils – 0.0713 inches – 14 gage.

16 97 mils – 0.1017 inches – 12 gage.
17

18 43 mils (18 gage) and lighter C-shaped components: minimum yield point of 33,000 psi.
19

20 54 mils (16 gage) and heavier C-shaped components: minimum yield point of 50,000
21 psi.
22

23 Track and bridging components: minimum yield point of 33,000 psi.
24

25 Connection Clip Angles and Vertical or Horizontal Deflection Angle connections:
26 minimum yield point of 50,000 psi.
27

28 Framing Components: Manufacturer's standard C-shaped cold-formed metal studs having
29 punched and/or un-punched webs with stiffened flanges shall comply with ASTM C955. Provide
30 sizes, shapes, and gages indicated. Nomenclature used on the drawings is designated by:
31 Depth, Shape, Width, and Thickness of framing components. i.e.: 600 S-162-54.
32

33 Depth: The number represents the depth of the member multiplied by 100 and
34 expressed as a whole number. i.e.: 362 = 3 5/8"; 600 = 6"; 800 = 8".
35

36 Shape: S – C-shaped members; T – track member; F – furring channel; U – U-shaped
37 channel.
38

39 Width: The number represents the flange width of the member multiplied by 100 and
40 expressed as a whole number. i.e.: 162 = 1 5/8"; 200 = 2"; 250 = 2 1/2".
41

42 Thickness: Expressed in mils and as defined above.
43

44 System Accessories: Provide manufacturer's standard steel tracks, bridging, blocking, clip
45 angles, reinforcements, stiffeners, fasteners, braces, and accessories for each type of cold-
46 formed metal framing required. Provide all components recommended by the manufacturer for
47 the applications indicated and as needed to provide a complete metal framing system.
48

49 Finish:
50

1 Galvanized: Provide framing components; studs, joists, rafters, and headers, with
2 protective zinc coating complying with ASTM A1003, minimum G60 coating.

3
4 Provide connection components; clip angles, deflection angles, joist hangers, hurricane
5 ties, holdowns, etc., with protective zinc coating complying with ASTM A1003, minimum
6 G90 coating.

7
8 Galvanizing repair paint: Tnemec Co., Inc. – No. 92 “Tneme-Zinc”; SSPC-Paint 20; or
9 an approved equal zinc-rich primer paint.

10
11 **Fasteners:**

12
13 Manufacturer’s recommended self-drilling, self-tapping screws, bolts, nuts, and washers
14 with hot-dip galvanized finished complying with ASTM C1513.

15
16 Anchorage devices: Powder-actuated fasteners (PAF), anchor bolts, drilled expansion
17 anchors, or chemical anchors.

18
19 Welding: Comply with AWS D1.1 when applicable, and AWS D1.3 for welding base
20 metals less than 1/8” thick.

21
22 **FABRICATION**

23
24 Attach and join indicated components by welding. Attach and join other components by
25 welding, bolting, or screw fasteners, as recommended by the manufacturer. Wire-tying of
26 framing components is not permitted.

27
28 Cut framing to fit squarely against abutting members. Hold members securely in position until
29 properly fastened.

30
31 Saw cut all field cuts of cold-formed framing members and components squarely for attachment
32 to perpendicular members, or as required for an angular fit against abutting members.

33
34
35 **PART 3 - EXECUTION**

36
37 **INSPECTION**

38
39 Examine structure, substrates and installation conditions. Do not proceed with cold-formed
40 metal framing work until unsatisfactory conditions have been corrected.

41
42 Installation constitutes acceptance of existing conditions and responsibility for satisfactory
43 performance.

44
45 **INSTALLATION – GENERAL**

46
47 Install cold-formed metal framing in accordance with ASTM C1007, unless otherwise indicated.

48
49 Install cold-formed metal framing and accessories plumb, square, and true to line, according to
50 the manufacturer’s written recommendations and requirements in this Section.

1
2 Connections of cold-formed metal framing members and components are to be securely
3 anchored to the supporting structure according to the manufacturer's written recommendations
4 and requirements in this Section.

5
6 Do not bridge building expansion joints and control joints with cold-formed metal framing
7 members or accessories. Frame each side of joints with independent members.

8
9 Install insulation in assemblies and built-up members in exterior framing, such as headers,
10 multiple stud columns and jambs, sills, and boxed beams or joists, that are not accessible to the
11 insulation contractor upon erection of framing work.

12
13 Fasten hole-reinforcing plates over web penetrations that exceed the manufacturer's standard
14 punched openings.

15 16 INSTALLATION – NON-LOAD BEARING CURTAIN WALL STUDS

17
18 Install continuous top and bottom tracks sized to match studs. Align tracks accurately to layout
19 at base and top of studs. Secure tracks at corners, ends, and laps, as recommended by the
20 manufacturer for type of construction involved. Securely anchor tracks to building framing as
21 indicated.

22
23 Squarely set studs against web of tracks and secure studs to top and bottom tracks by either
24 welding or fastening with screws at both inside and outside flanges.

25
26 Set studs plumb, except as needed for diagonal bracing or for non-plumb walls and warped
27 surfaces and other similar requirements.

28
29 Isolate non-load bearing curtain wall studs for the building structure to prevent transfer of
30 vertical loads while providing lateral support.

31
32 Install stud wall bridging (continuous cold-rolled channels positioned through the stud punch-
33 outs) either by welding directly to the stud or attaching with clips. Bridging shall consist of the
34 following:

35
36 3 5/8" and 6" studs 1-1/2" x 16-gage channel fastened to each stud with standard clip
37 angles.

38
39 Proprietary bridging bars provided and installed according to manufacturer's written
40 instructions.

41
42 A combination of flat, taut, steel straps of width and thickness indicated and stud-track
43 solid blocking of width and thickness to match stud. Fasten straps to stud flanges and
44 secure solid blocking to stud webs or flanges with standard clip angles.

45
46 Install bridging rows at a maximum spacing of 4'-0" on center.

47
48 Install supplementary framing, connections, diagonal braces or kickers, blocking, stiffeners, clip
49 angles, and fasteners required to provide a complete and stable curtain wall framing system.

1 FIELD QUALITY CONTROL

2

3 Testing: Owner will engage a qualified independent testing and inspecting agency to conduct
4 field tests and inspections and prepare field reports.

5

6 Field and shop welds will be subject to testing and inspecting.

7

8 Testing agency will report results promptly and in writing to Contractor and Architect.

9

10 Remove and replace work where test results indicate that members, materials, or connections
11 do not comply with the specified requirements.

12

13 Additional testing and inspecting will be conducted at Contractor's expense to determine
14 compliance of replaced or additional work with specified requirements.

15

16 FIELD REPAIRS AND PROTECTION

17

18 Galvanized Repairs: Prepare and repair damaged galvanized coatings on fabricated and
19 installed cold-formed metal framing, connections, and components with galvanized repair paint
20 according to ASTM A780 and manufacturer's written instructions.

21

22 Provide final protection and maintain conditions, in a manner acceptable to the manufacturer
23 and Installer, which ensure the cold-formed metal framing is without damage or deterioration at
24 time of Substantial Completion.

25

26

27

28 END OF SECTION

1 SECTION 055213 - PIPE AND TUBE RAILINGS

2
3
4 PART 1- GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes the following:

14
15 Steel pipe railings.

16
17 PERFORMANCE REQUIREMENTS

18
19 General: In engineering railings to withstand structural loads indicated, determine allowable design
20 working stresses of railing materials based on the following:

21
22 Steel: 72 percent of minimum yield strength.

23
24 Structural Performance: Provide railings capable of withstanding the effects of gravity loads and
25 the following loads and stresses within limits and under conditions indicated:

26
27 Handrails:

28
29 Uniform load of 50 lbf applied in any direction.

30
31 Concentrated load of 200 lbf applied in any direction.

32
33 Uniform and concentrated loads need not be assumed to act concurrently.

34
35 Top Rails of Guards:

36
37 Uniform load of 50 lbf applied in any direction.

38
39 Concentrated load of 200 lbf applied in any direction.

40
41 Uniform and concentrated loads need not be assumed to act concurrently.

42
43 Infill of Guards:

44
45 Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.

46
47 Uniform load of 25 lbf/sq. ft. applied horizontally.

48
49 Infill load and other loads need not be assumed to act concurrently.

1 Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the
2 following maximum change (range) in ambient and surface temperatures by preventing buckling,
3 opening of joints, over-stressing of components, failure of connections, and other detrimental
4 effects. Base engineering calculation on surface temperatures of materials due to both solar heat
5 gain and nighttime-sky heat loss.

6
7 Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

8
9 Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and
10 other materials from direct contact with incompatible materials.

11 12 SUBMITTALS

13
14 Product Data: For the following:

15
16 Grout, anchoring cement, and paint products.

17
18 Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

19
20 Samples for Initial Selection: For products involving selection of color, texture, or design.

21 22 QUALITY ASSURANCE

23
24 Source Limitations: Obtain each type of railing through one source from a single manufacturer.

25
26 Welding: Qualify procedures and personnel according to the following:

27
28 AWS D1.1, "Structural Welding Code--Steel."

29 30 PROJECT CONDITIONS

31
32 Field Measurements: Verify actual locations of walls and other construction contiguous with railings
33 by field measurements before fabrication and indicate measurements on Shop Drawings.

34 35 COORDINATION AND SCHEDULING

36
37 Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and
38 directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items
39 with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to
40 Project Site in time for installation.

41
42 Schedule installation so wall attachments are made only to completed walls. Do not support
43 railings temporarily by any means that do not satisfy structural performance requirements.

44 45 46 PART 2 - PRODUCTS

47 48 MANUFACTURERS

1 Available Manufacturers: Subject to compliance with requirements, manufacturers offering
2 products that may be incorporated into the Work include, but are not limited to, the following:

3
4 Anodized Aluminum Pipe and Tube Railings:

5
6 Pisor Industries, Inc.

7 Sharpe Products.

8 Wagner, R & B, Inc.; a division of the Wagner Companies.
9

10 METALS, GENERAL

11
12 Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller
13 marks, rolled trade names, stains, discolorations, or blemishes.

14
15 Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as
16 supported rails, unless otherwise indicated.

17
18 FASTENERS

19
20 General: Provide the following:

21
22 Aluminum Railings: Aluminum fasteners.

23
24 Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class
25 required to produce connections suitable for anchoring railings to other types of construction
26 indicated and capable of withstanding design loads.

27
28 Fasteners for Interconnecting Railing Components:

29
30 Provide concealed fasteners for interconnecting railing components and for attaching them
31 to other work, unless exposed fasteners are unavoidable or are the standard fastening
32 method for railings indicated.

33
34 Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise
35 indicated.
36

37 Anchors: Provide cast-in-place or torque-controlled expansion anchors, fabricated from
38 corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the
39 load imposed when installed in unit masonry and equal to four times the load imposed when
40 installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified
41 independent testing agency.

42
43 MISCELLANEOUS MATERIALS

44
45 Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy
46 welded.
47

1 Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, non-corrosive, nongaseous grout
2 complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior
3 and exterior applications.

4
5 Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion
6 cement formulation for mixing with water at Project Site to create pourable anchoring, patching, and
7 grouting compound.

8
9 Water-Resistant Product: At exterior locations provide formulation that is resistant to
10 erosion from water exposure without needing protection by a sealer or waterproof coating
11 and that is recommended by manufacturer for exterior use.

12 13 FABRICATION

14
15 General: Fabricate railings to comply with requirements indicated for design, dimensions, member
16 sizes and spacing, details, finish, and anchorage, but not less than that required to support
17 structural loads.

18
19 Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly.
20 Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for
21 reassembly and coordinated installation. Use connections that maintain structural value of joined
22 pieces.

23
24 Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of
25 approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed
26 surfaces.

27
28 Form work true to line and level with accurate angles and surfaces.

29
30 Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep
31 holes where water may accumulate.

32
33 Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

34
35 Connections: Fabricate railings with welded connections, unless otherwise indicated.

36
37 Welded Connections: Cope components at connections to provide close fit, or use fittings
38 designed for this purpose. Weld all around at connections, including at fittings.

39
40 Use materials and methods that minimize distortion and develop strength and corrosion
41 resistance of base metals.

42
43 Obtain fusion without undercut or overlap.

44
45 Remove flux immediately.

46
47 At exposed connections, finish exposed surfaces smooth and blended so no roughness
48 shows after finishing and welded surface matches contours of adjoining surfaces.

1 Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings.
2 Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

3
4 Form changes in direction as follows:

5
6 By flush bends.

7
8 Form simple and compound curves by bending members in jigs to produce uniform curvature for
9 each repetitive configuration required; maintain cross section of member throughout entire bend
10 without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

11
12 Close exposed ends of railing members with prefabricated end fittings.

13
14 Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of
15 returns unless clearance between end of rail and wall is $\frac{1}{4}$ inch or less.

16
17 Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings,
18 and anchors to interconnect railing members to other work, unless otherwise indicated.

19
20 At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made
21 from crush-resistant material, or other means to transfer wall loads through wall finishes to
22 structural supports and prevent bracket or fitting rotation and crushing of substrate.

23
24 Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
25 Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate
26 anchorage devices with supporting structure.

27
28 For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside
29 dimensions not less than $\frac{1}{2}$ inch greater than outside dimensions of post, with steel plate forming
30 bottom closure.

31
32 FINISHES, GENERAL

33
34 Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for
35 recommendations for applying and designating finishes.

36
37 Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary
38 protective covering before shipping.

39
40 Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are
41 acceptable if they are within one-half of the range of approved Samples. Noticeable variations in
42 the same piece are not acceptable. Variations in appearance of other components are acceptable
43 if they are within the range of approved Samples and are assembled or installed to minimize
44 contrast.

45
46 Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

47
48
49 PART 3 - EXECUTION

1 EXAMINATION

2
3 Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that
4 locations of concealed reinforcements have been clearly marked for Installer. Locate
5 reinforcements and mark locations if not already done.
6

7 INSTALLATION, GENERAL

8
9 Fit exposed connections together to form tight, hairline joints.

10
11 Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location,
12 alignment, and elevation; measured from established lines and levels and free of rack.
13

14 Do not weld, cut, or abrade surfaces of railing components that have been coated or
15 finished after fabrication and that are intended for field connection by mechanical or other
16 means without further cutting or fitting.
17

18 Set posts plumb within a tolerance of 1/16 inch in 3 feet.
19

20 Align rails so variations from level for horizontal members and variations from parallel with
21 rake of steps and ramps for sloping members do not exceed ¼ inch in 12 feet.
22

23 Adjust railings before anchoring to ensure matching alignment at abutting joints.
24

25 Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for
26 securing railings and for properly transferring loads to in-place construction.
27

28 RAILING CONNECTIONS

29
30 Nonwelded Connections: Use mechanical for permanently connecting railing components. Use
31 wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes
32 of exposed locking screws using plastic cement filler colored to match finish of railings.
33

34 Welded Connections: Use fully welded joints for permanently connecting railing components.
35 Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding
36 is performed in the shop or in the field.
37

38 Expansion Joints: Install expansion joints at locations indicated but not farther apart than required
39 to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond
40 joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches of post.
41

42 ANCHORING POSTS

43
44 Form or core-drill holes not less than 5 inches deep and ¾ inch larger than outer diameter of post
45 for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space
46 between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and
47 placed to comply with anchoring material manufacturer's written instructions.
48

1 Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8 inch buildup,
2 sloped away from post.

3
4 Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by
5 conditions, connected to posts and to metal supporting members as follows:

6
7 For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

8 9 ANCHORING RAILING ENDS

10
11 Anchor railing ends to concrete and masonry with round flanges connected to railing ends and
12 anchored to wall construction with anchors and bolts.

13
14 Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing
15 ends.

16 17 ATTACHING HANDRAILS TO WALLS

18
19 Attach handrails to wall with wall brackets. Provide brackets with 1 1/2 inch clearance from inside
20 face of handrail and finished wall surface.

21
22 Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.

23
24 Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

25
26 Secure wall brackets to building construction as follows:

27
28 For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or
29 lag bolts.

30
31 For hollow masonry anchorage, use toggle bolts.

32
33 For wood stud partitions, use hanger or lag bolts set into wood backing between studs.
34 Coordinate with carpentry work to locate backing members.

35
36 For steel-framed gypsum board partitions, use hanger or lag bolts set into
37 fire-retardant-treated wood backing between studs. Coordinate with stud installation to
38 locate backing members.

39 40 ADJUSTING AND CLEANING

41
42 Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing
43 with clean water.

44 45 PROTECTION

46
47 Protect finishes of railings from damage during construction period with temporary protective
48 coverings approved by railing manufacturer. Remove protective coverings at time of Substantial
49 Completion.

- 1 Restore finishes damaged during installation and construction period so no evidence remains of
- 2 correction work. Return items that cannot be refinished in the field to the shop; make required
- 3 alterations and refinish entire unit, or provide new units.
- 4
- 5
- 6
- 7 END OF SECTION

1 SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes the following:

- 14
- 15 Framing with dimension lumber.
- 16 Wood blocking and nailers.
- 17 Wood furring.
- 18 Plywood backing panels.
- 19

20 Related Sections include the following:

21
22 Division 06 Section "Sheathing."

23
24 Division 06 Section "Finish Carpentry" for nonstructural carpentry items exposed to view
25 and not specified in another Section.

26
27 DEFINITIONS

28
29 Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least
30 dimension.

31
32 Lumber grading agencies, and the abbreviations used to reference them, include the following:

- 33
- 34 NeLMA: Northeastern Lumber Manufacturers' Association.
- 35 NHLA: National Hardwood Lumber Association.
- 36 NLGA: National Lumber Grades Authority.
- 37 SPIB: The Southern Pine Inspection Bureau.
- 38 WCLIB: West Coast Lumber Inspection Bureau.
- 39 WWPA: Western Wood Products Association.
- 40

41 SUBMITTALS

42
43 Product Data: For each type of process and factory-fabricated product, indicate component
44 materials and dimensions and include construction and application details.

45
46 Include data for wood-preservative treatment from chemical treatment manufacturer and
47 certification by treating plant that treated materials comply with requirements. Indicate type
48 of preservative used and net amount of preservative retained.

1 For products receiving a waterborne treatment, include statement that moisture content of
2 treated materials was reduced to levels specified before shipment to Project site.

3
4 Include copies of warranties from chemical treatment manufacturers for each type of
5 treatment.

6 7 DELIVERY, STORAGE, AND HANDLING

8
9 Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air
10 circulation around stacks and under coverings.

11
12 Deliver interior wood materials that are to be exposed to view only after building is enclosed and
13 weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining
14 temperature and humidity at occupancy levels.

15 16 17 PART 2 - PRODUCTS

18 19 WOOD PRODUCTS, GENERAL

20
21 Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is
22 indicated, provide lumber that complies with the applicable rules of any rules-writing agency
23 certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC
24 Board of Review to inspect and grade lumber under the rules indicated.

25
26 Factory mark each piece of lumber with grade stamp of grading agency.

27
28 For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on
29 end or back of each piece.

30
31 Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for
32 moisture content specified. Where actual sizes are indicated, they are minimum dressed
33 sizes for dry lumber.

34
35 Provide dressed lumber, S4S, unless otherwise indicated.

36 37 WOOD-PRESERVATIVE-TREATED MATERIALS

38
39 Preservative Treatment by Pressure Process: AWPAC2, except that lumber that is not in contact
40 with the ground and is continuously protected from liquid water may be treated according to AWPAC
41 C31 with inorganic boron (SBX).

42
43 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no
44 arsenic or chromium.

45
46 For exposed items indicated to receive a stained or natural finish, use chemical
47 formulations that do not require incising, contain colorants, bleed through, or otherwise
48 adversely affect finishes.

1 Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material
2 that is warped or does not comply with requirements for untreated material.

3
4 Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of
5 Review.

6
7 For exposed lumber indicated to receive a stained or natural finish, mark end or back of
8 each piece.

9
10 Application: Treat items indicated on Drawings, and the following:

11
12 Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar
13 members in connection with roofing, flashing, vapor barriers, and waterproofing.

14
15 Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact
16 with masonry or concrete.

17
18 Wood framing and furring attached directly to the interior of below-grade exterior masonry
19 or concrete walls.

20
21 Wood framing members that are less than 18 inches above the ground in crawl spaces or
22 unexcavated areas.

23
24 Wood floor plates that are installed over concrete slabs-on-grade.

25 26 DIMENSION LUMBER FRAMING

27
28 Maximum Moisture Content: 19 percent

29
30 Other Framing: Construction, stud, or No. 3 grade and any of the following species:

31
32 Hem-fir (north); NLGA.

33 Southern pine; SPIB.

34 Douglas fir-larch; WCLIB or WWPA.

35 Mixed southern pine; SPIB.

36 Spruce-pine-fir; NLGA.

37 Douglas fir-south; WWPA.

38 Hem-fir; WCLIB or WWPA.

39 Douglas fir-larch (north); NLGA.

40 Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

41 42 MISCELLANEOUS LUMBER

43
44 General: Provide miscellaneous lumber indicated and lumber for support or attachment of other
45 construction, including the following:

46
47 Blocking.

48 Nailers.

49 Rooftop equipment bases and support curbs.

1 Furring.

2

3 For items of dimension lumber size, provide Construction, stud, or No. 3 grade lumber with 19
4 percent maximum moisture content and any of the following species:

5

6 Hem-fir (north); NLGA.

7 Mixed southern pine; SPIB.

8 Spruce-pine-fir; NLGA.

9 Hem-fir; WCLIB, or WWPA.

10 Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

11 Western woods; WCLIB or WWPA.

12 Northern species; NLGA.

13 Eastern softwoods; NeLMA.

14

15 For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of
16 any species may be used provided that it is cut and selected to eliminate defects that will interfere
17 with its attachment and purpose.

18

19 For blocking and nailers used for attachment of other construction, select and cut lumber to
20 eliminate knots and other defects that will interfere with attachment of other work.

21

22 For furring strips for installing plywood or hardboard paneling, select boards with no knots capable
23 of producing bent-over nails and damage to paneling.

24

25 PLYWOOD BACKING PANELS

26

27 Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in
28 thickness indicated or, if not indicated, not less than ½ inch nominal thickness.

29

30 FASTENERS

31

32 General: Provide fasteners of size and type indicated that comply with requirements specified in
33 this Article for material and manufacture.

34

35 Where carpentry is exposed to weather, in ground contact, pressure-preservative treated,
36 or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying
37 with ASTM A 153/A 153M.

38

39 Nails, Brads, and Staples: ASTM F 1667.

40

41 Power-Driven Fasteners: NES NER-272.

42

43 Wood Screws: ASME B18.6.1.

44

45 Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and
46 reamer wings, length as recommended by screw manufacturer for material being fastened.

47

48 Lag Bolts: ASME B18.2.1.

49

1 Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where
2 indicated, flat washers.

3
4 Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability
5 to sustain, without failure, a load equal to six (6) times the load imposed when installed in unit
6 masonry assemblies and equal to four (4) times the load imposed when installed in concrete as
7 determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting
8 agency.

9
10 Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn
11 5.

12 13 METAL FRAMING ANCHORS

14
15 Basis-of-Design Products: Subject to compliance with requirements, provide comparable products
16 by one of the following:

17
18 Cleveland Steel Specialty Co.
19 Harlen Metal Products, Inc.
20 KC Metals Products, Inc.
21 Simpson Strong-Tie Co., Inc.
22 Southeastern Metals Manufacturing Co., Inc.
23 USP Structural Connectors.

24
25 Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M,
26 coating designation.

27
28 Use for interior locations where stainless steel is not indicated.

29 30 MISCELLANEOUS MATERIALS

31
32 Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with
33 ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

34 35 36 PART 3 - EXECUTION

37 38 INSTALLATION, GENERAL

39
40 Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit
41 carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers,
42 blocking, and similar supports to comply with requirements for attaching other construction.

43
44 Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction,"
45 unless otherwise indicated.

46
47 Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

48
49 Do not splice structural members between supports, unless otherwise indicated.

1 Provide blocking and framing as indicated and as required to support facing materials, fixtures,
2 specialty items, and trim.

3

4 Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and
5 as follows:

6

7 Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96
8 inches on center with solid wood blocking or noncombustible materials accurately fitted to
9 close furred spaces.

10

11 Fire block concealed spaces of wood-framed walls and partitions at each floor level, at
12 ceiling line of top story, and at not more than 96 inches on center. Where fire blocking is
13 not inherent in framing system used, provide closely fitted solid wood blocks of same width
14 as framing members and 2-inch nominal thickness.

15

16 Fire block concealed spaces between floor sleepers with same material as sleepers to limit
17 concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.

18

19 Fire block concealed spaces behind combustible cornices and exterior trim at not more than
20 20 feet on center.

21

22 Sort and select lumber so that natural characteristics will not interfere with installation or with
23 fastening other materials to lumber. Do not use materials with defects that interfere with function
24 of member or pieces that are too small to use with minimum number of joints or optimum joint
25 arrangement.

26

27 Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

28

29 Use inorganic boron for items that are continuously protected from liquid water.

30

31 Use copper naphthenate for items not continuously protected from liquid water.

32

33 Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying
34 with the following:

35

36 NES NER-272 for power-driven fasteners.

37

38 Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code.

39

40 Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully
41 penetrate members where opposite side will be exposed to view or will receive finish materials.
42 Make tight connections between members. Install fasteners without splitting wood; do not
43 countersink nail heads, unless otherwise indicated.

44

45 WOOD BLOCKING AND NAILER INSTALLATION

46

47 Install where indicated and where required for attaching other work. Form to shapes indicated and
48 cut as required for true line and level of attached work. Coordinate locations with other work
49 involved.

1 Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces,
2 unless otherwise indicated.

3

4 WOOD FURRING INSTALLATION

5

6 Install level and plumb with closure strips at edges and openings. Shim with wood as required for
7 tolerance of finish work.

8

9 Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal size furring
10 horizontally and vertically at 24 inches.

11

12 Furring to Receive Gypsum Board or Plaster Lath: Install 1-by-2-inch nominal size furring vertically
13 at 16 inches on center.

14

15 PROTECTION

16

17 Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection,
18 inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate
19 solution by spraying to comply with EPA-registered label.

20

21 Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply
22 EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered
23 label.

24

25

26

27 END OF SECTION

1 SECTION 061600 - SHEATHING

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes the following:

14
15 Sheathing behind metal panels.

16
17 Flexible flashing at openings in sheathing.

18
19 RELATED SECTIONS

20
21 Division 06 Section "Rough Carpentry" for plywood backing panels.

22
23 Division 07 Section "KEE Membrane Roofing"

24
25 SUBMITTALS

26
27 Product Data: For each type of process and factory-fabricated product. Indicate component
28 materials and dimensions and include construction and application details.

29
30 Include data for wood-preserved treatment from chemical treatment manufacturer and
31 certification by treating plant that treated plywood complies with requirements. Indicate type
32 of preservative used and net amount of preservative retained.

33
34 For products receiving a waterborne treatment, include statement that moisture content of
35 treated materials was reduced to levels specified before shipment to Project site.

36
37 Include copies of warranties from chemical treatment manufacturers for each type of
38 treatment.

39
40 For building wrap, include data on air-moisture-infiltration protection based on testing
41 according to referenced standards.

42
43 DELIVERY, STORAGE, AND HANDLING

44
45 Stack plywood and other panels flat with spacers between each bundle to provide air circulation.
46 Provide for air circulation around stacks and under coverings.

1 PART 2 - PRODUCTS

2
3 WOOD PANEL PRODUCTS, GENERAL

4
5 Plywood: DOC PS 1.

6
7 Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

8
9 Factory mark panels to indicate compliance with applicable standard.

10
11 PRESERVATIVE-TREATED PLYWOOD

12
13 Preservative Treatment by Pressure Process: AWPA C9.

14
15 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no
16 arsenic or chromium.

17
18 Mark plywood with appropriate classification marking of an inspection agency acceptable to
19 authorities having jurisdiction.

20
21 Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete.

22
23 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING

24
25 Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: Ridge, cellular
26 polyisocyanurate thermal insulation with oriented strand board laminated to one face complying with
27 ASTM C 1289, Type V and minimum 3/4" air space strips.

28
29 Products: Subject to compliance with requirements, provide one of the following:

30
31 Atlas Roofing Corporation.
32 Cornell Corporation
33 Johns Manville; Berkshire Hathaway Inc.
34 Rmax, Inc.

35
36 Polyisocyanurate-Foam Thickness: 4 inches

37
38 Oriented-Strand-Board Nominal Thickness: 7/16 inch thick, ADA Rated.

39
40 Nominal Panel Dimensions 4' - 0" x 8' - 0" x approximately 5 1/2" thick with a long term
41 thermal resistance (LTTR) not less than R-32.

42
43 Wood panel equal to be rabbeted, foam side and ends to be tongue and groove style.

44
45 ROOF SHEATHING

46
47 Plywood Roof Sheathing: Exterior grade sheathing.

1 Span Rating: Not less than required for spacing of framing.

2
3 Nominal Thickness: Not less than $\frac{5}{8}$ inch.

4
5 FASTENERS

6
7 General: Provide fasteners of size and type indicated that comply with requirements specified in
8 this Article for material and manufacture.

9
10 For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with
11 ASTM A 153/A 153M.

12
13 Nails, Brads, and Staples: ASTM F 1667.

14
15 Power-Driven Fasteners: NES NER-272.

16
17 Wood Screws: ASME B18.6.1.

18
19 Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing and Steel Decking:
20 ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw
21 manufacturer for material being fastened. For wall and roof sheathing panels, provide screws with
22 organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than
23 800 hours according to ASTM B 117.

24
25 Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing and Steel Decking: Steel
26 drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board
27 to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray
28 resistance of more than 800 hours according to ASTM B 117.

29
30 For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C
31 1002.

32
33 For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C
34 954.

35
36 MISCELLANEOUS MATERIALS

37
38 Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable,
39 rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to
40 produce an overall thickness of not less than 0.030 inch.

41
42 Products: Subject to compliance with requirements, provide one of the following:

43
44 Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.

45
46 Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-
47 Adhered Flashing.

1 MFM Building Products Corp.; Window Wrap.

2
3 Polyguard Products, Inc.; Polyguard 300.

4
5 Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for
6 substrate.

7
8 Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is
9 recommended for indicated use by adhesive manufacturer.

10
11
12 PART 3 - EXECUTION

13
14 INSTALLATION, GENERAL

15
16 Do not use materials with defects that impair quality of sheathing or pieces that are too small to use
17 with minimum number of joints or optimum joint arrangement.

18
19 Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting
20 construction, unless otherwise indicated.

21
22 Securely attach to substrate by fastening as indicated, complying with the following:

23
24 NES NER-272 for power-driven fasteners.

25
26 Table 2304.9.1, "Fastening Schedule," in OBC's "Ohio Building Code."

27
28 Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully
29 penetrate members where opposite side will be exposed to view or will receive finish materials.
30 Make tight connections. Install fasteners without splitting wood.

31
32 Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these
33 materials are installed in sequence and manner that prevent exterior moisture from passing through
34 completed assembly.

35
36 Do not bridge building expansion joints; cut and space edges of panels to match spacing of
37 structural support elements.

38
39 Coordinate sheathing installation with installation of materials installed over sheathing so sheathing
40 is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

41
42 WOOD STRUCTURAL PANEL INSTALLATION

43
44 General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood
45 Construction Guide," for types of structural-use panels and applications indicated.

46
47 Fastening Methods: Fasten panels as indicated below:

1 Wall and Roof Sheathing:

2
3 Nail to wood framing.

4
5 Screw to cold-formed metal framing and/or steel decking.

6
7 Space panels 1/8 inch apart at edges and ends.

8
9 SHEATHING JOINT-AND-PENETRATION TREATMENT

10
11 Seal sheathing joints according to sheathing manufacturer's written instructions.

12
13 Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity
14 of sealant to completely cover joints and fasteners after troweling. Seal other penetrations
15 and openings.

16
17 Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and
18 trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to
19 exposed fasteners with a trowel so fasteners are completely covered. Seal other
20 penetrations and openings.

21
22 Apply sheathing tape to joints between foam-plastic sheathing panels and at items
23 penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

24
25 FLEXIBLE FLASHING INSTALLATION

26
27 Apply flexible flashing where indicated to comply with manufacturers written instructions.

28
29 Prime substrates as recommended by flashing manufacturer.

30
31 Lap seams and junctures with other materials at least 4 inches, except that at flashing
32 flanges of other construction, laps need not exceed flange width.

33
34 Lap flashing over weather-resistant building paper at bottom and sides of openings.

35
36 Lap weather-resistant building paper over flashing at heads of openings.

37
38 After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure
39 that flashing is completely adhered to substrates.

40
41
42
43 END OF SECTION

1 SECTION 062000 - FINISH CARPENTRY

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Division
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY:

12
13 This section includes the following:

- 14
- 15 Standing and running trim.
- 16 Hanging of doors and frames (wood and metal).
- 17 Installation of finish hardware.
- 18 Installation of pencil sharpener supports.
- 19 Countertop cut outs for sinks by others.
- 20 Installation of miscellaneous components.

21
22 Related Sections:

- 23
- 24 Division 6 Section "Rough Carpentry" for furring, blocking and other non-exposed work.
- 25
- 26 Division 8 Section "Door Hardware" for installation of hardware.
- 27
- 28 Division 9 Section "Painting" for priming and backpriming of interior carpentry.
- 29
- 30 Division 12 Section "Plastic Laminate Casework" for shop fabricated casework.

31
32 DEFINITIONS:

33
34 Definition Finish carpentry: Carpentry work which is exposed to view, is non-structural, and which
35 is not specified as part of other sections.

36
37 Lumber grading agencies, and the abbreviations used to reference them, include the following:

- 38
- 39 NeLMA: Northeastern Lumber Manufacturers' Association.
- 40 NHLA: National Hardwood Lumber Association.
- 41 NLGA: National Lumber Grades Authority.
- 42 SPIB: The Southern Pine Inspection Bureau.
- 43 WCLIB: West Coast Lumber Inspection Bureau.
- 44 WPA: Western Wood Products Association.

45
46 MDF: Medium-density fiberboard.

1 MDO Plywood: Plywood with a medium-density overlay on the face.

2
3 QUALITY ASSURANCE:

4
5 Quality Standards: Except as otherwise shown or specified, comply with specified provisions of the
6 Architectural Woodwork Institute 9AWI "Quality Standards".

7
8 Custom Grade

9
10 Optimum Moisture Content: Kiln-dry woodwork to an average moisture content within the following
11 ranges or as otherwise recommended by applicable quality standards for the regional climate
12 involved.

13
14 Exterior Woodwork: 9 to 15 percent

15
16 Interior Woodwork: 5 to 10 percent

17
18 SUBMITTALS

19
20 Product Data: For each type of product indicated.

21
22 Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details,
23 attachment devices, and other components.

24
25 Show details full size.

26
27 Show locations and sizes of furring, blocking, and hanging strips, including concealed
28 blocking and reinforcement specified in other Sections.

29
30 Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap
31 dispensers and other installed items.

32
33 DELIVERY, STORAGE, AND HANDLING

34
35 Protect materials during transit, delivery, storage and handling against weather and contact with
36 damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each
37 bundle to provide air circulation. Provide for air circulation within and around stacks and under
38 temporary coverings.

39
40 Deliver interior finish carpentry materials only when environmental conditions meet requirements
41 specified for installation areas. If interior finish carpentry materials must be stored in other than
42 installation areas, store only where environmental conditions meet requirements specified for
43 installation areas.

44
45 PROJECT CONDITIONS

1 Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish
2 carpentry installation areas. Do not install finish carpentry until required temperature and relative
3 humidity have been stabilized and will be maintained in installation areas.

4
5 Maintain temperature and humidity in installation area as required to maintain moisture content of
6 installed finish carpentry withing a 1.0 percent tolerance of optimum moisture content, from date
7 of installation through remainder of construction period. The fabricator of woodwork shall determine
8 optimum moisture content and required temperature and humidity conditions.

9
10 Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

11
12 Indications that materials are wet or moisture damaged include discoloration, sagging, or
13 irregular shape.

14
15 Indications that materials are mold damaged include fuzzy or splotchy surface
16 contamination and discoloration.

17 18 19 PART 2 - PRODUCTS

20 21 MATERIALS, GENERAL

22
23 Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked
24 and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to
25 actual sizes and patterns as shown, unless otherwise indicated.

26
27 Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board
28 of Review.

29
30 Factory mark each piece of lumber with grade stamp of inspection agency indicating grade,
31 species, moisture content at time of surfacing, and mill.

32
33 For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp
34 and provide certificates of grade compliance issued by inspection agency.

35
36 Softwood Plywood: DOC PS 1.

37
38 Hardboard: AHA A135.4.

39
40 MDF: ANSI A208.2, Grade 130, made with binder containing no urea-formaldehyde resin.

41
42 Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea-formaldehyde resin.

43 44 STANDING AND RUNNING TRIM

45
46 Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):

1 Species and Grade: Red Oak, White Maple; Clear, A finish; NHLA.
2 Maximum Moisture Content: 10 percent.
3 Finger Jointing: Not allowed.
4 Gluing for Width: Not allowed for lumber trim narrower than 6 inches.
5 Veneered Material: Not allowed.
6 Face Surface: Surfaced (smooth).
7 Matching: Selected for compatible grain and color.

8
9 Hardwood Lumber Trim for Opaque (Paint) Finish:

10
11 Species and Grade: Yellow Poplar; NHLA.
12 Maximum Moisture Content: 10 %
13 Finger Jointing: Smooth

14
15 MISCELLANEOUS MATERIALS:

16
17 Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the type, size,
18 material and finish required for application indicated to provide secure attachment, concealed where
19 possible, and complying with applicable Federal Specifications.

20
21 Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide
22 fasteners and anchorages with a hot-dipped zinc coating (ASTM A 153).

23
24 Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for
25 general carpentry use.

26
27 Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is
28 recommended for indicated use by adhesive manufacturer.

29
30 Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.

31
32
33 PART 3 - EXECUTION

34
35 EXAMINATION

36
37 Examine substrates for compliance with requirements for installation tolerances and other
38 conditions affecting performance.

39
40 Examine finish carpentry materials before installation. Reject materials that are wet, moisture
41 damaged, and mold damaged.

42
43 Proceed with installation only after unsatisfactory conditions have been corrected.

44
45 PREPARATION

46

1 Clean substrates of projections and substances detrimental to application.

2
3 Before installing interior finish carpentry, condition materials to average prevailing humidity in
4 installation areas for a minimum of 24 hours unless longer conditioning is recommended by
5 manufacturer.

6 7 INSTALLATION, GENERAL

8
9 Do not use materials that are unsound, warped, bowed, twisted, improperly treated or finished,
10 inadequately seasoned, or too small to fabricate with proper jointing arrangements or which are of
11 defective manufacturer with respect to surfaces, sizes or patterns.

12
13 Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use
14 concealed shims where necessary for alignment. Install to tolerance of 1/8 inch in 96 inches for level
15 and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush
16 installation and 1/16-inch maximum offset for reveal installation.

17
18 Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as
19 recommended by manufacturer.

20
21 Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.

22
23 Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide
24 cutouts for mechanical and electrical items that penetrate interior finish carpentry.

25 26 STANDING AND RUNNING TRIM INSTALLATION

27
28 Install with minimum number of joints practical, using full-length pieces from maximum lengths of
29 lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger
30 joints in adjacent and related standing and running trim. Cope at returns and miter at corners to
31 produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for
32 end-to-end joints. Plane backs of casings to provide uniform thickness across joints where
33 necessary for alignment.

34
35 Install trim after gypsum board joint finishing operations are completed.

36
37 Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent
38 movement or warping. Countersink fastener heads on exposed carpentry work and fill
39 holes.

40 41 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:

42
43 Repair damaged and defective finish carpentry work wherever possible to eliminate defects
44 functionally and visually; where not possible to repair properly, replace woodwork, adjust joinery
45 for uniform appearance.

- 1 Clean finish carpentry work on exposed and semi-exposed surface. Touch-up shop applied
- 2 finishes to restore damage or soiled areas.
- 3
- 4 Refer to Division 9 sections for final finishing of installed finish carpentry work.
- 5
- 6 Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintain
- 7 conditions necessary to ensure that work will be without damage or deterioration at time of
- 8 acceptance.
- 9
- 10
- 11
- 12 END OF SECTION

1 SECTION 072630 - MEDIUM-DENSITY CLOSED-CELL SPRAY POLYURETHANE INSULATION
2 FOAM AIR BARRIER

3
4
5 PART 1 - GENERAL

6
7 RELATED DOCUMENTS:

8
9 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
10 0 and 1 Specifications Sections, apply to this Section.

11
12 SECTION INCLUDES

13
14 This Section specifies a spray polyurethane foam air barrier in exterior wall assemblies.

15
16 RELATED SECTIONS:

17
18 Division 4 Section "Unit Masonry"; requirement that backup masonry joints are flush and
19 completely filled with mortar, and that excess mortar on brick ties will be removed;
20 requirement for gap at deflection joints and fillers; coordination with sequencing of through-
21 wall flashing.

22
23 Division 6 Section "Sheathing"; requirement that backup gypsum sheathing has been
24 installed with damaged corners repaired, joints filled and surface flush with compatible
25 material as acceptable to the air barrier manufacturer; requirement for gap at deflection
26 joints and fillers.

27
28 PERFORMANCE REQUIREMENTS

29
30 Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic
31 feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf) (0.02 L/sm
32 at 75 Pa.) when tested according to ASTM E 2178.

33
34 Spray Polyurethane Foam: Material shall meet requirements of ULC S705.1, Standard for Thermal
35 Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material - Specification.
36 CCMC Evaluation Report or reports from accredited testing laboratory shall be made available upon
37 request. Materials shall meet or exceed the following performance requirements as indicated in
38 the test reports.

39
40 Design R value minimum R 6 per inch.

41
42 Density of 1.9 pounds per cubic foot.

43
44 Smoke development not greater than 450 and flame spread not greater than 25 when
45 tested in accordance with ASTM E 84.

46
47 Assembly Performance: Provide a continuous air barrier assembly that has an air leakage rate not
48 to exceed 0.040 cubic feet per square foot per minute under a pressure differential of 0.3 in. water

1 (1.57 psf) (0.20 L/sm at 75 Pa.) when tested in accordance with ASTM E 2357. Assembly shall
2 perform as a liquid drainage plane flashed to discharge condensation or water penetration to the
3 exterior. Assembly shall accommodate movements of building materials by providing expansion
4 and control joints as required, with accessory air and vapor seal materials at such locations,
5 changes in substrate and perimeter conditions.
6

7 Assembly shall be capable of withstanding positive and negative combined design wind, fan
8 and stack pressures on the envelope without damage or displacement, and shall transfer
9 the load to the structure.

10 Assembly shall not displace adjacent materials under full load.

11 Assembly shall be joined in an airtight and flexible manner to the air barrier material of
12 adjacent assemblies, allowing for the relative movement of assemblies due to thermal and
13 moisture variations and creep, and anticipated seismic movement.
14
15

16
17 Connections to Adjacent Materials: Provide connections to prevent air leakage at the following
18 locations:

19 Foundation and walls, including penetrations, ties and anchors.

20 Walls, windows, curtain walls, storefronts, louvers or doors.

21 Different wall assemblies, and fixed openings within those assemblies.

22 Wall and roof connections.

23 Floors over unconditioned space.

24 Walls, floor and roof across construction, control and expansion joints.

25 Walls, floors and roof to utility, pipe and duct penetrations.

26 Seismic and expansion joints.

27 All other leakage pathways in the building envelope.
28
29

30 SUBMITTALS

31 Submittals: Submit in accordance with Division 1 requirements.

32 Quality Assurance Program: Submit evidence of current accreditation of the subcontractor and
33 certification of the installers under the Air Barrier Association of America's (ABAA) Quality
34 Assurance Program. Submit accreditation number of subcontractor and certification number of
35 installers.
36
37

1 Product Data: Submit manufacturer's product data, manufacturer's printed instructions for
2 evaluating, preparing, and treating substrate, temperature and other limitations of installation
3 conditions, technical data, and tested physical and performance properties.

4
5 Submit letter from primary materials manufacturer indicating approval of products not
6 manufactured by primary manufacturer.

7
8 Include statement that materials are compatible with adjacent materials proposed for use.

9
10 Submit reports indicating that field peel-adhesion test on all materials to which sealants are
11 adhered have been performed and the changes made, if required, to other approved
12 materials, in order to achieve successful adhesion.

13
14 Samples: Submit clearly labeled samples, 3 by 4 inch minimum size of each material specified.

15
16 Shop Drawings of Mock-Up: Submit shop drawings of proposed mock-ups showing plans,
17 elevations, large-scale details, and connections to the test apparatus.

18
19 Shop Drawings: Submit shop drawings showing locations and extent of air barrier assemblies and
20 details of all typical conditions, intersections with other envelope assemblies and materials,
21 membrane counter-flashings, and details showing how gaps in the construction will be bridged, how
22 inside and outside corners are negotiated, how materials that cover the air barrier are secured with
23 air-tight condition maintained, and how miscellaneous penetrations such as conduits, pipes electric
24 boxes and similar items are sealed.

25
26 Include statement that materials are compatible with adjacent materials proposed for use.

27
28 Include recommended values for field adhesion test on each substrate.

29
30 Compatibility: Submit letter from manufacturer stating that materials proposed for use are
31 permanently chemically compatible and adhesively compatible with adjacent materials proposed
32 for use. Submit letter from manufacturer stating that cleaning materials used during installation are
33 chemically compatible with adjacent materials proposed for use.

34
35 QUALITY ASSURANCE

36
37 Air Barrier Subcontractor Qualifications: Subcontractor shall be currently accredited by the Air
38 Barrier Association of America (ABAA) whose installers are certified in accordance with the ABAA
39 Quality Assurance Program.

40
41 Installers shall also be certified by ABAA/BPQI (Building Performance Quality Institute) in
42 accordance with the training requirements outlined in the ULC S705.2-05 Installation
43 Standard. Installers shall have their photo-identification certification cards in their
44 possession and available on the project site, for inspection upon request.

45
46 Manufacturer: Obtain primary materials from a single manufacturer regularly engaged in
47 manufacturing air barrier membranes. Obtain secondary materials from a source acceptable to the
48 primary materials manufacturer.

1 Accredited Laboratory Testing for Materials: Laboratory accredited by International Accreditation
2 Service Inc. (IAS), American Association for Laboratory Accreditation (A2LA), or the Standards
3 Council of Canada (SCC).

4
5 VOC Regulations: Provide products which comply with applicable regulations controlling the use
6 of volatile organic compounds.

7
8 Preconstruction Meeting: Convene a minimum of two weeks prior to commencing Work of this
9 Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of
10 construction, coordination with substrate preparation, materials approved for use, compatibility of
11 materials, coordination with installation of adjacent and covering materials, and details of
12 construction. Attendance is required by representatives of related trades including covering
13 materials, substrate materials and adjacent materials.

14
15 Field Quality Assurance: Implement the ABAA Quality Assurance Program requirements.
16 Cooperate with ABAA inspectors and independent testing and inspection agencies engaged by the
17 Owner. Do not cover air barrier until it has been inspected, tested and accepted.

18 19 DELIVERY, STORAGE, AND HANDLING

20
21 Deliver materials to Project site in original packages or containers with seals unbroken, labeled with
22 manufacturer's name, product, date of manufacture, and directions for storage.

23
24 Store materials in their original undamaged packages or containers in a clean, dry, protected
25 location and within temperature range required by air barrier membrane manufacturer. Protect
26 stored materials from direct sunlight.

27
28 Handle materials in accordance with manufacturer's recommendations.

29 30 PROJECT CONDITIONS

31
32 Temperature: Install air barrier within range of ambient and substrate temperatures recommended
33 by air barrier manufacturer. Do not apply air barrier to a damp or wet substrate.

34
35 Field Conditions: Do not install air barrier in snow, rain, fog, or mist. Do not install air barrier when
36 the temperature of substrate surfaces and surrounding air temperatures are below those
37 recommended by the manufacturer.

38 39 WARRANTY

40
41 Material Warranty: Provide manufacturer's standard product warranty, for a minimum three (3)
42 years from date of Substantial Completion.

43
44 Installation Warranty: Provide air barrier subcontractor's two (2) year warranty from date of
45 Substantial Completion, including all components of the air barrier assembly, against failures
46 including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to
47 cure properly.

1 PART 2 - PRODUCTS

2
3 MATERIALS

4
5 Spray Polyurethane Foam Air Barrier: Spray-applied proprietary materials as specified. Subject to
6 compliance with requirements, provide one of the following:

- 7
8 WALLTITE US by BASF.
9 InsulBloc by NCFI
10 HEATLOK Soya by Demilec (USA) LLC.

11
12 AUXILIARY MATERIALS

13
14 Membrane at Transitions in Substrate and Connections to Adjacent Elements: One of the following
15 as acceptable to the spray polyurethane foam air barrier manufacturer:

- 16
17 CCW-705 TWF by Carlisle Coatings and Waterproofing.
18
19 Perm-A-Barrier Flashing by Grace Construction Products.
20
21 Blueskin SA by Henry.
22
23 Poly-Wall Crack Guard by Protective Coatings Technology, Inc.
24
25 ExoAir 110 by Tremco, Inc.
26
27 Air Shield by W. R. Meadows, Inc.

28
29 Transition Membrane Between Air Barrier Membrane and Roofing and Other Adjacent Materials:
30 Comply with both air barrier manufacturer's recommendations and material manufacturer's
31 recommendations.

32
33 Counterflashing for Masonry Through-Wall Flashing: One of the following and as acceptable to the
34 spray polyurethane foam air barrier manufacturer:

- 35
36 CCW-705 TWF by Carlisle Coatings and Waterproofing.
37
38 Perm-A-Barrier Flashing by Grace Construction Products.
39
40 Blueskin TWF by Henry.
41
42 Poly-Wall Crack Guard by Protective Coatings Technology, Inc.
43
44 ExoAir TWF by Tremco, Inc.
45
46 Detail Strip by W. R. Meadows, Inc.

1 PART 3 - EXECUTION

2
3 EXAMINATION

4
5 Examine substrates, areas, and conditions under which air barrier assemblies will be applied, with
6 installer present, for compliance with requirements.

7
8 Verify that surfaces and conditions are suitable prior to commencing work of this section.
9 Do not proceed with installation until unsatisfactory conditions have been corrected.

10
11 Do not proceed with installation until after minimum concrete curing period recommended
12 by air barrier manufacturer.

13
14 Ensure that the following conditions are met:

15
16 Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other
17 contaminants.

18
19 Concrete surfaces are cured and dry, smooth without large voids, spalled areas or
20 sharp protrusions.

21
22 Masonry joints are flush, and all excess mortar sitting on masonry ties has been
23 removed.

24
25 Verify substrate is visibly dry and free of moisture. Test for capillary moisture by
26 plastic sheet method according to ASTM D 4263 and take suitable measures until
27 substrate passes moisture test.

28
29 Verify sealants used in sheathing are compatible with membrane proposed for use.
30 Perform field peel-adhesion test on materials to which sealants are adhered.

31
32 Notify Architect in writing of anticipated problems using air barrier over substrate
33 prior to proceeding.

34
35 SURFACE PREPARATION

36
37 Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean,
38 dust-free, and dry substrate for air barrier application.

39
40 Ensure that penetrating work by other trades is in place and complete.

41
42 Prepare surfaces by brushing, scrubbing, scraping, or grinding to remove loose mortar,
43 dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of
44 the spray polyurethane foam.

45
46 Wipe down metal surfaces to remove release agents or other non-compatible coatings,
47 using clean sponges or rags soaked in a solvent compatible with the spray polyurethane
48 foam.

1 Ensure veneer anchors are in place.

2
3 Prime substrate for application of sheet membrane transition strips as recommended by
4 manufacturer and as follows:

5
6 Prime masonry, concrete substrates with conditioning primers.

7
8 Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve
9 required bond, with adequate drying time between coats.

10
11 Prime wood, metal, and painted substrates with primer.

12
13 Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations
14 through air barrier and at protrusions.

15
16 Protection from Spray Applied Materials:

17
18 Mask and cover adjacent areas to protect from over spray.

19
20 Ensure any required foam stop or back up material are in place to prevent over spray and
21 achieve complete seal.

22
23 Seal off existing ventilation equipment. Install temporary ducting and fans to ensure
24 exhaust fumes. Provide for make-up air.

25
26 Erect barriers, isolate area and post warning signs to advise non-protected personnel to
27 avoid the spray area.

28
29 INSTALLATION

30
31 Transition Strip Installation: Install transition strip materials to provide continuity throughout the
32 building envelope. Install materials in accordance with manufacturer's recommendations and the
33 following:

34
35 Apply primer for transition strips at rate recommended by manufacturer. Allow primer to dry
36 completely before transition strip application. Apply as many coats as necessary for proper
37 adhesion.

38
39 Position subsequent sheets of transition strips applied above so that membrane overlaps
40 the membrane sheet below by a minimum of 2 inches, unless greater overlap is
41 recommended by manufacturer. Roll into place with roller.

42
43 Overlap horizontally adjacent pieces of transition strips a minimum of 2 inches, unless
44 greater overlap is recommended by manufacturer. Roll seams with roller.

45
46 Seal around all penetrations with a transition strip or other procedure in accordance with
47 manufacturer's recommendations.

1 Connect air barrier in exterior wall assembly continuously to the air barrier of the roof, to
2 concrete below-grade structures, to windows, curtain wall, storefront, louvers, exterior
3 doors, penetrations, and other intersection conditions using transition membranes and in
4 accordance with the manufacturer's recommendations.

5
6 At changes in substrate plane, provide transition material recommended by manufacturer
7 to make a smooth transition from one plane to another.

8
9 Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane
10 and to make a smooth transition from one plane to the other. Membrane shall be
11 continuously supported by substrate.

12
13 At through-wall flashings, provide an additional 6 inch wide strip of manufacturer's
14 recommended membrane counterflashing to seal top of through-wall flashing to membrane.
15 Seal exposed top edge of strip with bead of mastic as recommended by manufacturer.

16
17 At deflection and control joints, provide backup for the membrane to accommodate
18 anticipated movement.

19
20 At expansion and seismic joints provide transition to the joint assemblies.

21
22 Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams,
23 rough cuts, and as recommended by the manufacturer when membrane will be exposed to
24 the elements.

25
26 At end of each working day, seal top edge of self-adhered membrane to substrate with
27 termination mastic if exposed.

28
29 Do not allow materials to come in contact with chemically incompatible materials.

30
31 Do not expose transition membrane to sunlight longer than as recommended by the
32 manufacturer.

33
34 Inspect installation prior to enclosing assembly and repair damaged areas with spray
35 polyurethane foam as recommended by manufacturer.

36
37 Spray Application of Polyurethane: Install materials in accordance with manufacturer's
38 recommendations, ULC S705.2 and the following:

39
40 Equipment used to spray polyurethane foam shall comply with ULC S705.2 and the
41 manufacturer's recommendations for the specific type of application. Record equipment
42 settings on the Daily Work Record as required by the ULC S705.2 installation standard.
43 Each proportioner unit shall supply only one spray gun.

44
45 Apply only when surfaces and environmental conditions are within limits prescribed by the
46 material manufacturer and the ULC S705.2 Installation standard.

1 Apply in consecutive passes as recommended by manufacturer to thickness as indicated
2 on drawings. Passes shall be not less than ½ inch and not greater than 2 inches. An
3 additional pass of 2 inches shall only be done after the first pass has had time to cool down.
4 At no time shall more than 4 inches be installed in a single day.

5
6 Install within manufacturer's tolerances, but not more than minus ¼ inch or plus ½ inch.

7
8 Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light
9 fixtures and chimneys.

10
11 Finished surface of foam insulation to be free of voids and embedded foreign objects.

12
13 Remove masking materials and over spray from adjacent areas immediately after foam
14 surface has hardened. Ensure cleaning methods do not damage work performed by other
15 sections.

16
17 Trim, as required, any excess thickness that would interfere with the application of
18 cladding/covering system by other trades.

19
20 Clean and restore surfaces soiled or damaged by work of the section. Consult with section
21 of work soiled before cleaning to ensure methods used will not damage the work.

22
23 Complete connections to other components and repair any gaps, holes or other damage
24 using material which conforms to ULC S710.1 or ULC S711.1 and installed in accordance
25 with ULC S710.2 or ULC S711.2 as applicable.

26 27 FIELD QUALITY CONTROL

28
29 Owner's Inspection and Testing: Cooperate with Owner's testing agency. Allow access to work
30 areas and staging. Notify Owner's testing agency in writing of schedule for Work of this Section
31 to allow sufficient time for testing and inspection. Daily inspection and testing may be required.
32 Do not cover Work of this Section until testing and inspection is accepted.

33
34 ABAA Site Inspections: Arrange and pay for site inspections by ABAA to verify conformance with
35 the manufacturer's instructions, the ULC S705.2 Installation standard, the ABAA Quality Assurance
36 Program, and this section of the project specification.

37
38 Inspections and testing shall be carried out at 5, 50 and 95 percent of completion. Forward
39 written inspection reports to the Architect within 10 working days of the inspection and test
40 being performed.

41
42 If the inspections reveal any defects, promptly remove and replace defective work at no
43 additional expense to the Owner.

44 45 PROTECTING AND CLEANING

46
47 Protect air barrier assemblies from damage during application and remainder of construction period,
48 according to manufacturer's written instructions.

1
2 Coordinate with installation of materials which cover air barrier, to ensure exposure period
3 does not exceed that recommended by the air barrier manufacturer.
4
5 Clean spillage and soiling from adjacent construction using cleaning agents and procedures
6 recommended by manufacturer of affected construction and acceptable to the primary material
7 manufacturer.
8
9
10
11 END OF SECTION

1 SECTION 072750 - AIR AND MOISTURE BARRIERS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 MOCK-UPS:

12
13 Apply fluid applied air barrier system to field-constructed mock-ups of unit masonry assemblies
14 illustrating materials interface and seals. Use the manufacturer's application instructions. Keep
15 mock-ups available for inspection throughout the project.

16
17 SUBMITTALS

18
19 Submittals: Submit in accordance with Division 1 requirements.

20
21 Quality Assurance Program: Submit evidence of current accreditation of the subcontractor and
22 certification of the installers under the Air Barrier Association of America's (ABAA) Quality
23 Assurance Program. Submit accreditation number of subcontractor and certification number of
24 installers.

25
26 Product Data: Submit manufacturer's product data, manufacturer's printed instructions for
27 evaluating, preparing, and treating substrate, temperature and other limitations of installation
28 conditions, technical data, and tested physical and performance properties.

29
30 Submit letter from primary materials manufacturer indicating approval of products not
31 manufactured by primary manufacturer.

32
33 Include statement that materials are compatible with adjacent materials proposed for use.

34
35 Submit reports indicating that field peel-adhesion test on all materials to which sealants are
36 adhered have been performed and the changes made, if required, to other approved
37 materials, in order to achieve successful adhesion.

38
39 Samples: Submit clearly labeled samples, 3 by 4 inch minimum size of each material specified.

40
41 Shop Drawings of Mock-Up: Submit shop drawings of proposed mock-ups showing plans,
42 elevations, large-scale details, and connections to the test apparatus.

43
44 Field Test Results of Mock-Up: Submit test results of air leakage test and water leakage test of
45 mock-up in accordance with specified standards, including retesting if initial results are not
46 satisfactory.

47
48 Shop Drawings: Submit shop drawings showing locations and extent of air barrier assemblies and
49 details of all typical conditions, intersections with other envelope assemblies and materials,

1 membrane counter-flashings, and details showing how gaps in the construction will be bridged, how
2 inside and outside corners are negotiated, how materials that cover the air barrier are secured with
3 air-tight condition maintained, and how miscellaneous penetrations such as conduits, pipes electric
4 boxes and similar items are sealed.

5
6 Include statement that materials are compatible with adjacent materials proposed for use.

7
8 Include recommended values for field adhesion test on each substrate.

9
10 Compatibility: Submit letter from manufacturer stating that materials proposed for use are
11 permanently chemically compatible and adhesively compatible with adjacent materials proposed
12 for use. Submit letter from manufacturer stating that cleaning materials used during installation are
13 chemically compatible with adjacent materials proposed for use.

14 15 16 PART 2 - PRODUCTS

17 18 MANUFACTURER:

19
20 PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. Phone: (800) 255-4255; Fax: (785)
21 830-9797. E-mail: CustomerCare@prosoco.com. Products by other manufacturers may be
22 considered.

23 24 PRODUCT DESCRIPTION

25
26 PROSOCO R-GUARD™ is a fluid applied air and moisture barrier for use in preventing air and
27 water leakage through cavity wall, masonry veneer construction. The system consists of adhesive
28 R-GUARD™ Tape, and liquid R-Guard™ Fill and R-GUARD™ Spray Wrap.

29 30 AIR AND MOISTURE BARRIER

31
32 PROSOCO R-GUARD™ Fill: a ready mixed, acrylic air barrier compound for use with PROSOCO
33 R-GUARD™ Tape over cracks, sheathing joints or rough openings through the structural wall.

34 35 TECHNICAL DATA:

36
37 Form: Dark red, viscous liquid, mild odor

38
39 Specific Gravity: >1.0

40
41 Total Solids: 83% ASTM D 2369

42
43 pH: 7.5 – 10.0 WT./GAL.: 11.9 lbs. FLASH POINT: >200 degrees F

44
45 Freeze Point: 32 DEGREES f (0 degrees C)

46
47 VOC: Complies with all known national, state and district AIM VOC regulations.
48

1 PROSOCO R-GUARD™ Spray Wrap: a ready mixed, flexible, acrylic coating to be applied to
2 structural sheathing or CMU backup to prevent penetration of liquid water.

3
4 TECHNICAL DATA

5
6 Form: light red, viscous liquid, mild odor

7
8 Specific Gravity: >1.0

9
10 Total Solids: 74% ASTM D 2369

11
12 pH: 7.5 – 10.0

13
14 WT./GAL.: 12.7 lbs.

15
16 Flash Point: >200 degrees F

17
18 Freeze Point: 32 degrees F (0 degrees C)

19
20 VOC: Complies with all known national, state and district AIM VOC regulations.

21
22 R-GUARD™ Tape: self-adhering, glass fiber, fabric tape for use with PROSOCO R-GUARD™ Fill
23 to reinforce rough openings, inside and outside corners and sheathing joints.

24
25 Size: 4.25-inch and 9.5-inch wide self-adhesive, flexible, symmetrical, interlaced glass fiber
26 fabric, with alkaline resistant coating.

27
28 LIMITATIONS

29
30 Do not apply when surface or air temperatures are below 40°F (4°C) or above 100°F
31 (38°C).

32
33 Not for application below-grade or to surfaces designed to be immersed in water.

34
35
36 PART 3 - EXECUTION

37
38 INSTALLATION

39
40 Before applying, read “Preparation” and “Safety Information” sections in the Manufacturer’s Product
41 Data Sheet for PROSOCO R-GUARD™. Refer to the Product Data Sheet for additional information
42 about application.

43
44 Use R-GUARD™ Fill and R-GUARD™ Spray Wrap in concentrate. Do not dilute or alter.
45 Thoroughly mix liquids before applying.

46
47 Apply 4.25” R-GUARD™ Tape over sheathing joints and seams. Fold and apply 9.5” R-
48 GUARD™ Tape to rough openings, inside and outside corners. Use a seam roller or other
49 blunt tool to firmly adhere mesh tape to sheathing.

1 Uniformly cover tape and about 4 inches of sheathing on either side of the tape with R-
2 GUARD™ Fill using a trowel or texture sprayer. Trowel smooth. Spot fasteners and surface
3 defects with R-GUARD™ Fill. Let dry.

4
5 Spray or roller apply R-GUARD™ Spray Wrap to the entire surface – including areas
6 covered by R-GUARD™ Tape and R-GUARD™ Fill – to a uniform wet mil thickness of 10
7 mils. Let dry.

8
9 CONCRETE MASONRY WALL CONSTRUCTION

10
11 Spray or roller apply PROSOCO R-GUARD™ Spray Wrap to the entire surface to a uniform wet
12 mil thickness of 10 mils. When spray applying, backroll to close pinholes and ensure even
13 coverage. Take special care to achieve full coverage around wall ties or surface irregularities. Let
14 dry.

15
16 Spray or roller apply a second coat of PROSOCO R-GUARD™ Spray Wrap to the entire surface
17 to a uniform wet mil thickness of 10 mils. When spray applying, backroll to close pinholes and
18 ensure even coverage. Let dry.

19
20 CLEAN UP

21
22 Clean tools and equipment water immediately after use. Dried material must be removed
23 mechanically.

24
25
26
27 END OF SECTION

1 SECTION 074213 - METAL WALL PANELS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and
9 Divisions 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes the following:

14
15 Exposed-fastener, lap-seam metal wall panels.

16
17 Related Sections include the following:

18
19 Division 05 Section "Cold-Formed Metal Framing" for support framing, including girts,
20 studs, and bracing.

21
22 Division 07 Section "Sheet Metal Flashing and Trim" for copings, flashings.

23
24 Division 07 Section "Joint Sealants" for field-applied sealants.

25
26 Division 07 Section "Weather Barriers" for infiltration barrier.

27
28 SUBMITTALS

29
30 Product Data: For each type of product indicated. Include construction details, material
31 descriptions, dimensions of individual components and profiles, and finishes for each type of
32 wall panel and accessory.

33
34 Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge
35 conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings,
36 closures, and accessories; and special details. Distinguish between factory and field-
37 assembled work. Include details of trim and anchorage systems. .

38
39 Samples for Initial Selection: For each type of metal wall panel indicated with factory-applied
40 color finishes.

41
42 Submit samples of metal wall material.

43
44 Submit samples of all trim pieces and accessories.

45
46 Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and
47 wall-mounted items. Show the following:

48 Wall panels and attachments.

1 Panel joint locations.
2 Wall-mounted items including windows, louvers, and lighting fixtures.
3 Penetrations of wall by pipes and utilities.
4

5 QUALITY ASSURANCE

6
7 Source Limitations: Obtain each type of metal wall panel from single source from single
8 manufacturer.

9
10 Installer Qualifications: Installer shall be experienced in performing work of this section and be
11 specialized in the installation of similar work required on this project.
12

13 Mockups: Build mockups to verify selections made under sample submittals and to
14 demonstrate aesthetic effects and set quality standards for fabrication and installation.
15

16 Build mockup of typical wall panel, corner panel and soffit panels as shown on Drawing.
17

18 Approval of mockups does not constitute approval of deviations from the Contract Documents
19 contained in mockups unless owner's representative specifically approves such deviations in
20 writing.

21 Preinstallation Conference: Conduct conference at project site.
22

23 Meet with owner's representative, metal wall panel installer, metal wall panel
24 manufacturer's representative, structural support installer, and installers whose work
25 interfaces with or affects metal wall panels, including installers of doors, windows, and
26 louvers.
27

28 Review and finalize construction schedule and verify availability of materials, Installer's
29 personnel, equipment, and facilities needed to make progress and avoid delays.
30

31 Review methods and procedures related to metal wall panel installation, including
32 manufacturer's written instructions.
33

34 Examine support conditions for compliance with requirements, including alignment
35 between and attachment to structural members.
36

37 Review flashings, special siding details, wall penetrations, openings, and condition of
38 other construction that will affect metal wall panels.
39

40 DELIVERY, STORAGE, AND HANDLING

41
42 Deliver components, sheets, metal wall panels, and other manufactured items so as not to be
43 damaged or deformed. Package metal wall panels for protection during transportation and
44 handling.
45

46 Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting,
47 and surface damage.
48

1 Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight
2 and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for
3 drainage of water. Do not store metal wall panels in contact with other materials that might
4 cause staining, denting, or other surface damage.

5
6 Protect strippable protective covering on metal wall panels from exposure to sunlight and high
7 humidity, except to extent necessary for period of metal wall panel installation.

8 9 PROJECT CONDITIONS

10
11 Weather Limitations: Proceed with installation only when existing and forecasted weather
12 conditions permit assembly of metal wall panels to be performed according to manufacturers'
13 written instructions and warranty requirements.

14
15 Field Measurements: Verify locations of structural members and wall opening dimensions by
16 field measurements before metal wall panel fabrication and indicate measurements on Shop
17 Drawings.

18 19 COORDINATION

20
21 Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction
22 of soffits, and other adjoining work to provide a leakproof, secure, and non-corrosive installation.

23 24 WARRANTY

25
26 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or
27 replace components of metal wall panel assemblies that fail in materials or workmanship within
28 specified warranty period.

29
30 Failures include, but are not limited to, the following:

31
32 Structural failures, including rupturing, cracking, or puncturing.

33
34 Deterioration of metals, metal finishes, and other materials beyond normal
35 weathering.

36
37 Warranty Period: Two years from date of Substantial Completion.

38
39 Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer
40 agrees to repair finish or replace metal wall panels that show evidence of deterioration of
41 factory-applied finishes within specified warranty period.

42
43 Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

44
45 Color fading more than 5 Hunter units when tested according to ASTM D 2244.

46
47 Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

1 Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2
3 Finish Warranty Period: 20 years from date of Substantial Completion.

4
5 Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer
6 agrees to repair or replace metal wall panel assemblies that fail to remain weathertight,
7 including leaks, within specified warranty period.

8
9 Weathertight Warranty Period: Five years from date of Substantial Completion.

10
11
12 PART 2 – PRODUCTS

13
14 METAL SOFFIT

15
16 General: Provide factory-formed metal wall panels designed to be field assembled by lapping
17 and interconnecting edges of adjacent panels and mechanically attaching through panel to
18 supports using concealed fasteners in laps. 22 Gauge, profile to match Centria IW-10.

19
20 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

21 General: Provide factory-formed metal wall panels designed to be field assembled by lapping
22 and interconnecting edges of adjacent panels and mechanically attaching through panel to
23 supports using exposed fasteners in laps. Include accessories required for weathertight
24 installation.

25
26 PANEL MATERIALS

27
28 Material: 18 gauge G90 galvanized steel to 12' above grade, 20 gauge G90 galvanized at 12'
29 and higher, 0.032 inch thick. Coil-coated sheet, ASTM B 209 with temper as required to suit
30 forming operations and structural performance required.

31
32 Panel Coverage: 30" minimum

33
34 Panel Height: $\frac{3}{4}$ " - $\frac{7}{8}$ "

35
36 Panel Ribs: 2 $\frac{2}{3}$ "

37
38 Surface: Corrugated

39
40 Exposed Finishes: Apply the following coating.

41
42 2-Coat Fluoropolymer: AAMA 605.2. Fluoropolymer finish containing not less than 70
43 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to
44 exposed metal surfaces to comply with coating and resin manufacturers' written
45 instructions. Primer coat to be 0.8 mils color coat to be 0.8 mils, total thickness 1.6 mils.

1 Concealed Finish: Apply pretreatment and manufacturer's standard white or light-
2 colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a
3 minimum total dry film thickness of 1.0 mils.
4

5 Color: As selected by owner's representative from manufacturer's full range.
6

7 Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type
8 of use and finish indicated.
9

10 Panel Sealants:

11
12 Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant;
13 of type, grade, class, and use classifications required to seal joints in metal wall panels
14 and remain weathertight; and as recommended in writing by metal wall panel
15 manufacturer.
16

17 Attachment System Components: Galvanized furring system compatible with panel product.
18

19 Flashing and Trim: Same material, finish, and color as facings of adjacent composite panels,
20 unless otherwise indicated.
21

22 MANUFACTURERS

23
24 Manufacturers: Subject to compliance with requirements, provide one of the following.
25

26 Centria; Econolap $\frac{3}{4}$ ", exposed fasteners with preformed mitered corners, BOD
27 FloLine $\frac{7}{8}$ " Corrugated Panel
28 Fabral $\frac{7}{8}$ " Corrugated Panel
29 Morin $\frac{7}{8}$ " Corrugated Panel
30

31 FABRICATION

32
33 General: Fabricate and finish metal wall panels and accessories at the factory to greatest
34 extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill
35 indicated performance requirements demonstrated by laboratory testing. Comply with indicated
36 profiles and with dimensional and structural requirements.
37

38 FINISHES, GENERAL

39
40 Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for
41 recommendations for applying and designating finishes.
42

43 Protect mechanical and painted finishes on exposed surfaces from damage by applying a
44 strippable, temporary protective covering before shipping.
45

46 Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are
47 acceptable if they are within one-half of the range of approved Samples. Noticeable variations
48 in the same piece are not acceptable. Variations in appearance of other components are

1 acceptable if they are within the range of approved Samples and are assembled or installed to
2 minimize contrast.

3
4
5 PART 3 - EXECUTION

6
7 EXAMINATION

8
9 Examine substrates, areas, and conditions, with Installer present, for compliance with
10 requirements for installation tolerances, metal wall panel supports, and other conditions
11 affecting performance of work.

12
13 Examine wall framing to verify that girts, angles, channels, studs, and other structural
14 panel support members and anchorage have been installed within alignment tolerances
15 required by metal wall panel manufacturer.

16
17 Examine wall sheathing to verify that sheathing joints are supported by framing or
18 blocking and that installation is within flatness tolerances required by metal wall panel
19 manufacturer.

20 Verify that weather-resistant sheathing paper has been installed over sheathing or backing
21 substrate to prevent air infiltration or water penetration.

22
23 Examine roughing-in for components and systems penetrating metal wall panels to verify actual
24 locations of penetrations relative to seam locations of metal wall panels before metal wall panel
25 installation.

26
27 Proceed with installation only after unsatisfactory conditions have been corrected.

28
29 PREPARATION

30
31 Clean substrates of substances harmful or detrimental to installation, including removing
32 projections capable of interfering with panel installation.

33
34 Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall
35 panel support members and anchorages according to ASTM C 754 and metal wall panel
36 manufacturer's written recommendations.

37
38 Substrate Board: Install substrate board over entire wall surface. Attach with substrate-board
39 fasteners.

40
41 Install substrate board with long joints in continuous straight lines, perpendicular to
42 direction of metal wall panel seams with end joints staggered between rows. Tightly butt
43 substrate boards together.

44
45 METAL WALL PANEL INSTALLATION, GENERAL

46
47 General: Install metal wall panels according to manufacturer's written instructions in orientation,
48 sizes, and locations indicated on drawings. Install panels perpendicular to girts and subgirts

1 unless otherwise indicated. Anchor metal wall panels and other components of the work
2 securely in place, with provisions for thermal and structural movement.

3
4 Shim or otherwise plumb substrates receiving metal wall panels.

5
6 Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping
7 screws.

8
9 Do not begin installation until weather barrier and flashings that will be concealed by
10 metal wall panels are installed.

11
12 Install screw fasteners in pre-drilled holes.

13
14 Locate and space fastenings in uniform vertical and horizontal alignment.

15
16 Install flashing and trim as metal wall panel work proceeds.

17
18 Locate panel splices over, but not attached to, structural supports. Stagger panel
19 splices and end laps to avoid a four-panel lap splice condition.

20
21 Apply elastomeric sealant continuously between metal base channel as necessary for
22 waterproofing.

23
24 Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping
25 screws. Fasten flashings and trim around openings and similar elements with self-
26 tapping screws.

27
28 Provide weathertight escutcheons for pipe and conduit penetrating exterior walls

29
30 Fasteners: Aluminum Wall Panels; Use galvanized or stainless-steel fasteners at all locations.

31
32 Metal Protection: Where dissimilar metals will contact each other or corrosive substrates,
33 protect against galvanic action as recommended by metal wall panel manufacturer.

34
35 Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant.
36 Install sealant backing and sealant according to requirements specified in Division 07 Section
37 "Joint Sealants."

38
39 Joint Sealers: Install gaskets, joint fillers, and sealants where required for weathertight
40 performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants
41 indicated or, if not indicated, types recommended by metal wall panel manufacturer.

42
43 Seal metal wall panel end laps with double beads of tape or sealant, full width of panel.
44 Seal side joints where recommended by metal wall panel manufacturer.
45 Prepare joints and apply sealants to comply with requirements in Division 07 Section
46 "Joint Sealants."

47
48 CLEANING AND PROTECTION

- 1
- 2 Remove temporary protective coverings and strippable films, if any, as metal wall panels are
- 3 installed, unless otherwise indicated in manufacturer's written installation instructions. On
- 4 completion of metal wall panel installation, clean finished surfaces as recommended by metal
- 5 wall panel manufacturer. Maintain in a clean condition during construction.
- 6
- 7 After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt,
- 8 and sealant.
- 9
- 10 Replace metal wall panels that have been damaged or have deteriorated beyond successful
- 11 repair by finish touchup or similar minor repair procedures.
- 12
- 13
- 14
- 15 END OF SECTION

1 SECTION 075200 - MODIFIED BITUMINOUS MEMBRANE ROOFING

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SCOPE OF WORK:

12
13 Extent of hot melt modified bitumen roofing system (HM MB) is indicated on drawings and is hereby
14 defined to include non-traffic bearing roof membrane system intended for weather exposure as
15 primary roofing over properly prepared substrate.

16
17 Work includes installation of the following:

18
19 Hot built-up roof system, with nailed base sheet (one ply) at steel roof deck and roof
20 membrane ply sheets (base ply + three-ply), adhered with hot melt modified bitumen
21 adhesive.

22
23 Tapered roof insulation system.

24
25 Aggregate surface.

26
27 Specified flashings and accessories.

28
29 Roof curb supports for mechanical equipment are Alternates shown on HVAC Drawings.

30
31 Steel roof deck is specified in Division 5 Section "Steel Decking."

32
33 REGULATORY REQUIREMENTS:

34
35 It is the intent of this specification to provide a roofing system that meets the approval of the (OBC)
36 Ohio Building Code. The insulation, recovery board, and other components shall be required by
37 the membrane manufacturer to provide UL-790, Class A fire resistance, and FM 4470, Class I, I-90
38 windstorm resistance.

39
40 SUBMITTALS:

41
42 Submit certification that the roof system furnished is approved by Factory Mutual, Underwriters
43 Laboratories, or Warnock Hersey for external fire E-108 Class 1A and that the roof system is
44 adhered properly to meet or exceed 1-90.

45
46 Product Data for each type of product specified including manufacturer's technical product data,
47 installation instructions and recommendations for each type of roofing product required. Include
48 data substantiating that materials comply with specified requirements.

1 For all modified bituminous sheeting roofing, include independent test data according to ASTM
2 designation D-5147-91 "Standard Test Methods for Sampling and Testing Modified Bituminous
3 Sheet Material", substantiating that materials comply with specified requirements.

4
5 Show evidence that the Installer specializes in modified bituminous roof application with a minimum
6 10 years experience and who is certified by the roofing system manufacturer as qualified to install
7 manufacturer's roofing materials.

8
9 Shop Drawings of plans, sections, details, and attachments to other work, for the following:

10
11 Detail connection to the existing roof.

12
13 Base flashings, cants , and membrane terminations.

14
15 Tapered insulation, including slopes, maximum height and average 'R'.

16
17 Crickets, saddles, and tapered edge strips, including slopes.

18
19 Outline of roof and roof size.

20
21 Location and type of all penetrations.

22
23 Details for all conditions of roof membrane, sheet metal work, roof drains, perimeter and
24 penetration details, and other roofing work installation.

25
26 Roof insulation makeup and layout that have been accepted by an authorized
27 manufacturer's representative.

28
29 QUALITY ASSURANCE:

30
31 Manufacturer Qualifications: Roofing system manufacturer shall have a minimum of ten (10) years
32 experience in manufacturing bitumen roofing products in the United States and be ISO 9001
33 certified. Roofing system manufacturer shall be an Associate Member in good standing with
34 National Roofing Contractor's Association (NRCA) for at least ten (10) years.

35
36 Roofing system manufacturer must employ full-time Field Technical Services
37 Representative for monitoring project work on a periodic basis, and for final roof inspection.

38
39 Installer Qualifications: Installer (Roofer) shall be specializing in modified bituminous roof
40 application with minimum ten (10) years experience and who is certified by the roofing system
41 manufacturer as qualified to install manufacturer's roofing materials. Installer must acquire full-time
42 inspection days utilizing manufacturer's technical inspectors. The minimum number of Technical
43 Service full time inspection days is seven (7) days.

44
45 Installer's Field Supervision: Require Installer to maintain a full-time Supervisor/Foreman on job
46 site during all phases of bituminous sheet roofing work and at any time roofing work is in progress,
47 proper supervision of workmen shall be maintained. A copy of the specification shall be in the
48 possession of the Supervisor/Foreman and on the roof at all times. It is the Supervisor/Foreman's

1 responsibility to monitor the application to assure that all specifications and requirements are being
2 met.

3
4 It shall be the Contractor's responsibility to respond immediately to correction of roof leakage
5 during construction. If the Contractor does not respond within 24 hours, the Owner has the right
6 to hire a qualified contractor and backcharge the original contractor.

7
8 Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response
9 characteristics indicated as determined by testing identical products per test method indicated, by
10 UL, FM, Warnock Hersey, or another testing and inspecting agency acceptable to authorities
11 having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting
12 agency.

13
14 Exterior Fire-Test Exposure: Class A; complying with ASTM E108, for application and
15 slopes indicated.

16
17 Pre-Installation Conference: Approximately two (2) weeks before scheduled commencement of
18 modified bitumen roof system installation and associated work, meet at project site with installer
19 of each component of associated work, installers of deck or substrate construction to receive
20 roofing work, installers of rooftop units and other work that must precede or follow roofing work
21 (including mechanical work if any), Architect/Owner, roofing system manufacturer's representative,
22 and other representatives directly concerned with performance of the Work, including (where
23 applicable) Owner's insurers, test agencies and governing authorities.

24
25 Objectives to include:

26
27 Review foreseeable methods and procedures related to roofing installation, including
28 manufacturer's written instructions.

29
30 Tour representative areas of roofing substrates (decks), inspect and discuss condition of
31 substrate, roof drains, curbs, penetrations and other preparatory work performed by other
32 trades.

33
34 Review structural loading limitations of deck and inspect deck for loss of flatness and for
35 required attachment.

36
37 Review roofing system requirements (drawings, specifications and other contract
38 documents).

39
40 Review required submittals both completed and yet to be completed.

41
42 Review and finalize construction schedule related to roofing work and verify availability of
43 materials.

44
45 Installer's personnel, equipment and facilities needed to make progress and avoid delays.

46
47 Review weather and forecasted weather conditions and procedures for coping with
48 unfavorable conditions, including possibility of temporary roofing (if not mandatory
49 requirement).

1 Review roof observation and repair procedures after roofing installation.

2
3 Record (contractor) discussion of conference including decisions and agreements (or
4 disagreements) reached and furnish copy of record to each party attending. If substantial
5 disagreements will be resolved and set date for reconvening conference.
6

7 Review notification procedures for weather or non-working days.
8

9 DELIVERY, STORAGE AND HANDLING

10
11 Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and
12 undamaged.
13

14 Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to ensure no
15 possibility of significant moisture exposure. Store rolls of felt and other sheet materials on pallets
16 or other raised surface. Stand all roll materials on end. Cover roll goods with a canvas tarpaulin
17 or other breathable material (not polyethylene).
18

19 Do not leave unused materials on the roof overnight or when roofing work is not in progress unless
20 protected from weather and other moisture sources.
21

22 It is the responsibility of the contractor to secure all material and equipment on the job site. If any
23 material or equipment is stored on the roof, the contractor must make sure that the integrity of the
24 deck is not compromised at any time. Damage to the deck caused by the contractor will be the
25 sole responsibility of the contractor and will be repaired or replaced at his expense.
26

27 MANUFACTURER'S INSPECTIONS

28
29 When the project is in progress, the Roofing System Manufacturer will provide the following:
30

31 Keep the Architect informed as to the progress and quality of the work as observed.
32

33 Provide job site inspections a minimum of three days a week.
34

35 Report to the Architect in writing any failure or refusal of the Contractor to correct
36 unacceptable practices called to the Contractor's attention.
37

38 Confirm after completion of the project and based on manufacturer's observation and tests
39 that manufacturer has observed no applications procedures in conflict with the
40 specifications other than those that may have been previously reported and corrected.
41

42 PROJECT CONDITIONS

43
44 Field measurements and materials quantities: Contractor shall have sole responsibility for accuracy
45 of all measurements, estimates of material quantities and sizes and site conditions that will affect
46 work.
47

48 Existing Conditions:
49

1 Access to roof from exterior only.

2

3 There are no current HVAC units in the project area. Appropriate measures shall be taken to
4 prevent dust, vapors, gases or odors from entering the building during roof scope of work.

5

6 Fume Recovery: Roofing work is expected to be performed and completed during the summer
7 months when the building is unoccupied. In the event roofing work is not completed by the start
8 of the school year, student/teacher occupancy of the building will require the Roofing Contractor
9 to utilize a fume recovery system to capture odors produced by roofing materials.

10

11 Weather Limitations: Do not apply roofing membrane during inclement weather or when a 40%
12 chance of precipitation is expected.

13

14 Do not apply roofing insulation or membrane to damp deck surface.

15

16 Do not expose materials vulnerable to water or sun damage in quantities greater than can be
17 weatherproofed during same day.

18

19 Proceed with roofing work only when existing and forecasted weather conditions will permit work
20 to be installed in accordance with manufacturer's recommendations and warranty requirements.

21

22 The total membrane/insulation assembly must be completed in one operation.

23

24 Phase construction is not acceptable.

25

26 The application of the top pour and aggregate surfacing should be completed the same time as the
27 membrane is installed. If it is not practical to install the top surfacing during the same day as the
28 membrane, it may be delayed until a later time. Such a delay is not to exceed 14 days. Before
29 installing the final top pour and aggregate, the surface of the membrane must be dry and free of
30 all dirt and debris.

31

32 It is recommended that the application of roll materials take place at temperature at or above 40
33 degrees F. When this is not practical, special procedures must be instituted to assure that the
34 recommended application temperatures and material qualities are closely followed without
35 exceeding maximum heating temperatures. When the air temperature, including windchill, is too
36 low to assure immediate bitumen penetration and felt adhesion, (below 25 degrees F), the project
37 will be shut down until conditions improve.

38

39 SEQUENCING AND SCHEDULING

40

41 Sequence installation of modified bituminous sheet roofing with related units of work specified in
42 other sections to ensure that roof assemblies including roof accessories, flashing, trim and joint
43 sealers are protected against damage from effects of weather, corrosion and adjacent construction
44 activity.

45

46 All work must be fully completed on each day. Phased construction will not be accepted.

47

48 WARRANTY/GUARANTEE

49

1 Manufacturer's Warranty and Service Agreement: Upon project completion, acceptance by the
2 Owner and Architect, acceptance by the Manufacturer, and once complete payment has been
3 received by both Contractor and Manufacturer, the Manufacturer shall deliver to Owner a twenty
4 (20) year (no dollar limit) Manufacturer Roofing System Warranty plus a ten (10) year Maintenance
5 Service Agreement (Equivalent of a Quality Assurance Plus Warranty and Service Agreement).
6 Manufacturer's Warranty shall cover defects in materials and/or workmanship occurring within the
7 time limit of the warranty. The membrane manufacturer shall replace all defective materials and
8 shall repair all leaks due to defective materials and/or workmanship and shall replace all damaged
9 insulation and other materials covered by the warranty due to leaks in the roof system. Warranty
10 exclusions for ponded roof areas are not acceptable. Manufacturer will, during the second, fifth,
11 tenth and fifteenth year of this warranty service agreement, provide the following for the
12 Manufacturer's Roof System:

13
14 Inspection by a Manufacturer Technical Service Representative and delivery of a written
15 inspection report documenting roof conditions.

16
17 Preventive maintenance and necessary repairs, including splits, tears, or breaks in the roof
18 membrane system and flashing that could inhibit sound roof performance and are not
19 exempt due to neglect, negligence, vandalism, or some other exclusive.

20
21 General housekeeping and cleanup, subject to limits, but generally including removal of
22 debris from the roof membrane, roof drains, gutters and scuppers.

23
24 Warranty Period: 20 years from date of Substantial Completion.

25
26 Maintenance Service Agreement Program: Responsibilities of Manufacturer to Owner:

27
28 Bi-Annual housekeeping, including removal of debris from roof surface (branches, tennis
29 balls, etc.) and removal of debris and dirt from drains, gutters and scuppers.

30
31 Storm Reports, monitoring and follow-up. In the event of serious storms, inspect the roof
32 system and building envelope for damage.

33
34 Provide an annual summary report of roof condition and any changes that Owner should
35 be aware of.

36
37 Bi-Annual preventative maintenance to include the following:

38
39 Metal edge flashing

40
41 Tears, splits or breaks to be repaired.

42
43 Exposed fasteners to be reinforced.

44
45 Any loose metal to be re-fastened.

46
47 Parapet wall and counterflashings:

48
49 Tears, splits, kickholes or breaks to be repaired.

1 Voids in termination bars, counterflashing receivers and coping joints to be
2 resealed.

3
4 Equipment/Protection flashing components:

5
6 Tears, splits, kickholes or breaks to be repaired.

7
8 Loose curb tops to be re-secured.

9
10 Roof membrane maintenance:

11
12 Blisters or splits in membrane will be cut open and repaired.

13
14 Wind scoured areas to be re-coated.

15
16 Reflective coatings on flashing will be re-dressed if necessary.

17
18 Pitch pans to be re-filled.

19
20 Provide toll free, 24 hours, 365 days a year for leak reporting.

21
22 Respond to leak call within 24 hours.

23
24 Have repair crew within 48 hours

25
26 Examine finished repair.

27
28 Report back to Owner. Provide written quarterly activity report.

29
30 The warranties specified in this Article shall not deprive the Owner of other rights the Owner may
31 have under other provisions of the Contract Documents and will be in addition to and run
32 concurrent with other warranties made by the Contractor under requirements of the Contract
33 Documents.

34
35
36 PART 2 - PRODUCTS

37
38 GENERAL

39
40 When a particular trade name or performance standard is specified, it shall be indicative of a
41 standard required.

42
43 DESCRIPTION

44
45 Hot melt modified bitumen roofing work includes, but is not limited to, the following:

46
47 One ply of trilaminate reinforced ply sheet (nailed base sheet) bonded to the prepared
48 substrate with base ply adhesive. Three plies of ASTM D-2178, Type IV glass fiber roofing

1 felt (roof membrane ply sheet) bonded to the prepared substrate with hot melt modified
2 bitumen.

3
4 The hot bitumen will consist of ASTM D-312-84 Type III steep asphalt.

5
6 All flashings will be set in bitumen and will be one ply of base flashing ply covered by an
7 additional layer of elastomeric flashing sheet.

8
9 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products
10 which may be incorporated in the work include, but are not limited to the following:

11
12 Tremco, Inc., or approved equal.

13
14 ROOFING MATERIALS

15
16 Roof Membrane Base ply:

17
18 Trilaminate reinforced ply sheet.

19
20 Number of plies: One

21
22 Adhesive: Premium III adhesive.

23
24 Roof Membrane Ply Sheet:

25
26 ASTM D 2178, Type IV:

27
28 Adhesive: Hot melt modified bitumen.

29
30 Number of plies: Three

31
32 Roof Membrane Surfacing:

33
34 Glaze coat: Premium III Asphalt.

35
36 Surfacing adhesive:

37
38 Premium III Asphalt.

39
40 Roofing Aggregate:

41
42 Hard, durable, opaque; washed free of clay, loam, sand or other foreign
43 substances.

44
45 Do not use: Crushed gravel, limestone or cinders.

46
47 ASTM D 1863-86, size six (6).

48
49 Related Materials:

- 1 Asphalt mastic: ASTM D 4586-86 fibrated asphalt mastic.
2
3 Elastomeric mastic: Rubber modified asphalt mastic.
4
5 Reinforcing membrane: Non-shrinking, non-rotting woven glass mesh.
6
7 Deck primer: Water based primer.
8
9 Asphalt primer: ASTM D 41-85.
10
11 Cant strip: ASTM C208-72 (1982), impregnated fiberboard.
12
13 Base flashing ply: Trilaminate reinforced ply sheet.
14
15 Base flashing ply adhesive: Asphalt mastic.
16
17 Flashing sheet: Reinforced CSPE, 0.045 inches thick.
18
19 Flashing adhesive: White Hypalon flashing adhesive.
20
21 Flashing surfacing: Ready-mixed aluminum coating.
22
23 Drawband sealant: Reglet Joint Sealant.
24
25 Reglet sealant: Reglet Joint Sealant.
26
27 Stripping bitumen for metal flanges: Fibrated asphalt mastic.
28
29 Stripping ply: Trilaminate reinforced ply sheet.
30
31 Walkway panels: Three ft. by four ft., granule surfaced, fiberglass reinforced panel.

32
33 SYSTEM PERFORMANCE REQUIREMENTS:

34
35 TRILAMINATE REINFORCED PLY SHEET

37	<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
38	Weight	31 lb/100 ft ²	ASTM D 228-69 (1978)
39	Breaking strength	135 lbf/in MD	ASTM D 146-78a (1986)
40		130 lbf/in XD	
41	Pliability, ½ in. radius bend	No failures	ASTM D 146-78a (1986)
42	Mass of desaturated	2.2 lb/100 ft ²	ASTM D 146-78a (1986)
43	polyester/glass mat, min		
44	Tear strength	195 lbf MD	ASTM D 1117-80
45		180 lbf XDA	
46	Surfacing and stabilizer, max	65%	ASTM D 146-78a (1986)
47	Asphalt	10.0 lb/100 ft ²	ASTM D 228-69 (1978)
48	Resistance to puncture	120 lbf	ASTM E 154-68 (1979)
49			

1
2 READY MIXED ALUMINUM COATING

3
4

<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
5 Asbestos content	None	ASTM D 276-87
6 Viscosity at 77°F	13.5 s	ASTM D 1200-82
7 (Ford cup No. 4)		
8 Density at 77°F	7.5 lb/gal	ASTM D 1475-85
9 Nonvolatile Content	35.2%	ASTM D 1644-88

10
11

12 FIBRATED ASPHALT MASTIC

13
14

<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
15 Asbestos content	None	ASTM D 276-87
16 Viscosity at 77°F	480,000 - 1,000,000cP	ASTM D 2196-86
17 Density at 77°F	9.3 lb/gal	ASTM D 1475-85
18 Nonvolatile Matter	80%	ASTM D 4586-86
19 Sag Resistance at 140°F	1/8"	ASTM D 4586-86
20 Moisture vapor transmission rate		
21 in ² /24 hrs at 0.020 in. thickness	0.10 - 0.40 g/100	ASTM E 398-83

22
23

24 ASTM D 312-84, TYPE III ASPHALT

25
26

<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
27 Softening point	195 - 205°F	ASTM D 36-86
28 Penetration at 77°F	15-30 dmm	ASTM D 5-86
29 Flash point, min	525°F	ASTM D 92-85
30 Ductility at 77°F min.	2.5 cm	ASTM D 113-86
31 Equiviscous temperature range		
32 125cP)	400 to 430°F	ASTM D 4402-87

33
34

35 COLD PROCESS, ELASTOMERIC MODIFIED BITUMEN ADHESIVE

36
37

<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
38 Asbestos content	None	ASTM D 276-87
39 Viscosity at 77°F	68,000 - 92,000 cP	ASTM D 2196-81
40 Density at 77°F	8.2 lb/gal	ASTM D 1475-85
41 Nonvolatile Matter	54%	ASTM D 4479-85
42 Flash point	>100°F	ASTM D 93-85
43 Uniformity and consistency	Pass	ASTM D 4479-85

44
45

46 ASTM - TYPE IV FIBERGLASS PLY SHEET

47

<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
-----------------	----------------------	--------------------

48
49

1	Net dry mass of asphalt impregnated		
2	glass felt, individual rolls min.	6.0 lb/100 ft. ²	ASTM D 146-78a (1986)
3	Moisture at point of manufacture	0.15%	ASTM D 146-78a (1986)
4	Mass of desaturated glass felt min	1.7 lb/100 ft ²	ASTM D 146-78a (1986)
5	Bituminous saturant, asphalt, min	3.0 lb/100 ft ²	ASTM D 146-78a (1986)
6	Ash	70 to 88%	ASTM D 146-78a (1986)
7	Breaking strength	44 lbf/in. MD	ASTM D 146-78a (1986)
8		44 lbf/in. XD	
9	Pliability, ½ in. radius bend	No failures	ASTM D 146-78a (1986)

10
11 WATER BASED PRIMER

12	<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
13			
14			
15	Asbestos content	None	ASTM D276-87
16	Viscosity at 77°F Stormer Krieb	65 KU	ASTM D562-81
17	Density at 77°F	8.8 lb/gal	ASTM D1475-85
18	Nonvolatile Content	32%	ASTM D 1644-88
19	Flash Point	Not Applicable	ASTM D3278-82
20	Volatile Organic Compound	60 g/l	ASTM D3960-89

21
22 NON-SHRINKING, NON-ROTTING WOVEN GLASS MESH

23	<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
24			
25			
26	Weight	1.32 lb/100 ft ²	ASTM D 146-78a (1986)
27	Moisture based on net wgt	None	ASTM D 146-78a (1986)
28	Average tensile strength at 77°F		
29	Wrap threads	75 lbf	ASTM D 146-78a (1986)
30	Filling threads	75 lbf	ASTM D 146-78a (1986)
31	Organic content:		
32	Weight	18.7%	ASTM D 579-83
33	Type	PVC/acrylic water based	

34
35 HYPALON ELASTOMERIC SHEETING

36	<u>Property</u>	<u>Typical Value</u>	<u>Test Method</u>
37			
38			
39	Thickness	0.045 in.	ASTM D 751-89
40	Tensile strength	250 - 300 lbf	ASTM D 751-89
41	Elongation at fabric break	25%	ASTM D 751-89
42	Tear resistance	95 lbf	ASTM D 751-89
43	Water absorption at 72°F	<5% within 7 days	ASTM D 471-89
44	Dimensional stability 1 hr at 212°	1.0 - 1.25% within	ASTM D 1204-84
45	Low temperature flexibility	-40°F to -45°F	ASTM D 2136-84 (1989)
46	Ply adhesion	15 lbf/in.	ASTM D 413-82 (1988)
47	Water vapor transmission	0.05 perms	ASTM E 96-88
48	(procedure BW)		
49			

1 HOT MELT MODIFIED BITUMEN

2

3 <u>Property</u>	4 <u>Typical Value</u>	5 <u>Test Method</u>
6 Softening point	7 195 - 205°F	8 ASTM D 36-86
9 Elongation at 77°F	10 1000%	11 ASTM D 412-87
12 Density at 77°F	13 8.3 lb/gal	14 ASTM D 70-82 (1986)
15 Flash point	16 525°F	17 ASTM D 92-85
18 Penetration at 77°F	19 25-40 dmm	20 ASTM D 5-86
21 Penetration index	22 4.5	

23 INSULATION MATERIALS

24 Tapered insulation:

25 FS HH-I-1972/2(1), Class I, isocyanurate insulation. **Note: Apache insulations are not**
26 **acceptable.**

27 Slope per running foot: 1.8 inch.

28 Minimum thickness: ½ inch.

29 Attachment: Mechanically fastened.

30 Top layer: ASTM C 208-72 (1982), fiberboard.

31 Asphalt coated

32 Thickness: 4' x 4' x ½"

33 Adhesive: Premium III Asphalt.

34 Tapered edge strip:

35 ASTM C 208-72(1982), impregnated fiberboard tapered from 1 5/8 inch to 1/8 inch.

36 Size: 12 x 48 inches.

37 Adhesive: Premium III Asphalt.

38 Crickets:

39 ASTM C 208-72(1982), impregnated fiberboard tapered from 1 5/8 inch to 1/8 inch
40 Size:

41 12 x 48 inches.

42 One foot of rise for every four feet of run.

1
2 Adhesive: Premium III Asphalt
3

4 Saddles:

5
6 ASTM C 208-72 (1982), asphalt coated fiberboard, factory fabricated, ½ inch slope, 2 x 4
7 feet dimension.

8
9 Dimensions: One foot of rise for every four feet of run.

10
11 Adhesive: Premium III Asphalt.
12

13 MECHANICAL FASTENERS

14
15 Drain bolts:

16
17 As provided by drain bowl manufacturer.
18

19 Wood to wood:

20
21 Olympic No. 14-10 Heavy Duty Roofing Fastener, with CR-10 fluorocarbon coating.

22
23 Length: Sufficient to penetrate underlay blocking 1 ¼ inches.
24

25 Wood to steel deck:

26
27 Olympic No. 14-10 Heavy Duty Roofing Fastener, with CR-10 fluorocarbon coating.

28
29 Screws: Sufficient to penetrate steel deck ½ inch.
30

31 Nailed base sheet to Cementitious wood fiber deck:

32
33 Insul-deck Loc-nail by ES Products.
34

35 Insulation to steel deck:

36
37 Olympic No. 12-11 Standard Roofing Fastener, with CR-10 fluorocarbon coating.

38
39 Screws: Sufficient to penetrate steel deck ½ inch.
40

41 Copper sheet metal to wood blocking:

42
43 Copper Wire Slating Nails, round shank, not smaller than twelve (12) gage by Clendenin
44 Bros., Inc., Baltimore, MD.

45
46 Length: Sufficient to penetrate wood blocking 1 ¼ inches minimum.
47

48 Aluminum sheet metal to wood blocking:
49

1 FS FF-N-105B(3) Type II, Style 20, roofing nails; 6061-T913 alloy wire, flat head, diamond
2 point, round, barbed shank.

3
4 Length: Sufficient to penetrate wood blocking 1 ¼ inches minimum.

5
6 Drawband:

7
8 Gold Seal stainless steel worm gear clamp by Murray Corporation, Cockeysville, MD.
9 Power-Seal stainless steel worm drive clamps by Breeze Clamp Company, Saltsburg, PA.

10
11
12 PART 3 - EXECUTION

13
14 SUBSTRATE EXAMINATION

15
16 Examine substrate surfaces to receive built-up coal tar roofing system and associated work, and
17 conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory
18 conditions have been corrected in a manner acceptable to Installer.

19
20 EXISTING ROOF PREPARATION:

21
22 Remove existing built-up roofing and flashing as required to properly perform the work. Remove
23 all nails and similar projections that might protrude and injure new roofing assembly. Contractor
24 shall sequence-stage these operations as required to accommodate overall progress with roofing
25 operations, and keep building water tight.

26
27 Existing roof assemblies shall be clean, smooth and completely dry, with all anchorages intact, free
28 of any imperfections detrimental to proper installation and securement of new materials; notify
29 Architect of any conditions which are not consistent with these requirements before proceeding to
30 install new materials.

31
32 Report any defects of unsatisfactory conditions, in writing to Architect. Proceeding without
33 verification and notification, or installation of materials prior to same, indicates acceptance of
34 working conditions and full responsibility for making corrections to remedy faulty situations deemed
35 necessary, in Architect's opinion, without extra cost, by Contractor.

36
37 After completion of inspection of existing roofing system and roof decks, then proceed with
38 preparation operations and installation of new materials.

39
40 Remove/disconnect existing exhaust fans, ventilators and similar roof mounted devices as required
41 to facilitate work of this Contract. Properly flash all such devices per membrane manufacturer's
42 recommendations and requirements; then reset and reconnect all such devices; leave in proper
43 working order.

44
45 Roofing Contractor to dispose of all existing materials removed from roof. Remove and salvage
46 for reuse all existing ventilation caps. Existing curbs to remain and be installed as work of this
47 contract; furnish and install curb extensions as required. Reinstall ventilation caps and similar
48 devices as required after roof repair operations have been completed.

1 Verify that roof openings and penetrations are in place and set and braced and that roof drains are
2 properly clamped into position.

3
4 Verify that wood nailers are in place and secured and match thicknesses of insulation required.

5
6 Verify that the deck is clean and smooth, free of depressions and projections, and has not
7 obstructions to retard drainage of water.

8
9 Verify that the surfaces to receive roofing are dry and free of snow and ice.

10
11 Beginning the installation means the installer accepts the existing surfaces.

12
13 If the installer finds the substrate unacceptable and outside the preparation requirements
14 contracted for, it is to be immediately reported to the Owner's Representative in writing.

15
16 GENERAL WORKMANSHIP

17
18 Substrate: Free of foreign particles prior to laying roof membrane.

19
20 Phased application: Not permitted. All plies shall be completed each day.

21
22 Traffic and equipment: Kept off completed plies until adhesive has set.

23
24 Wrapper and packaging materials: Not to be included in roofing system.

25
26 Entrapped aggregate: Not permitted within new membrane. Its discovery is sufficient cause for
27 rejection.

28
29 Ply shall never touch ply, even at roof edges, laps, tapered edge strips and cants.

30
31 Fit plies into roof drain rims: install lead flashing and finishing plies; secure clamping collars; install
32 domes.

33
34 Extend roofing membrane to top edge of cant at wall and projection bases.

35
36 Cut out fishmouths/side laps which are not completely sealed; patch. Replace all sheets which are
37 not fully and continuously bonded.

38
39 Modified bitumen heating:

40
41 Use low burner flames during initial melt-downs, circulate modified bitumen after initial melt-down.

42
43 Maximum bitumen temperature 525° F.

44
45 EVT: 415° - 465° F.

46
47 Kettle: Free of contaminants (asphalt or coal tar pitch).

48
49 Use separate kettle for asphalt bitumen heating.

1 Application rates: Bitumen quantities for waterstop/tie-offs, flashings, miscellaneous detail
2 applications and minimum kettle capacity are not included in application rates.

3
4 Asphalt heating:

5
6 Use low burner flames during initial melt-downs, circulate asphalt after initial melt-down.

7
8 Maximum bitumen temperature: 525° F.

9
10 EVT: 400° - 430° F.

11
12 Kettle: Free of contaminants.

13
14 Application rates: Bitumen quantities for waterstop/tie-offs, flashings, miscellaneous detail
15 applications and minimum kettle capacity are not included in application rates.

16
17 Insulation:

18
19 Install insulation boards in courses parallel to roof edges mopping surface up.

20
21 Firmly butt each insulation board to surrounding boards. Do not jam or deform boards.

22
23 Eliminate open joints and uneven surfaces.

24
25 Maximum insulation gap: ¼ inch.

26
27 Fill insulation board joint gaps larger than ¼ inch with roof insulation.

28
29 Maximum elevation variation between boards at joints: ⅛ inch.

30
31 Cut and fit insulation boards where roof deck intersects vertical surfaces. Cut board ¼ inch from
32 vertical surface.

33
34 Stagger joints at least six (6) inches.

35
36 Filler size: Eighteen (18) inches in length or width, minimum.

37
38 Insulation: Form continuous insulation joints over deck flange. Do not cantilever insulation edges
39 over deck ribs. Minimum bearing surface: 1 ½ inches.

40
41 PREPARATION

42
43 Contractor shall be responsible for protection of property during course of work. Lawns, shrubbery,
44 paved areas and building shall be protected from damage. Repair damage at no extra cost to
45 Owner.

46
47 Provide at site prior to commencing removal of debris, a dumpster or dump truck to be located
48 adjacent to building where directed by Owner.

1 Roofing, flashings, membrane repairs and insulation shall be installed and sealed in a watertight
2 manner on same day of installation or before arrival of inclement weather.

3
4 At start of each work day drains within daily work area shall be plugged. Plugs to be removed at
5 end of each work day or before arrival of inclement weather.

6
7 Preparation work shall be limited to those areas that can be covered with installed roofing material
8 on same day and before arrival of inclement weather.

9
10 Arrange work sequence to avoid use of newly constructed roofing for storage, walking surface and
11 equipment movement. Move equipment and ground storage areas as work progresses.

12
13 Protect building surfaces at chute/set-up areas with tarpaulin. Secure tarpaulin. Remove dumpster
14 from premises when full and empty at approved dumping or refuse area. Deliver empty dumpster
15 to site for further use. Upon job completion, dumpster/chute shall be removed from premises.
16 Spilled or scattered debris shall be cleaned-up immediately. Removed material to be disposed
17 from roof as it accumulates.

18
19 At end of each working day, removal areas shall be sealed with water stops along edges to prevent
20 water entry.

21
22 Provide clean plywood walkways and take other precautions required to prevent tracking of
23 aggregate/debris from existing membrane into new work area where aggregate/debris pieces can
24 be trapped within new roofing membrane. Contractor shall instruct and police workmen to ensure
25 that aggregate/debris is not tracked into new work areas on workmen's shoes or equipment
26 wheels. Discovery of entrapped aggregate/debris within new membrane is sufficient cause for its
27 rejection.

28
29 Surface preparation:

30
31 Lift counterflashing; butt corners to within one (1) inch of reglet.

32
33 Remove: Existing roofing, insulation to roof deck.

34
35 Sweep clean roof deck.

36
37 Remove flashings to substrate.

38
39 Remove unused equipment as directed by Owner.

40
41 Remove perimeter gravel stop to wood blocking.

42
43 Remove heavy bituminous encrustations; fill small depressions; allow insulation to lay flat.

44
45 Seal open gaps in exposed cementitious wood fiber deck prior to the installation of nailed
46 base sheet.

47
48 CARPENTRY

49

1 Roof edge:

2
3 Mechanically attach wood blocking. Offset blocking layers twelve (12) inches; weave
4 corners.

5
6 Blocking thickness: Equal to final insulation thickness including tapered edge strips.

7
8 Fasteners shall be installed in two rows staggered. Spacing in any one row shall not
9 exceed twenty-four inches. Within eight feet of outside corners, spacing shall not exceed
10 twelve inches in any one row.

11
12 Install wood cants over extruded aluminum fascia deck brackets. Nail two rows at a
13 spacing not to exceed twelve inches from each side of deck brackets. Miter corners.

14
15 Expansion joints:

16
17 Install horizontal and vertical blocking.

18
19 Vertical blocking:

20
21 Thickness: Two (2) inches, nominal.

22
23 Height: Eight (8) inches above final surface of roofing.

24
25 Horizontal blocking:

26
27 Thickness: Equal to final insulation thickness, including tapered edge.

28
29 Width: Four (4) inches, nominal.

30
31 Mechanically attach horizontal blocking to deck. Fasteners shall be installed in two (2) rows
32 staggered. Spacing in any one (1) row shall not exceed twenty-four (24) inches.

33
34 Install wood cants to blocking. Nail two (2) rows staggered to horizontal and vertical
35 blocking. Spacing in any one (1) row shall not exceed twenty-four (24) inches.

36
37 Metal sleeve and storm collar:

38
39 Mechanically attach wood blocking to deck at all storm collar locations. Minimum two (2)
40 fasteners per section.

41
42 Offset blocking layers twelve (12) inches, weave corners.

43
44 Blocking thickness: Equal to final insulation thickness including tapered edge.

45
46 Blocking width: Four (4) inches, nominal.

47
48 Piping through roof deck:

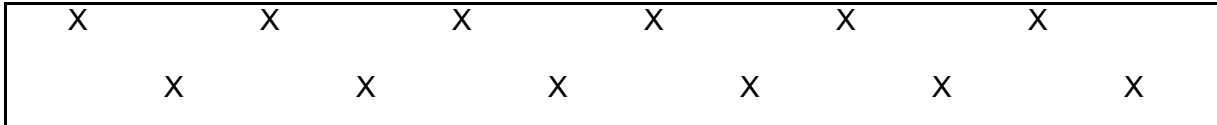
1 Mechanically attach wood blocking to deck at designated pipe locations. Minimum two (2)
2 fasteners per section.

3
4 Offset blocking layers twelve (12) inches, weave corners.

5
6 Blocking thickness: Equal to final insulation thickness including tapered edge.

7
8 Blocking width: Four (4) inches, nominal.

9
10 Wood blocking fastening pattern:



17 ADHERED THERMAL INSULATION OVER CEMENTITIOUS WOOD FIBER DECK

18
19 Install nailed base sheet over deck.

20
21 Mechanically attach 7 inches on center at laps and in staggered rows on the one-third and
22 two thirds ply lines spaces also at 7 inches.

23
24 Drive mechanical fasteners flush to top surface.

25
26 Filler insulation requires two (2) fasteners per piece minimum.

27
28 Adhere insulation layers with a uniform and continuous application of asphalt at a rate of thirty (30)
29 lbs. per 100 sq. ft.

30
31 Immediately after placement, walk insulation boards into hot bitumen to achieve solid bond.

32
33 Promptly spread any bitumen pools that may accumulate on insulation surface to achieve
34 smooth surface for roofing installation.

35
36 Offset joints of top layer six (6) inches in both directions from joints of base layer.

37
38 MECHANICALLY FASTENED/HOT ADHERED THERMAL INSULATION OVER METAL DECK

39
40 Mechanically attach tapered insulation to deck.

41
42 Fastener density: One (1) every two (2) sq. ft.

43
44 Install additional fasteners to ensure insulation is firm under foot.

45
46 Drive mechanical fasteners flush to top surface.

47
48 Filler insulation requires two (2) fasteners per piece minimum.

1 Adhere top layer insulation to bottom layer.
2
3 Adhere each layer with a uniform and continuous application of asphalt at a rate of thirty (3) lbs.
4 Per 100 sq. ft.

5
6 Immediately after placement, walk insulation boards into hot bitumen to achieve solid bond.
7
8 Promptly spread any bitumen pools that may accumulate on insulation surface to achieve
9 smooth surface for roofing installation.

10
11 Offset joints of top layer six (6) inches in both directions from joints of base layer.
12

13 CRICKETS AND SADDLES

14
15 Install crickets on the high side of all square penetrations, minimum width; twelve inches.

16
17 Install saddles in valleys, one foot of rise for every four feet of run.
18

19 Adhere crickets and saddles to substrate.
20

21 HOT BUILT UP ROOF SYSTEM APPLICATION

22
23 Install base ply to roof and all wall, curb and projection bases in a uniform and continuous mopping
24 of base ply adhesive.

25
26 Ply laps: Four (4) inches.
27

28 Apply adhesive no more than ten (10) feet ahead of each roll being embedded.
29

30 Broom ply before adhesive cools from unmopped side. Ensure complete and continuous
31 seal and contact between bitumen and ply sheets, including ends, edges and laps without
32 wrinkles, fish mouths or blisters. Broom width: Thirty-four (34) inches minimum. Avoid
33 walking on plies until adhesive has set.
34

35 Roofing ply shall never touch roofing ply, even at roof edges, laps, tapered edge strips and
36 cants.
37

38 Cut out fishmouths/side laps which are not completely sealed; patch. Replace all sheets
39 which are not fully and continuously bonded.
40

41 Lap ply membrane ends four (4) inches. Stagger end laps three (3) feet minimum.
42

43 Adhesive application rate: Thirty (30) lbs. Per 100 sq. ft.
44

45 Install three (3) plies of ply sheet, shingle fashion. Overlap starter strips twenty-six (26) inches with
46 first ply, then overlap each succeeding ply 24 2/8 inches. Place ply sheets to ensure water will flow
47 over or parallel to; but, never against exposed edges.
48

1 Use twelve (12) , twenty-four (24) and thirty-six (36) inch wide plies to start and finish roof
2 membrane along roof edges and terminations.

3
4 **Metric felts are not permitted on this project.**

5
6 Lap ply sheet ends six (6) inches. Stagger end laps twelve (12) inches minimum.

7
8 Apply adhesive no more than ten (10) feet ahead of each roll being embedded.

9
10 Broom each ply before adhesive cools from unmopped side. Ensure complete and
11 continuous seal and contact between bitumen and ply sheets, including ends, edges and
12 laps without wrinkles, fish mouths or blisters. Broom width: Thirty-four (34) inches
13 minimum. Avoid walking on plies until adhesive has set.

14
15 Embed each ply in a uniform and continuous mopping of interply adhesive.

16
17 Interply mopping rate: Twenty-five (25) lbs. per 100 sq. ft.

18
19 Glaze coat finished plies at the end of each day's installation.

20
21 DAILY WATERSTOP/TIE-INS

22
23 Remove embedded gravel/debris from top ply of felt along termination.

24
25 Width: Eighteen (18) inches.

26
27 Adhere twelve (12) and eighteen (18) inch wide ply sheets from exposed deck to existing
28 roofing with a continuous 1/16 inch thick application of tie-off mastic. Glaze cut-off with
29 surfacing mastic. Extend eighteen (18) inch wide felt three (3) inches either side twelve
30 (12) inch felt.

31
32 Install "deadman" insulation filler at insulation staggers.

33
34 Extend roofing system at least twelve inches onto prepared area of adjacent roofing. Seal
35 edge with six inch wide reinforcing membrane embedded between alternate courses of
36 tie-off mastic.

37
38 At beginning of next day's work remove temporary connection by cutting felts evenly along
39 edge of existing roof system. Remove "deadman" insulation fillers.

40
41 ELASTOMERIC FLASHINGS

42
43 General flashing requirements:

44
45 Base flashing ply: Adhere starter strip of base flashing ply to field, cant and wall. Extend
46 at least four inches above top of cant and four inches onto field of roof. Starter strip is to
47 be installed at the same time as the adjacent roofing.

1 Seal top edge of starter strip with asphalt mastic and reinforcing mesh.

2
3 Elastomeric flashing sheet:

4
5 Adhere elastomeric sheeting completely to flashing surface, cant and roofing with
6 flashing adhesive. Let adhesive flash off, fifteen (15) minutes minimum.

7
8 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends
9 four (4) inches. Adhere laps with flashing adhesive.

10
11 Elastomeric sheeting width: Sufficient to extend at least six (6) inches beyond toe
12 of cant onto new roof.

13
14 Seal vertical and horizontal edges of sheeting with reinforcing membrane embedded
15 in a base course of flashing adhesive and a top course of elastomeric mastic.

16
17 Base flashing height: Not less than eight (8) inches, not higher than twelve (12)
18 inches above finished roofing surface.

19
20 Two-Ply Stripping:

21
22 Set flange in asphalt mastic. Seal flange with two (2) stripping plies embedded
23 between alternate applications of stripping adhesive. Extend first ply four (4) inches
24 beyond flange; second ply two (2) inches beyond first ply.

25
26 Fascia system at perimeter edges:

27
28 Provide tapered edge strip to blocking.

29
30 Firmly butt tapered edge strip to blocking.

31
32 Fully adhere edge strip to insulation.

33
34 Install new roofing to blocking edge. Nail with spiral or annular shank nails, eight (8) inch
35 o.c. Nails to have one (1) inch integral cap.

36
37 Envelope felts.

38
39 Install elastomeric base flashing as described in general flashing requirements section.

40
41 Elastomeric sheeting shall be of sufficient width that after being inserted and secured by
42 fascia top cap and properly tucked, will extend at least six (6) inches onto new roof.

43
44 Solidly adhere sheeting completely to cant and roofing in a uniform and continuous
45 application of flashing adhesive.

46
47 Seal horizontal and vertical edges of sheeting with reinforcing membrane embedded in a
48 base course of hypalon flashing adhesive and a top course of elastomeric mastic.

1 At wall flashings:

2
3 Adhere cant strip to flashing base in a continuous application of flashing adhesive.

4
5 Install flashing as described in general flashing requirements section.

6
7 Secure top edge of flashing sheet to substrate with spiral or annular shank nails, with a one
8 inch cap, eight (8) inches o.c.

9
10 Fabricate and install new counterflashing.

11
12 Form ¼ inch hook dam by bending rear edge back on itself.

13
14 Secure into one (1) inch deep reglet with lead wedges eight (8) inches o.c.

15
16 Lap counterflashings four inches at transverse joints; three inches over base flashing.

17
18 Wipe clean metal surfaces of flashing joint with metal cleaner. Prime metal joint surfaces
19 with metal primer. Allow to dry.

20
21 Caulk flashing joint. Provide watershed. Tool neatly.

22
23 At expansion joint:

24
25 Extend new roofing to top edge of cant. Nail eight (8) inches o.c. with spiral or annular
26 shank nails, with one (1) inch cap.

27
28 Install vinyl water barrier over joint opening. Allow barrier to drape four (4) inches within
29 joint opening. Nail both sides of barrier four (4) inches o.c.

30
31 Insert fiberglass batt insulation into expansion joint opening; fill entire opening.

32
33 Install flashing as described in general flashing requirements section.

34
35 Secure top edge of flashing sheet to substrate with spiral or annular shank nails, with one
36 (1) inch cap, eight (8) inches o.c.

37
38 Fabricate and install expansion joint cover to curb.

39
40 Bevel curb top for drainage:

41
42 Mechanically fasten to vertical portion of curb with neoprene-grommeted screws
43 twelve (12) inches o.c.

44
45 Overlap sections one (1) inch

46
47 At wood curb flashings:

48
49 Remove mechanical equipment from curb.

1 Install new roofing to top edge of cant. Nail eight (8) inches o.c. with spiral or annular nails,
2 with a one (1) inch cap.

3
4 Install flashing as described in general flashing requirements section.

5
6 Secure top edge of flashing sheet to substrate with spiral or annular shank nails, with a one
7 (1) inch cap, eight (8) inches o.c.

8
9 Fabricate and install counterflashing.

10
11 Reinstall mechanical equipment onto curb. Refasten.

12
13 At plumbing vents:

14
15 Wedge plumbing vent tight against deck.

16
17 Apply 1/16 inch uniformly thick layer of asphalt mastic to surface receiving metal flange.

18
19 Fabricate and install plumbing vent flashing from lead. Flange: Four (4) inches wide
20 minimum; extend completely around periphery of vent flashing.

21
22 Prime metal flange with asphalt primer.

23
24 Set flange into mastic. Neatly dress flange with wood block.

25
26 Seal top of lead.

27
28 Pipe outside diameter greater than two (2) inches: Bend lead inside pipe one (1)
29 inch minimum with pliers or rubber/plastic mallet; replace cracked lead.

30
31 Pipe outside diameter two (2) inches or less: Cut lead at vent top; fabricate and
32 install integral lead cap.

33
34 Install two (2) ply stripping described in general flashing requirements section.

35
36 At metal sleeve and storm collars:

37
38 Apply 1/16 inch uniformly thick layer of asphalt mastic to surface receiving metal flange.

39
40 Fabricate and install sleeve flashing. Height: Eight (8) inches. Flange width: Four (4)
41 inches. Flange to extend completely around flashing periphery. Solder all joints. Double
42 solder vertical joints.

43
44 Prime flange with asphalt primer.

45
46 Nail flange to wood blocking three (3) inches o.c., staggered.

47
48 Install two (2) ply stripping described in general flashing requirements section.

49

1 Fabricate storm collar with bolted connection. Cover sleeve flashing three (3) inches
2 minimum. Tighten bolts.

3
4 Wipe clean top of storm collar and projection with metal cleaner. Prime surface with metal
5 primer. Caulk projection/sheet metal interface. Provide watershed. Tool neatly.
6

7 At piping through roof deck:

8
9 Fabricate and install two piece pipe box. Bottom portion fabricated with four (4) inch flange.
10 Top section notched to fit over piping.

11
12 Prime flange with asphalt primer.

13
14 Set flange in mastic, nail flange to wood blocking three (3) inches o.c.

15
16 Fill box interior with batt insulation.

17
18 Fasten top and closure detail to bottom.

19
20 Wipe clean metal surfaces of box and piping with metal cleaner. Prime metal with metal
21 primer. Caulk joint between box and piping. Tool neatly.

22
23 Install two (2) ply stripping described in general flashing requirements section.
24

25 At roof drains:

26
27 Plug drain to prevent water entry until service connection is completed.

28
29 Install tapered edge strip around drain to create a minimum 48 x 48 inch sump. Miter
30 corners. Seal toe of tapered edge to drain rim with reinforcing membrane embedded
31 between alternate courses of asphalt mastic.

32
33 Install roofing system into sump and onto drain rim.

34
35 Apply 1/16 inch uniformly thick layer of asphalt mastic to surface receiving lead flashing.

36
37 Prime lead with asphalt primer.

38
39 Set single piece lead flashing in mastic centered over drain; extend lead six (6) inches
40 beyond drain rim. Neatly dress lead with wood block.

41
42 Clamp flashing collar to drain in bed of mastic.

43
44 Neatly cut lead/felts within drain at rim. Lead to extend one (1) inch into bowl.

45
46 Install two-ply stripping described in general flashing requirements section. Stripping shall
47 not extend under clamping ring.
48

49 SURFACING TREATMENT ON FLASHINGS

1 Coat flashings with two (2) coats of aluminized heat reflective coating applied at an approximate
2 rate of 250 sq. ft. per gallon.

3
4 SURFACING APPLICATION

5
6 Flood coat:

7
8 Prior to application of surface treatment system, contractor shall inspect roof with
9 manufacturer's representative.

10
11 Over entire roof surface apply uniform and continuous flood coat of premium steep asphalt
12 at a rate of sixty lbs. per 100 sq. ft.

13
14 Immediately broadcast minimum 400 lbs. of new, clean roofing gravel per 100 sq. ft. Cover
15 flood coat material completely.

16
17 WALKWAYS

18
19 Install walkway at each access to roof and at service panels to roof mounted equipment.

20
21 Adhere to roofing in a spot application of asphalt mastic.

22
23 LIGHTNING PROTECTION SYSTEM

24
25 Install new wood blocking plus sleeve and collar flashings at ground lead entry points.

26
27 Lightning protection system may be disconnected to facilitate work. Reconnect daily or before
28 arrival of inclement weather. Ensure air terminals are anchored and vertical.

29
30 FIELD QUALITY CONTROL

31
32 It is the Contractor's responsibility to notify and coordinate with the manufacturer in a timely manner
33 in order for them to conduct their required inspections.

34
35 The Owner and/or his authorized representative has, without prior notice, the right to audit all work
36 being performed.

37
38 Although not a standard quality control procedure for this application, test cuts may be required in
39 areas where quality is in question. The cost of these test cuts will be the responsibility of the
40 Contractor.

41
42 If defects are detected, it will be the responsibility of the installing contractor to take corrective
43 procedures. Any corrective procedure must have prior approval of the building owner or his
44 representative, and the roof materials manufacturer, if a manufacturer's warranty is required. If,
45 in the opinion of the building owner or his representative, or the material manufacturer, the
46 corrective procedures are not appropriate, the installation in question must be removed and
47 replaced in an acceptable manner.

48
49 CLEANING AND DISPOSAL

- 1 Remove bituminous materials from all finishes surfaces.
2
3 Repair or replace defaced or disfigured finishes caused by work of this Section.
4
5 Clean roof drains, gutters of debris.
6
7 It is the Installing Contractor's responsibility to remove from the job site, and as necessary, safely
8 dispose of all excess materials and debris as a result of the work completed under this Section.
9
10 PROTECTING ROOFING
11
12 Upon completing roofing, including associated work, institute appropriate procedures for
13 surveillance and protection of roofing during remainder of construction period. At end of
14 construction period, or at a time when remaining construction will in no way affect or endanger
15 roofing, inspect roofing and prepare a written report with copies to Architect and Owner describing
16 nature and extent of deterioration or damage found.
17
18 Repair or replace, as required, deteriorated or defective work found at time of above inspection to
19 a condition free of damage and deterioration at time of Substantial Completion and in accordance
20 with requirements of specified warranty.
21
22
23
24 END OF SECTION

1 SECTION 075418 – THERMOPLASTIC MEMBRANE ROOFING (FIRBERTITE ROOFING
2 SYSTEMS)

3
4
5 PART 1 - GENERAL

6
7 RELATED DOCUMENTS

8
9 Drawings and general provisions of the Contract, including AIA General Conditions and
10 Divisions 0 and 1 Specifications Sections, apply to this Section.

11
12 SCOPE

13
14 Install an adhered FiberTite Roofing System as manufactured, furnished and supplied by:

15
16 Seaman Corporation
17 1000 Venture Blvd.
18 Wooster, Ohio 44691
19 Tel.: 1-800-927-8578
20 Fax: 1-800-649-2737

21
22 Contact:

23
24 Dave Shultz, RRO, CSI
25 FiberTite Roofing Solutions
26 4084 Forest Run Circle
27 Medina, Ohio 44256
28 614-209-3764

29
30 SPECIAL CONDITIONS

31
32 The Contractor would provide the insulation, coverboard, vapor barrier and metal copings.
33 Seaman supplies membrane, adhesives, flashing and flashing accessories, and clad metal for
34 shop fabrication of edge mtetals.

35
36 All applications and project specifications require review by FiberTite Technical Customer
37 Services (FTCS) for acceptance prior to any commitment to provide a commercial warranty.

38
39 Seaman Corporation FiberTite Preinstallation Notice (FTR-PIN), must be completed, signed by
40 an authorized roofing contractor, submitted to and approved by FTCS before any consideration
41 for warranty and/or the release of any materials can be authorized.

42
43 SPECIAL DESIGN CONSIDERATIONS

44
45 Roof system composites that incorporate mechanically fastened insulations should incorporate
46 adhered or bonded coverboards to prevent telegraphing of the insulation stress plates.

47
48 ENVIRONMENTAL CONSIDERATIONS

49
50 Severe environmental exposure (e.g. coastal or high wind area(s)).

1 Chemical discharge not listed on the Seaman Corporation/FiberTite chemical resistance
2 publication.

3
4 Environmental conditions such as fog, dew, rain or snow and/or freezing temperatures can
5 have a detrimental effect on the application and performance of adhesives.

6
7 Compliance with EPA and OSHA requirements as published by local, state and federal
8 authorities.

9
10 All adhesives can be described as temperamental. The contractor must be aware of all potential
11 environmental variables when installing adhered roofing systems.

12
13 Pay particular attention to and follow all adhesive storage and application
14 precautions/guidelines.

15
16 Do not apply/use waterborne adhesives (FTR-490 or FTR 390) if the ambient air temperature is
17 expected to drop below 32°F (0°C) within 48 hours of application.

18
19 The use of polystyrene insulation/coverboard assemblies for adhered roofing systems
20 incorporating solvent borne adhesives shall also include a minimum 10-mil polyethylene solvent
21 barrier between the insulation and coverboard.

22
23 FIBERTITE® ROOFING SYSTEMS (FTR) REFERENCES

24
25 FTR GS 02/13 FiberTite General Guide Specification

26
27 FTR AD 02/13 FiberTite Adhered General Guide Specification

28
29 FiberTite Construction Details

30
31 FiberTite Foreman's Manual

32
33 QUALITY ASSURANCE

34
35 FiberTite Roofing Systems shall be installed only by a roofing contractor, authorized by Seaman
36 Corporation to install FiberTite Roofing Systems prior to bid and/or contract award. Herein, the
37 term Authorized FiberTite Roofing Contractor is synonymous with authorized, roofing contractor
38 and/or contractor.

39
40 Roofing contractor's key personnel shall have received specialized training in the installation of
41 FiberTite Roofing Systems by Seaman Corporation.

42
43 FiberTite Roofing Systems shall be installed in accordance with the most current guide
44 specifications and details as amended and/or authorized by FTCS for specific project
45 requirements.

46
47 There shall be no deviations from approved contract specifications or shop drawings without
48 prior written approval by the owner/owner representative and FTCS.

49
50 Unauthorized deviations may subject the roof system to warranty ineligibility.

1
2 Any and all work found to be substandard or in violation of the Contract Documents or
3 Manufacturer's Specifications shall be subject to rejection including complete removal and
4 replacement with new materials at the expense of the contractor.

5
6 Upon completion and certification by the contractor that a quality installation has been
7 completed in accordance with the approved contract specifications and all field welds have
8 been probed and inspected, a quality assurance inspection of the roof system shall be
9 performed by FTCS for acceptance and approval.

10
11 All field seams shall be visible and available to FTCS at the time of final inspection.

12 13 SUBMITTALS

14
15 The following information shall be submitted to FTCS for review before warranty consideration,
16 material shipment or acceptance can be confirmed.

17
18 Complete copy of project architectural specifications or roofing contractor's proposal
19 outlining design parameters.

20
21 Complete list of accessories or materials not manufactured or expressly authorized for
22 use in FiberTite literature.

23
24 Dimensioned outline of the roof indicating all FTR-Detail references.

25
26 Dimensioned shop drawings illustrating non-FiberTite details. Details that do not
27 conform with standard FiberTite details shall be returned with appropriate
28 recommendations.

29
30 At the time of contract award, the roofing contractor shall submit to the owner/owner's
31 Representative the following:

32
33 Most recent published technical literature and guide specifications issued by FTCS.

34
35 Roofing Contractor's approved copy of submittal form FTR-PIN.

36
37 Dimensioned shop drawings, including roof plan detailing perimeter enhancement,
38 flashing methods, terminations and acceptance by FTCS.

39
40 Written approval from FTCS confirming any accessories submitted, not manufactured or
41 expressly approved in FiberTite literature are acceptable and compatible with the
42 proposed FiberTite Roofing System.

43
44 Material Safety Data Sheets (MSDS) relating to all products, chemicals and solvents.

45
46 Certification that the system specified complies with all identifiable building code and
47 insurance requirements.

48 49 DELIVERY AND STORAGE

1 Highlighted list of materials will be delivered to the job site in manufacturer's original, unopened
2 containers, with legible labels and in sufficient quantity to allow for continuity of work.

3
4 Select and operate material handling equipment in a safe manner, guarding against damage to
5 existing construction or newly applied roofing and conforming to manufacturer's
6 recommendations of handling and storage.

7
8 All rolls of membrane shall be stored, lying down, elevated above the roof deck and completely
9 protected from moisture with tarpaulins. Manufacturer's packaging is not considered adequate
10 for outdoor storage.

11
12 Insulation and cover board materials shall be elevated on pallets and fully protected from
13 moisture with tarpaulins. Manufacturer's packaging is not considered adequate protection from
14 moisture.

15
16 All adhesives and sealants shall be safely stored between 50° F and 80°F prior to use.

17
18 Flammable materials shall be stored in a cool, dry area away from sparks and open flames.
19 Follow all precautions as outlined in manufacturer's Material Safety Data Sheets.

20
21 Materials, having been determined by the owner/owner's representative to be damaged, shall
22 be immediately removed from the construction site and replaced at no cost to the owner.

23 JOB CONDITIONS

24 Safety

25
26 Take all necessary precautions regarding worker health and safety when using solvents,
27 adhesives and/or hot asphalt.

28
29 Worker safety is paramount.

30
31 FiberTite is slippery when wet, exhibits dew, frost, ice or any other form of moisture.

32
33 Comply with all OSHA requirements for roof construction and fall protection where
34 required.

35
36 Store flammable liquid and materials away from open sparks, flames and extreme heat.

37
38 Take necessary precautions when using solvents and adhesives near fresh air intakes.

39
40 Daily site cleanup shall be performed to minimize debris and hazardous congestion.

41 Protection

42
43 Schedule installation sequence to limit access and utilization of the newly installed
44 membrane for material storage, construction staging, mechanical and/or excessive foot
45 traffic.

1 Provide proper protection on all newly completed roofing to avoid damage to the new
2 roofing system.

3
4 Traffic should be minimized on a freshly laid roof.

5
6 Protect building walls, rooftop units, windows and other components during installation.

7
8 Additional Precautions

9
10 Adverse weather conditions, e.g. extreme temperature, high winds, high humidity and
11 moisture, could have a detrimental effect on adhesives, general production efforts
12 and/or the quality of the finished installation.

13
14 Daily production schedules of new roofing shall be limited to only that which can be
15 made 100% watertight at the end of the day, including all flashing and night seals.

16
17 All surfaces to receive the new roof system, including insulation and flashing, shall be
18 free from all dirt, debris and be thoroughly dry.

19
20 Comply with local EPA requirements as published by local, state and federal authorities.

21
22 All construction debris shall be removed from the construction site and legally dispose of
23 offsite.

24
25 COORDINATION

26
27 Prior to installation of materials, a preroofing conference shall be held with the roofing
28 contractor, and owner/owner's representative(s) to discuss the specified roofing system,
29 coordinate its proper application and the expectations of all parties involved. The authorized
30 roofing contractor and the owner/owner's representative shall notify all parties a minimum of
31 fourteen days prior to the meeting.

32
33 Plan and coordinate the installation of the roofing system with other trades in such a manner to
34 avoid membrane damage, keeping the complete installation weather tight and in accordance
35 with all approved details and warranty requirements.

36
37 FTCS shall be available to make recommendations necessary to ensure compliance with
38 project specifications and specification alternatives due to unforeseen job conditions.

39
40 Field services are provided at the discretion of Seaman Corporation. A minimum two weeks
41 notice is required to evaluate and coordinate any request for onsite technical assistance.

42
43 WARRANTY

44
45 Inspections: A FiberTite Technical Customer Service Representative shall inspect the
46 completed FiberTite Roofing installation, and upon acceptance, Seaman Corporation shall
47 issue the preauthorized warranty, subject to the terms and conditions of the sample warranty
48 and contract documents.

49
50 Available Warranties

1
2 Seaman Corporation offers the following FiberTite Roofing System warranties:

3
4 Material Warranty provides the building owner protection against the cost of
5 repairing defects in the membrane only. This warranty is offered at no cost to the
6 owner.

7
8 Maintenance: Along with the issuance of the warranty, a set of instructions shall be included
9 detailing preventative maintenance requirements on the part of the building owner and noting a
10 list of harmful substances that may damage the FiberTite membrane.

11
12
13 PART 2 - PRODUCTS

14
15 GENERAL

16
17 All products and components for the FiberTite Roofing System shall be supplied by Seaman
18 Corporation.

19
20 Components other than those manufactured and/or supplied by Seaman Corporation shall be
21 submitted for review, prior to ordering. Any product(s) not specifically authorized in writing for
22 the project by Seaman Corporation, shall be considered unacceptable and their performance
23 excluded from the warranty.

24
25 FiberTite Roofing Systems may be installed over or directly to preapproved insulation, cover
26 board or composites thereof. Contact FTCS for additional information regarding compatible
27 substrates.

28
29 MEMBRANE "BY SEMAN CORPORATION"

30
31 FiberTite-XT FB Membrane: FiberTite-XT FB is a nominal 50-mil ketone ethylene ester (KEE)
32 membrane, reinforced with a 6.5-oz yd² knitted polyester fabric and a heat bonded 4 oz.
33 polyester backing, as manufactured by Seaman Corporation, under the trade name FiberTite-
34 XT FB, conforming to the physical properties as outlined in the associated data sheet.
35 FiberTite-XT FB greatly exceeds all requirements outlined ASTM D 6754 Standard
36 Specification for Ketone Ethylene Ester (KEE) Sheet Roofing.

37
38 Flashing Membrane: Nominal 36-mil FiberTite, 45-mil FiberTite-SM, or 50-mil FiberTite-XT
39 membrane shall be used for all respective roofing system flashing requirements to match the
40 field membrane and warranty expectations selected for the roofing system.

41
42 ACCEPTABLE SUBSTRATE(S)

- 43
44 Authorized rigid insulation or cover board.
45
46 Structural Concrete, insulated
47
48 Insulated Steel Decking
49
50 Exterior grade plywood; insulated or non-insulated*

1
2 Cementitious fiber or Gypsum, insulated or non-insulated*

3
4 (*) A slip sheet or separation layer is recommended depending upon system type. The
5 "requirement" for including and/or the selection of an appropriate slip sheet or base sheet will
6 be determined by the system selected, surface texture of the substrate, environmental and/or
7 fire classification requirements of the project roof assembly.

8
9 RELATED MATERIALS "BY SEAMAN CORPORATION"

10 The following product(s)/material(s) shall be supplied by Seaman Corporation.

11
12
13 FTR Adhesives: Adhesives, supplied by Seaman Corporation have been specially formulated
14 for FiberTite Roofing Systems.

15
16 NOTE: Solvent borne adhesives are not compatible with polystyrene insulation. Application
17 technique and coverage rates will vary according to substrate and environmental conditions.

18
19 FTR-190e Bonding Adhesive: A VOC compliant solvent borne, contact (two-sided)
20 bonding adhesive, designed for bonding non-fleece back FiberTite membranes to
21 properly prepared and preauthorized horizontal and vertical substrates.

22
23 FTR-290 Adhesive: A VOC compliant solvent borne adhesive, one side application
24 (substrate only), designed for bonding FiberTite-FB (fleece back) membranes to
25 properly prepared and preauthorized horizontal substrates.

26
27 FTR-390 Adhesive: A rubberized/asphalt water borne emulsion adhesive, VOC
28 compliant, one side application (substrate only), designed for bonding FiberTite-FB
29 (fleece back) membranes to properly prepared and pre-authorized horizontal substrates.

30
31 FTR-490 Adhesive: A polymeric water borne, VOC compliant adhesive, one side
32 application (substrate only), designed for bonding FiberTite-FB (fleece back), FiberTite-
33 SM and FiberTite Brite to properly prepared and pre-authorized horizontal substrates.

34
35 FiberTite CR-20 Adhesive: A dual component elastomeric polyurethane froth adhesive
36 designed for bonding Fleece Back FiberTite membranes (spatter application) to properly
37 prepared and preauthorized horizontal and vertical substrates.

38
39 FTR #201 Mastic: A trowel grade elastomeric adhesive/sealant used to adhere FiberTite
40 flashing membranes to pre-approved vertical substrates.

41
42 FTR FASTENERS

43
44 FiberTite MAGNUM Series: To secure FiberTite Membranes to steel, wood and
45 structural concrete decks. A #15-13, buttress threaded, #3 Phillips head fastener
46 constructed of case hardened carbon steel with a reduced diameter drill point and
47 corrosion resistant coating.

48
49 FiberTite-HD: To secure insulation to steel, wood and structural concrete decks. A #14-
50 13, heavy duty threaded steel #3 Phillips truss, self tapping corrosion resistant fastener.

1
2 FiberTite Peel Rivets: To secure insulation, base sheet and/or membrane to steel,
3 wood, cement fiber, Tectum fiberglass and lightweight plank decks. Threadless, high
4 magnesium alloy fastener.

5 6 FTR STRESS PLATES

7 8 FTR-Magnum Series Barbed Stress Plates

9
10 Used to anchor FiberTite membranes:

11
12 FTR Magnum Plus – 1.5" x 2.75" Barbed Rectangular Stress Plate with radial
13 corners; manufactured from 8-gauge AZ-50 galvalume steel.

14
15 FTR Magnum R275 – 2.75" Barbed Round Stress Plate; manufactured from 20-
16 gauge galvanized steel.

17
18 FTR Magnum 2S – 2.375" Barbed Round Stress Plate; manufactured from 20-
19 gauge galvanized steel.

20
21 FTR 3 inch Metal Round Insulation Stress Plates – Finished with AZ-50 galvalume and
22 have a flat/flush profile for use on rigid board surfaces.

23 24 ADDITIONAL COMPONENTS

25
26 FTR-101 Sealant – A single-component gun-grade polyether sealant to seal flashing
27 termination.

28
29 FTR-SLS Sealant – A single-component self leveling polyether sealant for pitch pans.

30
31 FiberClad Metal – To fabricate metal flashing, 4' x 10' sheets of 24 gauge hot dipped G-90
32 steel, or 0.040" thick 3003H14 aluminum, laminated with a 0.02-mil polymeric coating.

33
34 FTR-Premolded Flashing(s) – Injection molded vent stack, split Wrapid Flash® and
35 inside/outside corner flashing using FiberTite vinyl compound.

36
37 FTR Non-Reinforced Membrane – Field fabrication membrane, 60-mil non-reinforced vinyl
38 membrane.

39
40 FTR-Tuff Track Walkway & Protection Pads – High grade walk way/protection material with
41 slip-resistant design.

42
43 FTR-Termination Bar – Membrane flashing(s) restraint/termination seals, nominal 0.125" x 1" x
44 10' 6060-T5 extruded aluminum bar with pre-punched slots, 8 inches on center.

45
46 FiberTite Metal Fascia System – Two piece "snap-on" pre-formed, architectural Kynar metal
47 edge systems.

48
49 FTR-Value Insulation – Polyisocyanurate and extruded polystyrene flat or tapered insulation.
50

1 FTR-601 – Dual component, single bead (ribbon applied) urethane insulation adhesive.
2 Adhesive is a non-solvent, elastomeric, urethane adhesive, specifically designed for bonding
3 single or multiple layers of roof insulation and insulation composites and/or cover boards to
4 structural roof decks and base sheets.

5
6 FTR-Cover Board – Gypsum or gypsum/cellulose core board.

7
8 Simulated Metal Roofing Profile (Rib)

9
10 The simulated metal roofing profile shall be an ornamental co-extrusion with a heat-
11 activated KEE adhesive strip provided by Seaman Corporation.

12
13 Extruded profile shall be provided in 100 feet continuous lengths and match fleece back
14 membrane color.

15
16 FTR T-Joint Covers – Pre-cut 4” x 4” 60 mil non-reinforced membrane to reinforce areas where
17 three overlapping sheets of membrane intersect.

18
19 RELATED MATERIALS

20
21 Wood Nailers

22
23 Wood Nailers are being tested to determine the effect of preservatives on metal
24 components. Borate treated lumber seem to be the less corrosive and is strongly
25 recommended. Installation of other types of treated lumber should be verified with a
26 design professional.

27
28 Wood shall be No. 2 or better construction grade lumber.

29
30 Creosote or asphaltic type preservatives are not acceptable.

31
32 Minimum top nailer thickness shall be 1.5 inches nominal.

33
34 Vapor Retarder

35
36 The decision regarding the inclusion of a vapor retarder within the roof system shall fall
37 within the responsibility of the design professional. Consult N.R.C.A. or other technical
38 resource for appropriate guidelines.

39
40 Vapor retarder for use in a roof system shall comply with identifiable code and/or
41 insurance requirements.

42
43 The vapor retarder manufacturer shall certify, in writing, that the specified vapor retarder
44 meets identifiable code requirements and is approved for its intended use.

45
46 INSULATION

47
48 The term insulation is used interchangeably to refer to rigid insulation materials, in single or
49 multiple layers of tapered or flat, cover board, thermal barriers and or multilayered composites.

1 Insulation shall be installed, where specified and/or required to provide a suitable surface for
2 the FiberTite Roofing Systems and/or meet desired thermal values.

3
4 Acceptable products must be pre-approved in writing by Seaman Corporation and comply with
5 the minimal characteristics and classification listed for the products below:

6
7 Preapproved Products

8
9 FTR-Value Polyisocyanurate

10
11 FM approved rigid insulation meeting Class A 1-90, for fire and wind.

12
13 UL Classification: Class A

14
15 Density: 2.0 pcf. Minimum

16
17 Meet requirements of ASTM C1289

18
19 FTR-Value XPS

20
21 FM approved rigid insulation meeting Class A 1-90, for fire and wind.

22
23 UL Classification: Class A

24
25 Density: 1.5 pcf. Minimum

26
27 Meet requirements of ASTM D1621

28
29 Gypsum Core Cover Board

30
31 FM approved meeting Class A 1-90, for fire and wind.

32
33 UL Classification: Class A Assembly

34
35 Meet requirements of ASTM C 473

36
37 Georgia-Pacific Gypsum LLC DensDeck®Prime

38
39 United States Gypsum Company SECUROCK®

40
41 ADHESIVES FOR INSULATION ATTACHMENT

42
43 General

44
45 Adhesive not specifically supplied by Seaman Corporation shall be listed and approved
46 by Factory Mutual Research in conjunction with the specified insulation and specific
47 substrate.

1 Adhesive shall meet minimum roofing system design requirements as evidenced by
2 testing in conjunction with the proposed substrate and or composite; under FM-Global
3 requirements or acceptable third party laboratory.
4

5 Adhesive manufacturer shall provide written specifications regarding the safe handling,
6 storage and surface preparation for a quality application of the product.
7

8 All adhesives shall be preauthorized by Seaman Corporation.
9

10 Polyurethane

11
12 Adhesive shall be either a dual or single component polyurethane adhesive, dispensed
13 from a portable pressurized container or traditional foam equipment. Preapproved
14 Products:

15
16 FTR-601
17 FiberTite CR-20
18
19

20 PART 3 - EXECUTION

21 GENERAL

22
23
24 The "Authorized" roofing contractor shall ensure strict compliance with FTR GS 02/13; General
25 Guide Specifications for Installation of FiberTite Roofing Systems.
26

27 The roofing contractor shall provide a suitable substrate surface for the proper installation of the
28 FiberTite Roofing System, roof insulation and specified components.
29

30 Application of Seaman Corporation/FiberTite materials constitutes an agreement that the
31 roofing contractor has inspected and found the substrate suitable for the installation of the
32 FiberTite Roofing System.
33

34 The roofing contractor shall coordinate the installation to ensure that the system remains
35 watertight at the end of each working day
36

37 SUBSTRATE PREPARATION

38
39 The roofing contractor shall verify that the deck condition and/or existing roof construction is
40 suitable for the specified installation of the FiberTite Roofing System.
41

42 Seaman Corporation requires fastener withdrawal values (pull out tests) on all roofing projects
43 to verify the suitability of decking to accept a mechanically fastened insulation and/or
44 membrane roof system.
45

46 Examine surfaces for inadequate anchorage, low areas that will not drain properly, foreign
47 material, ice, wet insulation, unevenness or any other defect which would prevent the proper
48 execution and quality application of the FiberTite Roofing System as specified.
49

1 Prepared substrate shall be smooth, dry, and free of debris and/or any other irregularities which
2 would interfere with the proper installation of the FiberTite Roofing System.

3
4 The application of adhesives directly to structural concrete, gypsum or Tectum may require
5 sealing or priming with an appropriate elastomeric or asphalt primer prior to application.

6
7 Adhesives will not bond to wet structural concrete.

8
9 Do not proceed with any part of the application until all defects and preparation work have been
10 corrected and complete.

11 12 SUBSTRATE PREPARATION (New Construction)

13 14 Steel Deck

15
16 Steel decking shall conform to Factory Mutual (FM) guidelines for Class-1 insulated
17 steel deck construction.

18
19 Steel decking shall be constructed of a minimum 22-gauge cold rolled steel sheets with
20 factory G-90 galvanized coating.

21
22 Panel profiles, (ribs) shall be formed to minimize deflection and provide suitable strength
23 and integrity to support anticipated structural live and dead loads.

24
25 Steel decking shall be installed in compliance with specified design criteria and local
26 building code requirements.

27
28 Steel decking that is less than 22-gauge may be considered for application by Seaman
29 Corporation. Fastener withdrawal tests shall be performed on all "Non-FM Approved"
30 steel decking, (decking less than 22-gauge) to determine suitability and appropriate
31 fastener patterns and densities for mechanical attachment of the new components of
32 the FiberTite Roofing System.

33 34 Structural Concrete (Poured and/or Precast)

35
36 Decking shall be installed in strict conformance with industry standards, practices and/or
37 precast panel manufacturer's installation requirements.

38
39 Decking shall be installed to provide positive slope and subsequent positive drainage of
40 the new FiberTite Roofing System.

41
42 Finished decking shall be properly cured and dry, prior to the installation of approved
43 insulation.

44 Finished surface(s) to receive new roof system shall be smooth and level without
45 significant surface depressions or irregularities. Camber differentials greater than 3/16
46 inch must be leveled using a cementitious grout.

47
48 Finished surfaces shall be free of moisture, dust, loose debris and any other irregularity
49 that may hinder the proper performance of the new FiberTite Roofing System.
50

1 Wood

2
3 Wood decking shall conform to Factory Mutual (FM) guidelines for Class-1 impregnated
4 wood decking. FM Class-1 decking consists of a minimum 2 inches thick wood plank or
5 minimum ¾ inch plywood.
6

7 Wood decking that is less than 0.75 inch will be considered for application by Seaman
8 Corporation. Fastener withdrawal tests shall be performed on all "Non-FM Approved"
9 wood decking (wood plank less than 2 inches thick or plywood less than 0.75 inch thick)
10 to determine suitability and appropriate fastener patterns for the components of the new
11 FiberTite Roofing System.
12

13 Wood decking shall be sound, well seasoned or kiln dried and of proper thickness to
14 accommodate design loads (including wind up-lift) according to specified design criteria
15 and/or local building code requirements.
16

17 Wood decking should be installed to provide positive slope and subsequent positive
18 drainage of the new FiberTite Roofing System.
19

20 Cementitious Fiber

21
22 Molded panels shall be installed in strict accordance with the manufacturer's installation
23 requirements.
24

25 Decking should be installed to provide positive slope and subsequent positive drainage
26 of the new FiberTite Roofing System.
27

28 Vertical alignment between adjacent panels shall provide a uniform substrate. Alignment
29 differences shall be no greater than 0.125 of an inch and shall be leveled with
30 cementitious grout.
31

32 Fastener withdrawal tests shall be performed on all cement fiber decking to determine
33 suitability for and appropriate fastener patterns for the components of the new FiberTite
34 Roofing System.
35

36 Gypsum Concrete

37
38 Gypsum decks shall be installed in strict accordance with standard industry practice, the
39 manufacturer's installation requirements and local building code requirements.
40

41 Decking should be installed to provide positive slope and subsequent positive drainage
42 of the new FiberTite Roofing System.
43

44 The gypsum fill shall be reinforced with wire mesh at a proper depth within the fill.
45

46 Finished decking shall maintain a minimum thickness (not including the form board) of 2
47 inches.
48

1 Fastener withdrawal tests shall be performed on all gypsum decking to determine
2 suitability and appropriate fastener patterns for the components of the new FiberTite
3 Roofing System.

4 5 WOOD NAILERS

6
7 Install treated lumber at the same heights as insulation layer or adjacent construction \pm 0.25
8 inch. Continuous treated wood nailers are to be installed at all perimeters, around roof
9 projections and penetrations as shown in approved details.

10
11 Where wood nailers are installed directly on the substrate, the substrate shall be carefully
12 examined to confirm that the entire area provides a suitable fastening surface. All defects shall
13 be repaired by the appropriate trade prior to installation.

14
15 Nailers shall be at least 3.5 inches wide and 1.5 inches high and installed and anchored in such
16 a manner to resist a force of 250 lbs. per linear foot of wood blocking in any direction.

17
18 Nailers along parapets, curbs and expansion joints are recommended for insulated decking.
19 Consult FiberTite Construction Details or FiberTite Technical Customer Services for
20 optional/alternate membrane termination/securement methods.

21 22 BASE SHEET

23 24 General

25
26 Approved base sheet, when required or specified, shall be applied only to properly
27 prepared and preapproved substrates.

28
29 Install no more than can be covered or made 100% water tight during the same working
30 day.

31
32 Field pull-out tests must be performed for mechanically attached base sheets to
33 determine fastener withdrawal performance.

34
35 Base sheets shall be installed starting at the low point of the roof deck.

36
37 Base sheet shall be side lapped, a minimum of 3 inches, and properly shingled to shed
38 water.

39 40 Mechanically Attached Base Sheet

41
42 All base ply fasteners and stress plates for the mechanical attachment of base sheets
43 shall be provided by Seaman Corporation.

44
45 For 1-90 attachment, approved base sheet is secured to the deck in the field of the roof,
46 with FiberTite Fasteners, spaced a maximum of 7 inches on center through the
47 minimum 3 inch side laps and staggered at a maximum 7 inch on center in two rows
48 within the field of the sheet.

1 The number of fasteners securing the base sheet shall be increased over the field
2 spacing by 70% in the perimeter and 160% in the corners of the roof area.

3
4 Fastening increases can be obtained by adding rows of fasteners and/or additional
5 fasteners along each row.
6

7 ROOF INSULATION

8 9 General

10
11 Roof insulation shall be installed where by the long dimension of the board(s) run in
12 parallel alignment and the short dimensions are staggered.
13

14 Insulation shall be installed with minimum joint dimensions and shall be tightly butted
15 where possible. Maximum joint widths shall be 0.375 of an inch. Damaged corners shall
16 be cut out and replaced with an insulation piece a minimum of 12" x 12". Pieces that are
17 cut from larger panels and are smaller than one square foot are not acceptable.
18

19 Install no more than can be covered during the same working day.
20

21 Taper roof insulation to drain sumps using tapered edge strips. If an insulation layer is
22 1.5 inches or less, taper 12 inches from the drain bowl. If insulation thickness exceeds
23 1.5 inches, taper 18 inches from the drain bowl. All taper boards or pieces must be
24 adhered or mechanically fastened with a minimum of two fasteners per board.
25

26 When a cover board and/or multiple layers are installed each layer shall be offset from
27 the previous layer a minimum of 12 inches on center.
28

29 At the end of each working day, provide a watertight cover on all unused insulation as to
30 avoid moisture penetration.
31

32 Mechanically Attached Insulation

33
34 Insulation shall be applied to and installed over properly prepared and pre-approved
35 substrates, free of any debris, dirt, grease, oil or moisture.
36

37 All fasteners and stress plates for the mechanical attachment of insulation and/or
38 coverboard materials shall be FTR Fasteners as provided by Seaman Corporation.
39

40 All fasteners and stress plates shall be Factory Mutual Research approved for
41 mechanical attachment of insulation and comply with FM Standard 4470 for corrosion
42 resistance.
43

44 1-90 attachment for insulation/coverboard in the field of the roof requires 1 fastener and
45 stress plate per 2 square feet of insulation, when the top layer is < 2 inches thick and
46 the membrane is adhered.
47

48 Perimeter areas require a 50% increase in the fastener density.
49

50 Corner areas require a 100% increase in the fastener density.

1
2 1-90 attachment for insulation/coverboard in the field of the roof requires 1 fastener and
3 stress plate per 4 square feet of insulation, when the top layer is ≥ 2 inches thick and
4 the membrane is adhered.

5
6 Perimeter areas require a 50% increase in the fastener density.

7
8 Corner areas require a 100% increase in the fastener density.

9
10 Roof insulation shall be fastened in accordance with the roof insulation manufacturer's
11 recommendations and must be approved by the FTCS.

12
13 Adhered roof systems incorporating mechanically attached insulations and coverboards
14 may require mechanically fastened perimeter and corner membranes systems to comply
15 with guidelines articulated in FM LPD 1-29.

16
17 Fasteners shall be installed in accordance with manufacturer's recommendations,
18 complying with minimum penetration requirements for specific deck types.

19
20 Fasteners shall be installed using depth sensing tool attachments to ensure proper
21 installation.

22 23 Adhered Insulation

24
25 General approvals for the attachment of the insulation layer(s) using adhesives in adhered
26 roofing systems are restricted to non-steel deck projects. The insulation/coverboard
27 manufacturer must recommend and approve the specific board and adhesive combination in
28 writing prior to Seaman Corporation granting approval for this method of securement for steel
29 deck applications.

30 31 Polyurethane Adhesive

32
33 Adhesive shall be applied only to properly prepared and preapproved substrates,
34 free of any debris, dirt, grease, oil or moisture.

35
36 The minimum product temperature at time of application shall be 70°F.

37
38 Adhesives shall not be applied when surface or ambient temperatures are below
39 40°F or above 110°F.

40
41 Insulation shall be fully bonded to the substrate with a maximum board size of 4'
42 x 4'.

43
44 Insulation shall be set into a continuous 0.5 inch bead of adhesive at a minimum
45 rate of one linear foot of adhesive for every one square foot of insulation board.

46
47 Adhesive rates are to be increased in roof perimeter and corner zones according
48 to specific project requirements and manufacturer's design recommendations.
49

1 Place the boards onto the adhesive beads and walk on the boards, spreading
2 the adhesive for maximum contact.

3
4 A second walking will be required after 10 minutes to ensure maximum contact
5 and bond strength.

6 7 INSTALLATION OF FIBERTITE® MEMBRANE(S)

8 9 Quality Control

10
11 It is the responsibility of the roofing contractor to initiate and maintain a Quality Control
12 program to govern all aspects of the installation of the FiberTite Roofing System.

13
14 The project foreman and or supervisor will be responsible for the daily execution of the
15 Quality Control program which will include but is not limited to the supervision,
16 inspection and probing of all heat welded seams incorporated within the FiberTite
17 Roofing System.

18
19 If inconsistencies in the quality of the application of the composite, membrane and/or
20 welds are found, all work shall cease until corrective actions are taken to ensure the
21 continuity the installation.

22 23 General

24
25 Work shall be coordinated to ensure that sequencing of the installation promotes a
26 100% watertight installation at the end of each day.

27
28 All FiberTite Roofing Systems shall be designed utilizing and determined to be in
29 compliance with the procedures outlined within the current publication of ASCE
30 Standard 7. Alternative designs may be determined using the criteria within Factory
31 Mutual Research Loss Prevention Data.

32
33 A FiberTite SMRP Roofing Systems shall utilize conventional roll goods.

34
35 Restrictions regarding outside ambient air temperature are relative only to the exposure
36 limits of the workers and/or adhesives when necessary.

37
38 When using adhesives outside ambient air temperature shall be above 40°F. Curing or
39 drying time of the adhesive will be affected by ambient temperatures and must be taken
40 into consideration when determining flashing lengths.

41
42 Humidity can affect the drying time of solvent borne adhesives and/or cause
43 condensation to form on the newly applied adhesive.

44
45 No moisture may be present on the adhesive(s) prior to mating or application of
46 FiberTite membranes.

47
48 FiberTite Roofing Systems shall only be installed over properly prepared and sound
49 substrates, free from excessive surface roughness, dirt, debris and moisture.

50

1 Adhered Membrane
2

3 The authorized roofing contractor shall assume full responsibility for any and all
4 irregularities, defects or quality issues that arise due to failure to following published
5 "installation guidelines" for the proper installation of adhered FiberTite membrane
6 roofing systems.
7

8 FiberTite Fleece Back Membrane Adhered with FTR-290 Adhesive
9

10 Nominal 50-mil FiberTite-XT with fleece backing.
11

12 For all FB membranes, unroll approximately 30 feet of the FiberTite-FB
13 membrane and position the roll over the properly installed/prepared substrate.
14 Pull the tail back over the roll to expose a workable area (approx. 30') of
15 substrate. Apply a 100% continuous/uniform coat of FTR-490 adhesive to the
16 substrate ahead of the roll.
17

18 Apply a 100% continuous coat of adhesive to the substrate.
19

20 The amount substrate that can be coated with a workable amount of adhesive
21 will be determined by application method, ambient temperature, humidity and
22 available manpower.
23

24 To ensure proper application and curing of the adhesive, the outside air
25 temperature shall be above 40°F and rising.
26

27 FTR-290 adhesive may be applied by spraying and back rolling or just rolling. Do
28 not dump adhesive or pour from the cans.
29

30 Roller applied adhesive shall utilize a solvent resistant 3/8 inch nap roller.
31

32 Spray applied adhesive must also be rolled out by roller to ensure a smooth,
33 even 100% coverage of the substrate with no voids, skips, globs, puddles or
34 similar irregularities.
35

36 Allow the solvents in the adhesive to slightly dissipate/cure only to the point that
37 the adhesive is sticky but still wet Do not allow adhesive to dry.
38

39 Adhesives shall not be installed over moist or wet substrates.
40

41 Broom the adhered portion of the membrane to ensure full contact and complete
42 the bonding process by firmly pressing the bonded membrane into place with a
43 weighted, foam-covered, lawn roller.
44

45 Repeat the process for the remaining unbonded portion of the membrane,
46 lapping subsequent, adjacent rolls of membrane a minimum of 3 inches,
47 ensuring proper shingling of the membrane to shed water along the laps.
48

1 No adhesive shall be applied to the lap seam areas of the membrane. Areas
2 contaminated with adhesive are difficult to clean, will impair proper welding of the
3 seams and require a membrane patch or strip.
4

5 Do not use bad or marginal adhesives. Contact FTCS if the quality of the
6 adhesive is suspect.
7

8 FiberTite Fleece Back Membrane Adhered in FTR-490 Adhesive

9 Nom 50-mil FiberTite-XT with fleece backing

10 For "all" FB membranes unroll approximately 30 feet of the FiberTite-FB
11 membrane and position the roll over the properly installed/prepared substrate.
12 Pull the tail back over the roll to expose a workable area (approx. 30') of
13 substrate.
14
15

16 Apply a 100% continuous coat of adhesive to the substrate.
17

18 The amount of substrate that can be coated with a workable amount of adhesive
19 will be determined by application method, ambient temperature, humidity, and
20 available manpower.
21

22 To ensure proper application and curing of the adhesive, the outside air
23 temperature shall be above 40°F and rising.
24

25 FTR-490 adhesive is to be applied by spraying and back rolling or just rolling. Do
26 not "dump" adhesive or pour from the cans.
27

28 Roller applied adhesive shall utilize a solvent resistant 3/8 inch nap roller.
29

30 Adhesive must be rolled out to ensure a smooth, even 100% coverage of the
31 substrate with no voids, skips, globs, puddles, or similar irregularities.
32

33 Allow the adhesive to set up only to the point that the adhesive is slightly cured
34 but still wet. Do not allow adhesive to skin or dry out.
35

36 Water borne adhesives (FTR-490) can be directly affected by moisture. Water
37 based adhesives shall not be installed over/on substrates that are moist or wet
38 or on systems or substrates that have residual moisture.
39

40 Broom the adhered portion of the membrane to ensure full contact and complete
41 the bonding process by firmly pressing the bonded membrane into place with a
42 weighted, foam-covered, lawn roller.
43

44 Repeat the process for the remaining un-bonded portion of the membrane,
45 lapping subsequent, adjacent rolls of membrane a minimum of 3 inches,
46 ensuring proper shingling of the membrane to shed water along the laps.
47
48

1 No adhesive shall be applied to the lap seam areas of the membrane. Areas
2 contaminated with adhesive are difficult to clean, will impair proper welding of the
3 seams and require a membrane patch.
4

5 Do not use bad or marginal adhesives. Contact FTCS if the quality of the
6 adhesive is suspect.
7

8 FiberTite Fleece Back Membrane Adhered in FiberTite CR-20 Adhesive

9 Nom 50-mil FiberTite-XT with fleece backing

10 For all FB membranes, unroll and position two rolls of FiberTite-FB over the
11 properly installed/prepared substrate.
12

13 Ensure rolls are straight and the minimum 3 inch overlap between rolls is
14 maintained.
15

16 Peel (butterfly) the rolls back in the long direction, half way upon themselves to
17 expose the substrate and the underlying polyester fleece backing.
18

19 Apply continuous spatter pattern of FiberTite CR-20 adhesive to the substrate
20 between the rolls; dispensing the adhesive in a spattered pop-corn spray pattern.
21

22 Spatter pattern shall achieve a nominal 80% coverage of textured coating at
23 approximately 0.25 of an inch nominal thickness. The balance of the substrate
24 will get coated as the adhesive spreads during the brooming and rolling process.
25 Avoid spattering the back of the fleeceback membrane.
26

27 Do not allow adhesive to contaminate membrane overlaps. Use a sheet of
28 insulation board to mask the spray area if required along adjoining membrane
29 areas.
30

31 Overspray may be cleaned immediately with acetone while the adhesive is still
32 wet.
33

34 Fold/maneuver the FB membrane into the wet adhesive, (approximate open time
35 for the adhesive is 5 to 10 minutes depending on environmental conditions)
36 avoiding wrinkles or air pockets in the FB membrane.
37

38 Broom the membrane into the wet adhesive and complete the bonding process
39 by firmly pressing the bonded membrane into place with a weighted, foam
40 covered lawn roller.
41

42 Repeat the process for the remaining unbonded portion of the membrane,
43 lapping subsequent, adjacent rolls of membrane a minimum 3 inches, ensuring
44 proper shingling of the membrane to shed water along the laps.
45

46 No adhesive shall be applied to the lap seam areas of the membrane. Areas
47 contaminated with adhesive are difficult to clean, may impair proper welding of
48 the seams and may require a membrane patch or strip.
49
50

1
2 FiberTite CR-20 adhesive is designed for use only when the substrate and
3 ambient temperatures are a minimum 40°F and rising and the chemical cylinders
4 are at least 70°F.

5
6 Do not use bad or marginal adhesives. Contact FTCS if the quality of the
7 adhesive is suspect.

8 9 Peel Stops for Adhered Roofing Systems

10
11 Seaman Corporation's standard Terms and Conditions for commercial warranties list
12 60-mph wind velocity as the first exclusion for wind events. Perimeter assurance or
13 restraint must be provided for any modification to the standard commercial warranty.

14
15 Assurance or restraint is accomplished using rows of fasteners, installed parallel to
16 exterior roof edges at a prescribed interval and fastener spacing to create a peel stop
17 during a significant wind event.

18
19 Peel stops must be mechanically attached into or through the structural decking with
20 rows of Magnum stress plates and fasteners, (or authorized alternate) at 12 inches on
21 center. The peel stop is sealed by heat welding a nominal 6 inch strip of membrane over
22 the fasteners.

23
24 Lightweight insulating concrete is generally not considered a structural component and
25 peel stop fastening must penetrate through the lightweight into the structural
26 component.

27 Peel Stop(s) are only required by Seaman Corporation on adhered projects requiring
28 peak gust wind speed warranties greater than the default 60-mph articulated in the
29 standard commercial warranty.

30
31 Although not required for standard commercial warranties, it is recommended that
32 projects subject to the possibility of a significant wind event (hurricanes) should
33 incorporate the use of peel stops in the roof system design.

34
35 The following are "general" guidelines for the use and inclusion of peel stops in adhered
36 FiberTite Roofing Systems. Peel stop intervals are based upon the field pressure and
37 are as follows;

38
39 Buildings with Design Velocity Pressure less than: -45 psf (FM 1-90). No peel
40 stop.

41
42 Buildings with Design Velocity Pressure greater than: -45 psf (FM 1-90) but less
43 than or equal to -52.5 (FM 1-105). One peel stop at 18 inches from all edges.

44
45 Buildings with Design Velocity Pressure greater than: -52.5 (FM 1-105) but less
46 than or equal to: -60 psf (FM 1-120). One peel stop at 18 inches from all edges
47 and the second peel stop at 3 feet from all edges.

48
49 Buildings with Design Velocity Pressure greater than: -60 (FM 1-120 but less
50 than or equal to: -67.5 psf (FM 1-135). One peel stop at 18 inches from all

1 edges and the second peel stop at 3 feet from all edges and the third peel stop
2 at 6 feet from all edges.

3
4 Buildings with Non Class 1 decking (i.e. lightweight, wood, gypsum, and
5 cementitious wood fiber) do not default to the above requirements and require
6 additional evaluation and engineering review by FTCS.

7 8 WELDING

9 10 General

11
12 All field seams exceeding 10 feet in length shall be welded with an approved automatic
13 welder.

14
15 All field seams must be clean and dry prior to initiating any field welding.

16
17 Remove foreign materials from the seams (dirt, oils, etc.) with acetone or authorized
18 alternative.

19
20 Use CLEAN WHITE COTTON cloths and allow approximately five minutes for solvents
21 to dissipate before initiating the automatic welder. Do not use denim or synthetic rags
22 for cleaning.

23
24 Contaminated areas within a membrane seam will inhibit proper welding and will require
25 a membrane patch.

26
27 All welding shall be performed only by qualified personnel to ensure the quality and
28 continuity of the weld.

29 30 Hot Air Hand Welding

31
32 The lap or seam area of the membrane may be intermittently tack welded to hold the
33 membrane in place.

34
35 The back interior edge of the membrane shall be welded first, with a thin, continuous
36 weld to concentrate heat along the exterior edge of the lap during the final welding pass.

37
38 The nozzle of the hand held hot air welder shall be inserted into the lap at a 45° angle to
39 the lap. Once the polymer on the material begins to flow, a hand roller shall be use to
40 apply pressure at a right angle to the tip of the hand welder. Properly welded seams
41 shall utilize a 1.5 inch wide nozzle, to create a homogeneous weld, a minimum of 1.5
42 inches in width.

43
44 Smaller nozzles may be used for corners, and other field detailing, maintaining a
45 minimum 1 inch weld.

46 47 Automatic Hot Air Machine Welding

48
49 Proper welding of the FiberTite Membrane can be achieved with a variety of automatic
50 welding equipment. Contact FTCS for specific recommendations.

1
2 Follow all manufacturers' instructions for the safe operation of the automatic welder.

3
4 Follow local code requirements for electric supply, grounding and surge protection.

5
6 The use of a dedicated, portable generator is highly recommended to ensure a
7 consistent electrical supply, without fluctuations that can interfere with weld consistency.

8
9 Properly welded seams shall utilize a 1.5 inch wide nozzle, to create a homogeneous
10 weld, a minimum of 1.5 inches in width.

11
12 INSTALLATION OF SIMULATED METAL ROOFING PROFILE

13
14 Preparation

15
16 The ornamental nature of the SMRP places a high value on the aesthetics of the
17 finished roof system.

18
19 The surface of the FiberTite fleece back membrane shall be clean and dry for the proper
20 installation of the SMRP.

21
22 The SMRP shall be installed in equidistant and parallel lengths – alignment errors will be
23 visible at ground level.

24
25 Best spacing of the SMRP is determined by using incremental distances between fleece
26 back membrane laps.

27
28 Installation of SMRP at overlaps will be nominally spaced at 69 inch intervals.

29
30 Cut and/or preassemble SMRP to desired lengths.

31
32 Segments of SMRP can be joined using a plastic dowel.

33
34 Using washable chalk, snap/mark lines at predetermined/specified intervals between the
35 overlaps.

36
37

<u>Number of Interval Segments Of SMRP's Between Overlaps</u>	<u>Nominal "on center" Distance Between SMRP's</u>
1	34.50"
2	23.00"
3	17.25"

38
39
40
41
42
43

44 Application

45
46 Unroll the FiberTite Rib Profile and place next to the chalk line/or membrane overlap
47 edge.

48
49 Position SMRP so the bottom of the SMRP is lying flat and free to tension.
50

1 Once Aligned, adhere the beginning (2" - 4") of the SMRP to the fleece back roofing
2 membrane.

3
4 Pull the SMRP taught, aligned to the chalk line to keep the profile straight for the welder.

5
6
7 Using a hot air apparatus, adhere the SMRP's continuous, straight and parallel.

8
9 Do not overheat the fleece back membrane while adhering the heat activated adhesive
10 strip on the SMRP.

11
12 Do not install the SMRP on or over welded overlaps.

13
14 Do not rush the heat activation process and take time necessary to ensure aesthetics
15 are achieved.

16
17 SMRP splice joints and exposed ends can be detailed by using/welding small
18 strips/pieces of the same colored membrane.

19
20 Inspection

21
22 The job foreman and/or supervisor shall initiate daily inspections of all completed work
23 which shall include, but is not limited to the probing of all field welding with a dull pointed
24 instrument to assure the quality of the application and ensure that any equipment or
25 operator deficiencies are immediately resolved.

26
27 Ensure that all aspects of the installation (sheet layout, attachment, welding, flashing
28 details, etc.) are in strict accordance with the most current FiberTite Roofing Systems
29 Specifications and Details.

30
31 Excessive patching of field seams because of inexperienced or poor workmanship will
32 not be accepted at time of FINAL INSPECTION FOR WARRANTY ACCEPTANCE.

33
34 Any deviation from pre-approved specifications and/or details requires written
35 authorization from the FTCS prior to application to avoid any warranty disqualification.

36
37 It is the contractor, job foreman, and supervisor and/or quality control personnel's
38 responsibility to perform a final self inspection on all seams prior to requesting the
39 inspection for warranty issuance by the FTCS.

40
41 T-Joint Cover Installation

42
43 Installation of T-Joint Covers is mandatory on all FiberTite Membrane Systems greater
44 than nominal 50 mil, vegetated roofs, ballast roofs or where T-Joints have not been
45 properly sealed to exhibit a minimum 1.5" defined crease along the T-Joint.

46
47 Install T-Joint Covers, centered and aligned so edges are parallel to roof system seams.

48
49 The T-Joint Cover shall be 100% welded.
50

1 FLASHING

2
3 Clean all vents, pipes, conduits, tubes, walls, and stacks to bare metal. All protrusions must be
4 properly secured to the roof deck with approved fasteners. Remove and discard all lead, pipes
5 and drain flashing. Flash all penetrations according to approved details.

6
7 Remove all loose and/or deteriorated cant strips and flashings.

8
9 Flash all curbs, parapets and interior walls in strict accordance with approved FiberTite details.

10
11 All flashing shall be adhered to properly prepared, approved substrate(s) with FTR-190e
12 adhesive or FTR-201 mastic applied in sufficient quantity to ensure total adhesion.

13
14 The base flange of all membrane flashing shall extend out on to the plane of the deck, beyond
15 the wood nailers to a maximum width of 8 inches.

16
17 Vertical flashing shall be terminated no less than 8 inches above the plane of the deck with
18 approved termination bar and counter-flashing or metal cap flashing.

19
20 When using FTR-201 as the adhesive, vertical wall flashing termination shall not exceed 40
21 inches without supplemental mechanical attachment of the flashing between the deck and the
22 termination point of the flashing.

23
24 Complete all inside and outside corner flashing details with FiberTite preformed corners or an
25 approved field fabrication detail.

26
27 Probe all seams with a dull, pointed probe to ensure the weld has created a homogeneous
28 bond.

29
30 Install penetration accessories in strict accordance with approved details. Ensure penetration
31 accessories have not impeded in any way the working specification. Refer to the related trade
32 for the technical specification.

33
34 METAL FLASHING

35
36 All perimeter edge details are to be fabricated from FiberClad Metal or utilize a prefabricated
37 FiberTite Fascia System.

38
39 Ensure all fascias extend a minimum of 2 inches lower than the bottom of the wood nailers.

40
41 Fasten all metal flashing to wood nailers or approved substrate with approved fasteners 8
42 inches on center.

43
44 Break and install FiberClad metal in accordance with approved details, ensuring proper
45 attachment, maintaining 1/2 inch expansion joints and the installation of a minimum 2 inch bond
46 breaker tape prior to sealing the joint.

47
48 Solidly weld FiberClad expansion joints with a 6 inch strip of FiberTite membrane welded to the
49 Fiber Clad, covering the bond breaker tape (cover plates are optional).

1 Roof Drains

2
3 Flash all roof drains in accordance with FiberTite roof drain details.

4
5 Replace all worn or broken parts that may cut the FiberTite membrane or prevent a
6 watertight seal. This includes the clamping ring and strainer basket.

7
8 Replace all drain bolts or clamps used to hold the drain compression ring to the drain
9 bowl.

10
11 FiberTite non-reinforced 60-mil membrane shall be used for flashing the drain assembly.
12 Drain assemblies and basins or sumps must be free of any asphalt or coal tar pitch
13 residue prior to installation.

14
15 The drain target sheet should be sized and installed to provide for a minimum of 12
16 inches of exposed 60-mil on all sides of the drain.

17
18 Pitch Pans

19
20 EVERY REASONABLE effort shall be made to eliminate the need for pitch pans
21 including the removal of all existing pans. Contact FTCS for specific design alternatives
22 and recommendations.

23
24 In the event of no alternative, fabricate pitch pans from FiberClad metal, installed in
25 accordance with FiberTite details, ensuring proper attachment, maintaining a minimum
26 of 2 inch clearance around the penetration.

27
28 Pitch Pans shall be filled with non-shrinking grout to within 1 inch of the top of the pan.
29 Allow the grout to dry and fill remainder of the pan with FTR-SLS pourable sealant.

30
31 Pitch Pans and the sealant will require periodic maintenance by the building owner's
32 maintenance personnel.

33
34 EXPANSION JOINTS

35
36 Flash all expansion joints in accordance with authorized details. Fasten all expansion joint
37 material according to FiberTite specifications. Ensure the expansion material has sufficient
38 material to expand to the widest point in expansion without causing undue stress on the
39 expansion joint material.

40
41 If the expansion joint is a preformed system, the manufacturer, description and a drawing
42 illustrating the method of installation must be included when the (FTR-PIN) is submitted.

43
44 SEALANTS

45
46 Apply authorized sealant(s) to all surface mounted reglets and per project requirements.
47 Sealant(s) are to shed water. Follow all manufacturer's instructions and installation guides.

48
49 Use primer when recommended by the manufacturer.

1 Sealants will require periodic maintenance by the building owner's maintenance personnel.

2 3 TEMPORARY SEALS

4
5 At the end of each working day or at the sign of rain, install temporary, 100% watertight seal(s)
6 where the completed new roofing adjoins the uncovered deck or existing roof surface.

7
8 The authorized roofing contractor shall create and maintain the temporary seal in such a
9 manner to prevent water from traveling beneath the new and/or existing roof system.

10
11 The use of plastic roofing cement is permissible when sealing to an existing built up roof.

12
13
14 If water is allowed to enter beneath the newly completed roofing, the affected area(s) shall be
15 removed and replaced at no additional expense to the building owner.

16
17 Prior to the commencement of work, cut out and remove all contaminated membrane,
18 insulation, roof cement or sealant and properly dispose of off site.

19 20 WALKWAYS

21
22 FiberTite walkways and protection pads shall be installed at staging areas for rooftop
23 equipment maintenance or areas subject to regular foot traffic.

24 25 Walkway Installation

26
27 Roofing membrane to receive walkway material shall be clean and dry.

28
29 Cut and position the FiberTite walkway material as directed by the specifications or
30 agreement.

31
32 Hot air weld the entire perimeter of the walk way to the previously cleaned FiberTite
33 roofing membrane. Avoid excessive heating of the walk way material to prevent
34 scorching the underlying roofing membrane.

35 36 Protection Pad Installation

37
38 Roofing membrane to receive protection pad material shall be clean and dry.

39
40 Prior to installing the FiberTite protection pads (0.25" x 2' x 4'), weld a 6" x 6" strip of
41 FiberTite membrane to each of the four corners of the back side of the pad. Position the
42 strips in such a way that they overhang the edge of the pad a minimum of 2 inches
43 around the 90° corner.

44
45 Position the FiberTite protection pads as directed by the specifications or agreement
46 and weld the visible portion of the previously applied stripping to the FiberTite roofing
47 membrane.

48 49 LIGHTNING PROTECTION

1 The installation of lightning protection must be coordinated with the authorized FiberTite roofing
2 contractor, certified lightning contractor and the building owner.

3
4 The lightning protection must be installed in such a manner that base plates, air terminals and
5 cables do not penetrate the roofing membrane without the use of pre-approved flashing details.
6

7 Cables and air terminals may be attached to the membrane using base plates and an approved
8 construction adhesive or by welding intermittent strips of FiberTite membrane over the base
9 plates and cables to the FiberTite roofing. Contact FTCS for specific adhesive
10 recommendations.

11
12 Recommendations regarding the selection of adhesives or alternative affixing of lightning
13 protection systems to the FiberTite membrane does not in any way imply a warranty covering
14 their performance or ability of the adhesives to remain affixed to the FiberTite membrane.
15

16 COMPLETION

17
18 Remove any and all debris, excess materials and scrap of any kind from the roof and
19 surrounding premises prior to demobilization.
20

21 Inspect all field welds, detailing and terminations to ensure a 100% the watertight installation.
22

23 WARRANTY INSPECTION

24
25 Upon completion of the project, the authorized roofing contractor shall complete and submit the
26 FiberTite Notice of Completion to FTCS.
27

28 Upon receipt of the notice of completion, a FTCS representative will schedule an inspection with
29 a representative of the authorized roofing contractor to thoroughly review the installation and
30 verify compliance with Seaman Corporation specifications.
31

32 Any corrections or modifications necessary for compliance with the specifications and
33 acceptance for warranty (punch list) will be noted on the Final Inspection for Warranty Form.
34

35 Upon completion of all punch list items and final acceptance of the installation, a warranty as
36 authorized by the approved Seaman Corporation/FiberTite Preinstallation Notice will be issued.
37
38
39

40 END OF SECTION

1 SECTION 076200 - SHEET METAL FLASHING AND TRIM

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and General Provisions of the Contract, including General and Special Conditions,
9 and Divisions 0 and 1 Specification Sections,.

10
11 SUMMARY

12
13 This Section includes the following:

14
15 Metal counter flashing; and base flashing (if any)

16
17 Metal wall flashing

18
19 Exposed metal trim/fascia

20
21 Metal cap flashings and coping

22
23 Miscellaneous sheet metal accessories

24
25 Gutters and downspouts

26
27 Integral masonry flashings are specified as masonry work in sections of Division 4.

28
29 Roofing accessories which are installed integral with roofing membrane are specified in roofing
30 system sections as roofing work.

31
32 QUALITY ASSURANCE

33
34 Quality standard SMACNA's Architectural Sheet Metal Manual.

35
36 Warranty:

37
38 Fluoropolymer Finish: 10 years

39
40 SUBMITTALS:

41
42 Product Data; Gutters, Downspouts, and Accessories: Manufacturer's technical product data,
43 installation instructions and general recommendations for each specified sheet material and
44 fabricated product.

45
46 Samples of the following roof apron, fascia, gutter, downspout and accessory items:

47
48 12-inch long samples of factory-fabricated products exposed as finished work. Provide
49 complete with specified factory finish.

1
2 PROJECT CONDITIONS

3
4 Coordinate work of this section with interfacing and adjoining work for proper sequencing of
5 each installation. Ensure best possible weather resistance and durability of work and protection
6 of materials and finishes.
7

8
9 PART 2 - PRODUCTS

10
11 SHEET METAL FLASHING AND TRIM MATERIALS

12
13 Aluminum: ASTM B 209, alloy 3003, temper H14.
14

15 ROOF DRAINAGE SHEET METAL FABRICATIONS

16
17 Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other
18 accessories as required. Fabricate in minimum 96-inch long sections. Furnish flat-stock gutter
19 spacers and gutter brackets fabricated from same metal as gutters, of size recommended by
20 SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-
21 joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
22

23 Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with
24 metal hangers, from same material as downspouts, and anchors.
25

26 Hanger Style

27
28 Fabricate from the following materials:

29
30 Aluminum: .040
31

32 Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to
33 exterior, 4-inch wide wall flanges to interior, and base extending 4 inches beyond cant or
34 tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from
35 the following materials:
36

37 Aluminum: 0.032 inch
38

39 Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of
40 dimensions and shape indicated complete with outlet tubes, exterior flange trim, and built-in
41 overflows. Fabricate from the following materials:
42

43 Aluminum: 0.032 inch
44

45 Splash Pans: Fabricate from the following materials:

46
47 Aluminum: 0.040 inch
48

49 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

1
2 Roof-Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch long, but not
3 exceeding 10-foot long, sections. Furnish with 6-inch wide, joint cover plates. Fabricate from
4 the following materials:

5
6 Aluminum: 0.050 inch
7

8 Copings: Fabricate in minimum 96-inch long, but not exceeding 10-foot long, sections.
9 Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support
10 edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal,
11 and solder or weld watertight. Fabricate from the following materials:

12
13 Aluminum: 0.050 inch
14

15 Base Flashing: Fabricate from the following materials:

16
17 Aluminum: 0.040 inch
18

19 Counterflashing and Flashing Receivers: Fabricate from the following materials:

20
21 Aluminum: 0.032 inch
22

23 Roof-Penetration Flashing: Fabricate from the following materials:

24
25 Stainless Steel: 0.019 inch
26

27 Roof-Drain Flashing: Fabricate from the following materials:

28
29 Stainless Steel: 0.016 inch
30

31 Finishes: Fluorocarbon coating, inhibitive thermo-cured primer, 0.2 min. mil dry film thickness,
32 and thermo-cured fluorocarbon coating containing "Kynar 500" resin, 1.0 mil min. dry film
33 thickness. Color selected from metal manufacturer's standard color selections.
34

35 Miscellaneous Materials and Accessories:
36

37 Fasteners: Same metal as flashing/sheet metal or, other non- corrosive metal as recommended
38 by sheet manufacturer. Match finish of exposed heads with material being fastened.
39

40 Bituminous Coating: SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur,
41 compounded for 15-mil dry film thickness per coat.
42

43 Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of
44 components being sealed and complying with requirements for joint sealants as specified in
45 Division 7 Section "Joint Sealers".
46

47 Adhesives: Type recommended by flashing or roofing sheet manufacturer for
48 waterproof/weather-resistant seaming and adhesive application of flashing sheet.
49

1 Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory
2 units as required for installation of work, matching or compatible with material being installed,
3 non-corrosive, size and gage required for performance.

4 5 FABRICATED UNITS

6
7 General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with
8 details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal
9 Manual" and other recognized industry practices. Fabricate for waterproof and weather-
10 resistant performance; with expansion provisions for running work, sufficient to permanently
11 prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with
12 material manufacturer instructions and recommendations for forming material. Form exposed
13 sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels
14 indicated, with exposed edges folded back to form hems. Form metal fascias and cooping to
15 radii indicated on drawings by actually bending or curving metal sections. Segmented
16 connections of straight pieces are accepted.

17
18 Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. For metal other than
19 aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy
20 seam sealer; rivet joints for additional strength where required.

21
22 Provide copings which are designed and fabricated to fit applications indicated and to perform
23 optimally with respect to weather resistance, water tightness, durability, strength, and uniform
24 appearance. See drawings for joint locations.

25
26 Expansion Provisions: Fabricate copings to allow controlled expansion in running lengths not
27 only for movement of metal components in relationship to one another but also to adjoining
28 dissimilar materials, including flashing and roofing membrane materials, in a manner which is
29 sufficient to prevent water leakage, deformation or damage.

30
31 Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper
32 performance of work, form metal to provide for proper installation of elastomeric sealant, in
33 compliance with SMACNA standards.

34
35 Separations: Provide for separation of metal from non-compatible metal or corrosive substrates
36 by coating concealed surfaces at locations of contact, with bituminous coating or other
37 permanent separation as recommended by manufacturer/fabricator.

38 39 40 PART 3 - EXECUTION

41 42 INSTALLATION REQUIREMENTS

43
44 General: Comply with manufacturer's written installation instructions and recommendations.
45 Coordinate with installation of roof deck and other substrates to receive work of this section,
46 with roof insulation, roofing membrane, flashing, and wall construction; as required to ensure
47 that each element of the work performs properly, and that combined elements are waterproof
48 and weathertight. Anchor products included in this section securely to structural substrates,

1 adequate to withstand lateral and thermal stresses as well as inward and outward loading
2 pressures.

3
4 Isolation: Where metal surfaces of units are installed in contact with dissimilar metal or
5 corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or
6 provide other permanent separation as recommended by aluminum producer.

7
8 Bed flanges of work in a thick coat of sealant compatible with rubber roofing manufacturer
9 cement where required for waterproof performance.

10
11 Screw flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c.
12 Fabricate seams at joints between units with minimum 3 inch overlap, to form a continuous,
13 waterproof system.

14
15 Caulk as required to prevent leakage.

16
17 CLEANING AND PROTECTION

18
19 Clean exposed metal surfaces, removing substances which might cause corrosion of metal or
20 deterioration of finishes.

21
22 Protection: Advise Contractor of required procedures for surveillance and protection of
23 flashings and sheet metal work during construction, to ensure that work will be without damage
24 or deterioration, other than natural weathering at time of substantial completion.

25
26
27
28 END OF SECTION

1 SECTION 078413 - PENETRATION FIRESTOPPING

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 DEFINITIONS

12
13 Firestopping: Material or combination of materials used to retain integrity of fire-rated construction
14 by maintaining an effective barrier against the spread of flame, smoke, and hot gases through
15 penetrations in fire rated wall and floor assemblies.

16
17 SUMMARY

18
19 Only tested firestop systems shall be used in specific locations as follows:

20
21 Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways
22 and raceways through fire rated vertical barriers (walls and partitions), horizontal barriers
23 (floor/ceiling assemblies), and vertical service shaft walls and partitions.

24
25 Openings between structurally separate sections of wall or floors.

26
27 Gaps between the top of walls and ceilings or roof assemblies.

28
29 Expansion joints in walls and floors.

30
31 Openings and penetrations in fire rated partitions or walls containing fire doors.

32
33 Openings around structural members which penetrate floors or walls.

34
35 RELATED SECTIONS

36
37 Coordinate work of this section with work of other sections as required to properly execute the work
38 and as necessary to maintain satisfactory progress of the work of other sections, including:

39
40 Division 7 Section "Joint Sealants"

41
42 Division 9 Section "Gypsum Board"

43
44 Division 21, 22, 23 and 26 Sections

45
46 REFERENCES

47
48 Test Requirements: ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire
49 Stops" (July 1997).

1 Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL
2 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

3
4 UL Fire Resistance Directory:

5
6 Through-Penetration Firestop Devices (XHCR)
7 Fire Resistance Ratings (BXUV)
8 Through-Penetration Firestop Systems (XHEZ)
9 Fill, Voids, or Cavity Material (XHHW)
10 Forming Materials (XHKU)

11
12 Test Requirements: UL 2079, "Tests for Fire Resistance of Building Joint Systems" (July
13 1998.)

14
15 International Firestop Council Guidelines for Evaluating Firestop Systems Engineering
16 Judgments.

17
18 ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building
19 Materials.

20
21 OBC and IBC building codes.

22
23 NFPA 101 - Life Safety Code

24
25 NFPA 70 - National Electric Code

26
27 QUALITY ASSURANCE

28
29 A manufacturer's direct representative (not distributor or agent) shall be on-site during initial
30 installation of firestop systems to train appropriate contractor personnel in proper selection and
31 installation procedures. All work shall be done per manufacturer's written recommendations
32 published in their literature and drawing details.

33
34 Fire Test Response Characteristics: UL, Intertek ETL SEMKO or FM Global.

35
36 Provide products with ratings of a minimum of one (1) hour but not less than the fire resistance
37 rating of the assembly being penetrated. Products shall comply with the following:

38
39 Penetrations in Fire Resistance Rated Walls: F- ratings per ASTM E 814 or UL 1479.

40
41 Penetrations in Horizontal Assemblies: F- and T- ratings per ASTM E 814 or UL 1479.

42
43 Penetrations in Smoke Barriers: L- ratings per UL 1479.

44
45 W- Ratings: per UL 1479

46
47 Joints in or between Fire Resistance Rated Construction: ASTM E 1966 or UL 2079.

48
49 Joints at Exterior Curtain Wall/Floor Intersections: ASTM E 119 or ASTM E 2307.

1 Proposed materials and methods shall conform to applicable governing codes having local
2 jurisdiction.

3

4 Firestop Systems do not reestablish the structural integrity of load-bearing partitions/assemblies,
5 or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating
6 any load bearing assembly.

7

8 For those firestop applications that exist for which no UL tested system is available through a
9 manufacturer, an engineering judgment derived from similar UL system designs or other tests shall
10 be submitted to local authorities having jurisdiction for their review and approval prior to installation.
11 Engineer judgment drawings must follow requirements set forth by the International Firestop
12 Council (September 7, 1994, as may be amended from time to time).

13

14 SUBMITTALS

15

16 Submit Product Data: Manufacturer's specifications and technical data for each material including
17 the composition and limitations, documentation of UL firestop systems to be used and
18 manufacturer's installation instructions.

19

20 Manufacturer's engineering judgment identification number and drawing details when no UL system
21 is available for an application. Engineer judgment must include both project name and contractor's
22 name who will install firestop system as described in drawing.

23

24 Submit material safety data sheets provided with product delivered to job-site.

25

26 Product Data: For each type of product indicated.

27

28 INSTALLER QUALIFICATIONS

29

30 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping
31 manufacturer as having been provided the necessary training to install manufacturer's products per
32 specified requirements. A supplier's willingness to sell its firestopping products to the Contractor
33 or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

34

35 DELIVERY, STORAGE, AND HANDLING

36

37 Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with
38 brand, type, and UL label where applicable.

39

40 Coordinate delivery of materials with scheduled installation date to allow minimum storage time at
41 job-site.

42

43 Store materials under cover and protect from weather and damage in compliance with
44 manufacturer's requirements, including temperature restrictions.

45

46 Comply with recommended procedures, precautions or remedies described in material safety data
47 sheets as applicable.

48

49 Do not use damaged or expired materials.

1 PROJECT CONDITIONS

2
3 Do not use materials that contain flammable solvents.

4
5 Schedule installation of firestopping after completion of penetrating item installation but prior to
6 covering or concealing of openings.

7
8 Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions
9 before proceeding.

10
11 Weather conditions: Do not proceed with installation of firestop materials when temperatures
12 exceed the manufacturer's recommended limitations for installation printed on product label and
13 product data sheet.

14
15 During installation, provide masking and drop cloths to prevent firestopping materials from
16 contaminating any adjacent surfaces.

17
18
19 PART 2 - PRODUCTS

20
21 FIRESTOPPING, GENERAL

22
23 Provide firestopping composed of components that are compatible with each other, the substrates
24 forming openings, and the items, if any, penetrating the firestopping under conditions of service and
25 application, as demonstrated by the firestopping manufacturer based on testing and field
26 experience.

27
28 Provide components for each firestopping system that are needed to install fill material. Use only
29 components specified by the firestopping manufacturer and approved by the qualified testing
30 agency for the designated fire-resistance-rated systems.

31
32 Firestopping materials are either "cast-in-place" (integral with concrete placement) or "post
33 installed." Provide cast-in-place firestop devices prior to concrete placement.

34
35 MANUFACTURERS

36
37 Subject to compliance with through penetration firestop systems (XHEZ) and joint systems (XHBN)
38 listed in Volume II of the UL Fire Resistance Directory, provide products of the following
39 manufacturers:

- 40
41 Hilti, Inc., Tulsa, Oklahoma, (800) 879-8000
42 Tremco Sealants & Coatings, Beachwood, Ohio, (216) 292-5000
43 3M Fire Protection Products, St. Paul, Minnesota, (612) 736-0203
44 Nelson Firestop Products, Tulsa, Oklahoma, (918) 641-7299
45 Fox Couplings, Inc., Jacksonville, Florida, (904) 396-2865
46 Proset Systems Inc., Lawrenceville, Georgia, (800) 262-5355

47
48 MATERIALS

1 Use only firestop products that have been UL 1479, ASTM E-814 tested for specific fire rated
2 construction conditions conforming to construction assembly type, penetrating item type, annular
3 space requirements, and fire-rating involved for each separate instance.

4
5 Cast-in-place firestop devices are installed prior to concrete placement for use with non-
6 combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete
7 floors, the following products are acceptable:

8
9 Hilti CP 680 Cast-In Place Firestop Device
10 Fox Coupling, Inc. "Cast-In-Place Firestop Coupling".
11 Proset Cast-In-Place Device
12 Tremco "Fyre Can" Cast-in-Place Device"

13
14 Sealant or caulking materials for use with non-combustible items including steel pipe, copper pipe,
15 rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

16
17 Hilti FS-ONE Intumescent Firestop Sealant
18 3M Fire Barrier CP25 or Firestop Sealant 2000
19 Tremco Fyre Shield
20 Nelson LBS Sealant

21
22 Sealant or caulking materials for use with sheet metal ducts, the following products are acceptable:

23
24 Hilti CP 601S Elastomeric Firestop Sealant
25 Hilti CP 606 Flexible Firestop Sealant
26 Tremco Fyre-Shield High Performance Ceramic Firestop Sealant
27 3M Fire Barrier 1000 / 1003 / 2000 / 2003
28 Nelson FSP Putty

29
30 Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the
31 following products are acceptable:

32
33 Hilti CP 672 Speed Spray
34 Hilti CP 601S Elastomeric Firestop Sealant
35 Hilti CP 606 Flexible Firestop Sealant
36 3M FireDam Spray
37 3M Fire Barrier 1000 / 1003 / 2000 / 2003

38
39 Preformed mineral wool designed to fit flutes of metal profile deck; as a backer for spray material.

40
41 Hilti CP 777 Speed Plugs
42 Equivalent products listed in the U.L. Fire Resistance Directory – Volume 2.

43
44 Intumescent sealant or caulking materials for use with combustible items (penetrants consumed
45 by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable
46 bundles and plastic pipe, the following products are acceptable:

47
48 Hilti FS-ONE Intumescent Firestop Sealant
49 3M Fire Barrier CP25WB+

1 Tremco Intumescent Acrylic or TremStop WBM
2 Nelson LBS Sealant

3
4 Intumescent sealant, caulking or putty materials for use with flexible cable or cable bundles, the
5 following products are acceptable:

6
7 Hilti FS-ONE Intumescent Firestop Sealant
8 Hilti CP 618 Firestop Putty Stick
9 Tremco TremStop IA Intumescent Acrylic Firestop Sealant
10 3M Moldable Putty+
11 Nelson FSP Firestop Putty

12
13 Wall opening protective materials for use with UL listed metallic and specified nonmetallic outlet
14 boxes, the following products are acceptable:

15
16 Hilti CP 617 Firestop Putty Pad
17 3M Putty+ Pad
18 Nelson FSP Putty

19
20 Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and
21 open piping systems), the following products are acceptable:

22
23 Hilti CP 642 and CP643 Firestop Collars
24 Hilti CP 645 Wrap Strip
25 Tremco TREMstop D Combustible Pipe Intumescent Device System and TremStop WS
26 Wrap Strip
27 3M FS-195 Wrap Strip / Ultra GS
28 Nelson PCS Plastic Pipe Choke System and WRS Wrap Strip

29
30 Materials used for large size/complex penetrations made to accommodate cable trays, multiple
31 steel and copper pipes, electrical busways in raceways, the following products are acceptable:

32
33 Hilti CP 637 Trowelable Firestop Compound
34 Hilti FS 657 FIRE BLOCK
35 Tremco TremStop M Fire Rated Mortar and PS Pillows
36 3M CS-195+ Composite Sheet
37 Nelson CMP Firestop Compound and PLW Firestop Pillows

38
39 Non curing, re-penetrable materials used for large size/complex penetrations made to
40 accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways, the
41 following products are acceptable:

42
43 Hilti FS 657 FIRE BLOCK
44 Tremco PS Firestop Pillows
45 3M CS Intumescent Sheet
46 Nelson PLW Firestop Pillows
47

1 Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E814. The F rating
2 must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being
3 penetrated.

4 5 6 PART 3 - EXECUTION

7 8 PREPARATION

9
10 Verification of Conditions: Examine areas and conditions under which work is to be performed and
11 identify conditions detrimental to proper or timely completion.

12
13 Verify penetrations are properly sized and in suitable condition for application of materials.

14
15 Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust,
16 laitance, release agents, water repellents, and any other substances that may affect proper
17 adhesion.

18
19 Provide masking and temporary covering to prevent soiling of adjacent surfaces by
20 firestopping materials.

21
22 Comply with manufacturer's recommendations for temperature and humidity conditions
23 before, during and after installation of firestopping.

24
25 Do not proceed until unsatisfactory conditions have been corrected.

26 27 COORDINATION

28
29 Coordinate location and proper selection of cast-in-place firestop devices with trade responsible
30 for the work. Ensure devices are installed before placement of concrete.

31
32 Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-
33 place firestop devices without interferences.

34 35 INSTALLATION

36
37 Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance
38 Directory.

39
40 Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-
41 penetration joint materials.

42
43 Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

44
45 Consult with Mechanical Engineer, Project Manager and damper manufacturer prior to
46 installation of UL firestop systems that might hamper the performance of fire dampers as
47 it pertains to duct work.

48
49 Protect materials from damage on surfaces subjected to traffic.

1 FIELD QUALITY CONTROL

2

3 Examine sealed penetration areas to ensure proper installation before concealing or enclosing
4 areas.

5

6 Keep areas of work accessible until inspection by applicable code authorities.

7

8 Perform under this section patching and repairing of firestopping caused by cutting or penetrating
9 of existing firestop systems already installed by other trades.

10

11 ADJUSTING AND CLEANING

12

13 Remove equipment, materials and debris, leaving area in undamaged, clean condition.

14

15 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and
16 soiling as work progresses.

17

18

19

20 END OF SECTION

1 SECTION 079200 - JOINT SEALANTS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Division
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY:

12
13 Extent of each form and type of joint sealer is indicated on drawings and/or as listed below.

14
15 This Section includes joint sealers for the following locations:

16
17 Exterior - Vertical/Non-traffic Horizontal:

18
19 Perimeter joints between materials and frames.

20
21 Interior-Vertical/Non-traffic Horizontal

22
23 Control and expansion joints on exposed surfaces.

24
25 Perimeter joints of interior openings.

26
27 Perimeter joints between wall surfaces and frames.

28
29 Perimeter joints between wall surface and steel (beams, tubes, stringers, etc.)

30
31 Perimeter joints of plumbing fixtures.

32
33 Perimeter joints between plaster and drywall.

34
35 Tile control joints.

36
37 Interior-Horizontal Traffic

38
39 Control and expansion joints in slabs.

40
41 Control and expansion joints in tile flooring.

42
43 Sealants for fire-resistant joints are specified in Division 07 "Penetration Firestopping".

44
45 Sealants for glazing purposes are specified in Division 08 Section "Glazing."

46
47 Sealing concealed perimeter joints of gypsum drywall partitions to reduce sound transmission
48 characteristics is specified in Division 09 Section "Gypsum Board."
49

1 Sealing interior tile joints is specified in Division 09 Section "Tiling".

2

3 SYSTEM PERFORMANCES:

4

5 Provide joint sealers that have been produced and installed to establish and maintain watertight and
6 airtight continuous seals.

7

8 SUBMITTALS:

9

10 Product Data from manufacturers for each joint sealer product required, including instructions for
11 joint preparation and joint sealer application, evidencing compliance with requirements.

12

13 Product Data: For each joint-sealant product indicated.

14

15 Joint-Sealant Schedule: Include the following information:

16

17 Joint-sealant application, joint location and designation.

18

19 Joint-sealant manufacturer and product name.

20

21 Joint-sealant formulation.

22

23 Joint-sealant color.

24

25 Samples for Initial Selection Purposes: Manufacturer's standard bead samples consisting of strips
26 of actual products showing full range of colors available, for each product exposed to view.

27

28 Samples for verification purposes of each type and color of joint sealer required. Install joint sealer
29 samples in ½ inch wide joints formed between two 6 inch long strips of material matching the
30 appearance of exposed surfaces adjacent to joint sealers.

31

32 Certificates from manufacturers of joint sealers attesting that their products comply with
33 specification requirements and are suitable for the use indicated and specified.

34

35 Qualification data complying with requirements specified in "Quality Assurance" article. Include list
36 of completed projects with project name, addresses, names of Architects and Owners, plus other
37 information specified.

38

39 Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that
40 materials forming joint substrates and joint sealant backings have been tested for compatibility and
41 adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative
42 to sealant performance and recommendations for primers and substrate preparation needed to
43 obtain adhesion.

44

45 Preconstruction field test reports indicating which products and joint preparation methods
46 demonstrated acceptable adhesion to joint substrates.

47

48 QUALITY ASSURANCE:

49

1 Installer Qualifications: Engage an Installer who has successfully completed within the last 3-years
2 at least three (3) joint sealer applications similar in type and size to that of this Project.
3

4 Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single
5 manufacturer for each different product required.
6

7 Preconstruction Compatibility and Adhesion Testing: Submit samples of all materials that will
8 contact or affect joint sealers to joint sealer manufacturers for compatibility and adhesion testing.
9

10 Testing will not be required when joint sealer manufacturer is able to submit joint
11 preparation data required above which is acceptable to Owner's Representative and is
12 based on previous testing of current sealant products for adhesion to, and compatibility with,
13 joint substrates and other materials matching those submitted.
14

15 Field-Constructed Mock-Ups: Prior to installation of joint sealers, apply elastomeric sealants to
16 selected building joints as indicated by Owner's Representative for verification of adhesion,
17 extension, and color, and to represent completed work for qualities of appearance, materials, and
18 application:
19

20 Retain mock-ups during construction as standard for judging completed construction.
21

22 DELIVERY, STORAGE, AND HANDLING: 23

24 Deliver materials to Project site in original unopened containers or bundles with labels informing
25 about manufacturer, product name and designation, color, expiration period for use, pot life, curing
26 time, and mixing instructions for multi-component materials.
27

28 Store and handle materials in compliance with manufacturers' recommendations to prevent their
29 deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
30

31 PROJECT CONDITIONS: 32

33 Environmental Conditions: Do not proceed with installation of joint sealers under the following
34 conditions:
35

36 When ambient and substrate temperature conditions are outside the limits permitted by joint
37 sealer manufacturers.
38

39 When ambient and substrate temperature conditions are outside the limits permitted by joint
40 sealer manufacturer or below 40 deg F.
41

42 When joint substrates are wet due to rain, frost, condensation, or other causes.
43

44 Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less
45 than allowed by joint sealer manufacturer for application indicated.
46

47 Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants
48 capable of interfering with their adhesion are removed from joint substrates.
49

1 SEQUENCING AND SCHEDULING:

2
3 Sequence installation of joint sealers to occur not less than 21 nor more than 30 days after
4 completion of waterproofing, unless otherwise indicated.

5
6
7 PART 2 - PRODUCTS

8
9 MATERIALS, GENERAL:

10
11 Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with
12 one another and with joint substrates under conditions of service and application, as demonstrated
13 by sealant manufacturer based on testing and field experience.

14
15 Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected
16 by Owner's Representative from manufacturer's standard colors.

17
18 ELASTOMERIC JOINT SEALANTS:

19
20 Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric
21 sealant of base polymer indicated which complies with ASTM C 920 requirements, including those
22 referenced for Type, Grade, Class, and Uses. Provide products equal to or as follows:

23
24 One Part Non-acid Cure Silicone Sealant (ES-1) Type S; Grade NS; Class 25.

25
26 Additional capability, when tested for adhesion and cohesion under maximum cyclic
27 movement per ASTM C 719, to withstand the following percentage changes in joint width
28 as measured at time of application and remain in compliance with other requirements of
29 ASTM C 920 for Uses indicated:

30
31 40 percent movement in both extension and compression for a total of 80 percent
32 movement.

33
34 Latex Joint Sealants - Silicone Emulsion

35
36 Products:

37
38 "Omni Seal"; Sonneborn Building Products Div., Chem Rex, Inc.

39 "Tremsil 600"; Tremco, Inc.

40 "Dow Corning 790"; Dow Corning Corp

41
42 Uses: Interior - Vertical/Non traffic horizontal surfaces.

43
44 Application: Perimeter joints of plumbing fixtures casework to wall; and hollow metal door
45 frame to wall.

46
47 One Part Acid Cure Silicone Sealant (ES-2): Type S; Grade NS; Class 25.

48
49 Products:

1 "Omni Plus"; Sonneborn
2 "Tremsil 300"; Tremco Inc.
3 "Dow Corning 999-A" Dow Corning Corp.

4
5 Uses: Interior - Vertical/Non traffic horizontal surfaces.

6
7 Application: Perimeter joints of metal-to-metal, cap and toe bead joints, butt glazing.

8
9 Multi-component Non-sag Urethane Sealant (ES-3): Type M; Grade NS; Class 25.

10
11 Products:

12
13 "Dymeric 511"; Tremco Inc.
14 "Sikaflex-2c NS"; Sika Corporation
15 "Dynatrol II"; Pecora Corporation

16
17 Uses:

18
19 Exterior - Vertical/Non-traffic and horizontal traffic surfaces.
20 Interior - Vertical/Non-traffic horizontal surfaces.

21
22 Applications: Control and expansion joints in masonry.

23
24 Interior tile control joints.
25 Exterior joints in glass unit masonry units.

26
27 Multi-component Non-sag Urethane Sealant (ES-4): Type M; Grade NS; Class 25.

28
29 Products:

30
31 "NP_Δ2"; Sonneborn Building Products Div.,; Chem Rex Inc.
32 "Vulkem 922"; Tremco, Inc.
33 "Chem-Calk 2641"; Bostik Inc.

34
35 Uses: Exterior - Vertical/Non-traffic horizontal surfaces.

36
37 Applications: Control and expansion joints.

38
39 Exterior joints in glass unit masonry units.
40 Horizontal control, expansion and isolation joints.

41
42 Multi-component Pourable Urethane Sealant (ES-5): Type M; Grade P; Class 25.

43
44 Products:

45
46 "THC-900"; Tremco Inc.
47 "SL_Δ2"; Sonneborn Building Products Div.; Chem Rex Inc.
48 "Sikaflex - 2c SL"; Sika Corporation

1 Uses: Interior - Horizontal traffic surfaces.

2
3 Applications:

4
5 Tile Control and expansion joints in tile flooring.
6 Control and expansion joints in slabs.

7
8 Single-component Non-sag Urethane Sealant (ES-6): Type S; Grade NS; Class 25.

9
10 Products:

11
12 “NP Δ 1”; Sonneborn Building Products Div., Chem Rex Inc.
13 “Sikaflex-1a”; Sika Corporation
14 “Vulkem 116”; Tremco Inc.

15
16 Uses:

17
18 Exterior - Vertical/Non-traffic horizontal surfaces.
19 Interior - Vertical/Non-traffic horizontal surfaces.

20
21 Applications:

22
23 Control and expansion joints in masonry and ceilings.
24 Control, expansion and isolation joints.
25 Perimeter joints of exterior openings.
26 Perimeter joints between wall surfaces and frames.
27 Interior tile control joints.

28
29 Single-component Non-sag Urethane Sealant (ES-7): Type S; Grade NS; Class 25.

30
31 Products:

32
33 “Dymonic”; Tremco Inc.
34 “Chem-Calk 900”; Bostik Inc.
35 “Dynatrol I”; Pecora Corporation

36
37 Uses:

38
39 Exterior - Vertical/Non-traffic horizontal surfaces.
40 Interior - Vertical/Non-traffic horizontal surfaces.

41
42 Applications:

43
44 Control and expansion joints in masonry and ceilings.
45 Perimeter joints between materials and frames.
46 Interior control and expansion joints on exposed surfaces.
47 Perimeter joints of exterior openings.

48
49 Single-component Pourable Urethane Sealant (ES-8): Type S; Grade P; Class 25.

1 Products:

2
3 "SL Δ 1"; Sonneborn Building Products Div., Chem Rex, Inc.
4 "Chem-Calk 950"; Bostik Inc.
5 "NR-201"; Pecora Corporation

6
7 Uses: Interior - Horizontal traffic surfaces.

8
9 Applications:

10
11 Exterior tile control and expansion joints.
12 Interior control and expansion joints in slabs and tile flooring.

13
14 SOLVENT-RELEASE JOINT SEALANTS:

15
16 Acrylic-Based Solvent-Release Joint-Sealant Standard: Provide manufacturer's standard, solvent-
17 release sealant which complies with ASTM C1311 requirements, including those referenced for
18 Type, Grade, Glass and Uses. Provide products as follows:

19
20 Acrylic Sealant (SR-1):

21
22 Products:

23
24 "Sonolac"; Sonneborn
25 "Trem Flex 834"; Tremco, Inc.
26 "60 + Unicrylic"; Pecora Corp.

27
28 Uses: Interior-Vertical/ Non-traffic horizontal surfaces.

29
30 Applications: Perimeter joints between plaster and drywall.

31
32 Pigmented Small Joint Sealant (SR-2): Provide manufacturer's standard, solvent-release-curing,
33 pigmented, synthetic-rubber sealant which complies with AAMA 803.3 and formulated for sealing
34 joints 3/16 inch or smaller in width.

35
36 Products:

37
38 "PTI 200"; Protective Treatment, Inc.
39 "Trem Seam Sealer"; Tremco, Inc.
40 "PT \pm 200"; H.B. Fuller Co.

41
42 Uses: Interior-Vertical/ Non-traffic horizontal surfaces.

43
44 Applications: Perimeter joints between plaster and drywall.

45
46 LATEX JOINT SEALANTS:

47
48 Silicone Emulsion Sealant (LS-1): Manufacturer's standard one part, nonsag, mildew-resistant,
49 silicone-emulsion sealant complying with ASTM C 834 and ASTM C 920, formulated to be paintable

1 and recommended for exposed applications on interior and on protected exterior locations involving
2 joint movement of not more than plus or minus 12-1/2 percent.

3
4 Products: Subject to compliance with requirements, provide latex joint sealants from one of the
5 following:

6
7 Silicone-Emulsion Sealant:

8
9 "Performance Plus Silicone Sealant"; Dow Corning Corp.
10 "Sonolac"; Sonneborn Building Products Div., Chem Rex, Inc.
11 "Tremseal"; Tremco, Inc.

12
13 MISCELLANEOUS JOINT SEALANTS:

14
15 Acoustical Sealant for Concealed Joints (ACS-1): Manufacturer's standard, nondrying,
16 nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for
17 sealing interior concealed joints to reduce transmission of airborne sound.

18
19 Products: Subject to compliance with requirements, provide latex joint sealants from one of the
20 following:

21
22 Acoustical Sealants for Concealed Joints:

23
24 "Pro-Series SC-170 Rubber Base Sand Sealant"; Ohio Sealants, Inc.
25 "BA-98"; Pecora Corp.
26 "Tremco Acoustical Sealant"; Tremco Inc.

27
28 COMPRESSION SEALS:

29
30 Preformed Hollow Neoprene Gasket (PS-1): Manufacturer's standard preformed polychloroprene
31 elastomeric joint seal of the open-cell compression type complying with ASTM D 2628 and with
32 requirements indicated for size, profile and cross-sectional design.

33
34 JOINT SEALANT BACKING:

35
36 General: Provide sealant backings of material and type which are nonstaining; are compatible with
37 joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated
38 by sealant manufacturer based on field experience and laboratory testing.

39
40 Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonwaxing, nonextruding strips of
41 flexible, nongassing plastic foam of material indicated below; nonabsorbent to water and gas; and
42 of size, shape and density to control sealant depth and otherwise contribute to producing optimum
43 sealant performance.

44
45 Either open-cell polyurethane foam or closed-cell polyethylene foam, unless otherwise
46 indicated, subject to approval of sealant manufacturer, for cold-applied sealants only.

47
48 Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM
49 D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26

1 deg F. Provide products with low compression set and of size and shape to provide a secondary
2 seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

3
4 Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant
5 manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint
6 surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive
7 tape where applicable.

8
9 MISCELLANEOUS MATERIALS:

10
11 Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of
12 sealant to joint substrates indicated, as determined from joint sealer-substrate tests and field tests.

13
14 Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaners of type which are
15 acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to
16 substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise
17 have a detrimental effect on sealant adhesion or in-service performance.

18
19 Masking Tape: Provide non-staining, nonabsorbent type compatible with joint sealants and to
20 surfaces adjacent to joints.

21
22 Accessory Materials for Fire-Stopping Sealants: Provide forming, joint fillers, packing and other
23 accessory materials required for installation of fire-stopping sealants as applicable to installation
24 conditions indicated.

25
26 JOINT FILLERS FOR CONCRETE PAVING:

27
28 General: Provide joint fillers of thickness and widths indicated.

29
30 Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:

31
32 Granulated cork with asphalt binder encased between 2 layers of saturated felt or
33 glass-fiber felt of width and thickness indicated.

34
35
36 PART 3 - EXECUTION

37
38 EXAMINATION:

39
40 Examine joints indicated to receive joint sealers, with Installer present, for compliance with
41 requirements for joint configuration, installation tolerances and other conditions affecting joint sealer
42 performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have
43 been corrected.

44
45 PREPARATION:

46
47 Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply
48 with recommendations of joint sealer manufacturers and the following requirements:

1 Remove all foreign material from joint substrates which could interfere with adhesion of joint
2 sealer, including dust; paints, except for permanent, protective coatings tested and
3 approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers;
4 oil; grease; waterproofing; water repellants; water; surface dirt; and frost.

5
6 Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint
7 substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a
8 combination of these methods to produce a clean, sound substrate capable of developing
9 optimum bond with joint sealers. Remove loose particles remaining from above cleaning
10 operations by vacuuming or blowing out joints with oil-free compressed air.

11
12 Remove laitance and form release agents from concrete.

13
14 Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other nonporous
15 surfaces by chemical cleaners or other means which are not harmful to substrates or leave
16 residues capable of interfering with adhesion of joint sealers.

17
18 Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer
19 manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply
20 primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of
21 joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

22
23 Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining
24 surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning
25 methods required to remove sealant smears. Remove tape immediately after tooling without
26 disturbing joint seal.

27 28 INSTALLATION OF JOINT SEALERS:

29
30 General: Comply with joint sealer manufacturers' printed installation instructions applicable to
31 products and applications indicated, except where more stringent requirements apply.

32
33 Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use
34 of joint sealants as applicable to materials, applications and conditions indicated.

35
36 Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTM C 804
37 for use of solvent-release-curing sealants.

38
39 Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex
40 sealants.

41
42 Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use
43 of joint sealants in acoustical applications as applicable to materials, applications, and conditions
44 indicated.

45
46 Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
47

1 Install joint fillers of type indicated to provide support of sealants during application and at
2 position required to produce the cross-sectional shapes and depths of installed sealants
3 relative to joint widths which allow optimum sealant movement capability.

4
5 Do not leave gaps between ends of joint fillers.

6
7 Do not stretch, twist, puncture, or tear joint fillers.

8
9 Remove absorbent joint fillers which have become wet prior to sealant application
10 and replace with dry material.

11
12 Install bond breaker tape between sealants and joint fillers, compression seals, or back of
13 joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.

14
15 Install compressible seals serving as sealant backings to comply with requirements
16 indicated above for joint fillers.

17
18 Installation of Sealants: Install sealants by proven techniques that result in sealants directly
19 contacting and fully wetting joint substrates, completely filling recesses provided for each joint
20 configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths
21 which allow optimum sealant movement capability.

22
23 Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or
24 curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate
25 air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess
26 sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or
27 adjacent surfaces or are not approved by sealant manufacturer.

28
29 Provide concave joint configuration per Figure 6A in ASTM C 962, unless otherwise
30 indicated.

31
32 Provide flush joint configuration per Figure 6B in ASTM C 962, where indicated.

33
34 Use masking tape to protect adjacent surfaces of recessed tooled joints.

35
36 Provide Recessed joint configuration per Figure 6C in ASTM C 962, of recess depth and
37 at locations indicated.

38
39 Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing
40 protective wrapping, taking care not to pull or stretch material, and to comply with sealant
41 manufacturer's directions for installation methods, materials, and tools which produce seal
42 continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures
43 where expansion of sealant requires acceleration to produce seal, apply heat to sealant in
44 conformance with sealant manufacturer's recommendations.

45
46 Installation of Preformed Hollow Neoprene Gaskets: Install gaskets, with minimum number of end
47 joints, in joint recesses with edges free of spalls and sides straight and parallel, both within
48 tolerances specified by gasket manufacturer. Apply manufacturer's recommended adhesive to joint
49 substrates immediately prior to installing gaskets. For straight sections provide gaskets in

1 continuous lengths; where changes in direction occur, adhesively splice gasket together to provide
2 watertight joint. Recess gasket below adjoining joint surfaces by 1/8 inch to 1/4 inch.

3

4 Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other
5 accessory materials to fill openings around mechanical and electrical services penetrating floors
6 and walls to provide fire-stops with fire resistance ratings indicated for floor or wall assembly in
7 which penetration occurs. Comply with installation requirements established by testing and
8 inspecting agency.

9

10 CLEANING:

11

12 Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and
13 with cleaning materials approved by manufacturers of joint sealers and of products in which joints
14 occur.

15

16 PROTECTION:

17

18 Protect joint sealers during and after curing period from contact with contaminating substances or
19 from damage resulting from construction operations or other causes so that they are without
20 deterioration or damage at time of Substantial Completion. If, despite such protection, damage or
21 deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and
22 reseal joints with new materials to produce joint sealer installations with repaired areas
23 indistinguishable from original work.

24

25

26

27 END OF SECTION

1 SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Division
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 Extent of standard steel doors and frames is indicated and scheduled on drawings.

14
15 Related sections included the following:

16
17 Division 08 Section "Flush Wood Doors" for wood doors.

18
19 Division 08 Section "Door Hardware" for finish hardware.

20
21 Division 08 Section "Glazing" for glass view panels in doors.

22
23 QUALITY ASSURANCE

24
25 Source Limitations: Obtain hollow metal work from single source from single manufacturer.

26
27 Provide doors and frames complying with Steel Door Institute "Recommended Specifications:
28 Standard Steel Doors and Frames" (SDI-100-91) and as herein specified.

29
30 REGULATORY REQUIREMENTS

31
32 Fire Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing
33 agency acceptable to authorities having jurisdiction for fire protection ratings and temperature rise
34 limits as required, based on testing at positive pressure according to NFPA 252 or UL 10C.

35
36 Smoke and Draft Control Assemblies: Provide an assembly with gaskets listed and labeled for
37 smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction,
38 based on testing according to UL 1784 and installed in compliance with NFPA 105.

39
40 Fire Rated, Borrowed Light Assemblies: Complying with NFPA 80 and listed and labeled by a
41 testing and inspecting agency acceptable to authorities having jurisdiction for fire protection ratings
42 indicated, based on testing according to NFPA 257 or UL 9.

43
44 SUBMITTALS

45
46 Product Data: For each type of product.

47
48 Include construction details, material descriptions, core descriptions, fire resistance ratings,
49 temperature rise ratings.

- 1 Shop Drawings: Include the following:
2
3 Elevations of each door type.
4
5 Details of doors, including vertical and horizontal edge details and metal thicknesses.
6
7 Frame details for each frame type, including dimensioned profiles and metal thicknesses.
8
9 Locations of reinforcement and preparations for hardware.
10
11 Details of each different wall opening condition.
12
13 Details of anchorages, joints, field splices, and connections.
14
15 Details of accessories.
16
17 Details of moldings, removable stops, and glazing.
18
19 Details of conduit and preparations for power, signal, and control systems.
20
21 Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of
22 supplier, using same reference numbers for details and openings as those on Drawings.
23 Coordinate with final Door Hardware Schedule.
24

25 DELIVERY, STORAGE AND HANDLING

- 26
27 Deliver hollow metal work palletized, packaged, or crated to provide protection during transit and
28 project site storage. Do not use nonvented plastic.
29
30 Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to
31 jambs and mullions.
32
33 Store hollow metal work vertically under cover at project site with head up. Place on minimum 4
34 inch high wood blocking. Provide minimum 1/4 inch space between each stacked door to permit
35 air circulation.
36

37 38 PART 2 - PRODUCTS

39 40 MANUFACTURERS

- 41
42 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
43
44 Amweld/Div. American Welding & Mfg. Company
45 Ceco Corporation
46 Curries Company
47 Steelcraft/Div. American Standard Company
48 Republic Doors and Frames
49

1 INTERIOR DOORS AND FRAMES

2
3 Construct interior doors and frames to comply with the standards indicated for materials,
4 fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as
5 specified.

6
7 Heavy Duty Doors and Frames: SDI A250.8, Level 3.

8
9 Physical Performance: Level A according to SDI A250.4.

10
11 Doors:

12
13 Type: As indicated in the Door Schedule.

14
15 Thickness and Size: As indicated in the Door Schedule

16
17 Face: Uncoated, cold-rolled steel sheet, min. thickness of 0.042 inch (18 gauge).

18
19 Edge Construction: Model 2, Seamless.

20
21 Core: Manufacturer's standard kraft paper honeycomb, polyurethane, polyisocyanurate or
22 mineral board core at manufacturer's discretion.

23
24 Frames:

25
26 Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (16 gauge)

27
28 Construction: Full profile welded

29
30 Exposed Finish: Primed.

31
32 HOLLOW METAL PANELS

33
34 Provide hollow metal panels of same materials, construction, and finish as adjacent door
35 assemblies.

36
37 FRAME ANCHORS

38
39 Jamb Anchors: Stud Wall Type: Designed to engage stud, welded to back of frames; not less than
40 0.042 inch thick.

41
42 MATERIALS

43
44 Cold Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed
45 applications.

46
47 Metallic Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B.

48
49 Frame Anchors: ASTM A 879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1 For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or
2 ASTM A 1011, hot dip galvanized according to ASTM A 153, Class B.

3
4 Inserts, Bolts, and Fasteners: Hot dip galvanized according to ASTM A 153.

5
6 Grout: ASTM C 476, except with a maximum slump of 4 inches as measured according to ASTM
7 C 143.

8
9 FABRICATION

10
11 Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal
12 to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and
13 assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify
14 work that cannot be permanently factory assembled before shipment.

15
16 Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80
17 for fire performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on
18 which astragal is mounted or as required to comply with published listing of qualified testing
19 agency.

20
21 Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling
22 limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as
23 frames. All factory and field frame seams or joints shall be filled so that no face seams or joints
24 are visible (with door open or closed) on the completed installation.

25
26 Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face
27 seams or joints, fabricated from same material as door frame. Fasten members at
28 crossings and to jambs by butt welding.

29
30 Provide countersunk, flat or oval head exposed screws and bolts for exposed fasteners
31 unless otherwise indicated.

32
33 Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

34
35 Jamb Anchors: Provide number and spacing of anchors as follows:

36
37 Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of
38 frame. Space anchors not more than 32 inches o.c. and as follows:

39
40 Five anchors per jamb from 90 to 96 inches high.

41
42 Five anchors per jamb plus one additional anchor per jamb for each 24
43 inches or fraction thereof above 96 inches high.

44
45 Door Silencers: Except on weather stripped frames, drill stops to receive door silencers as
46 follows. Keep holes clear during construction.

47
48 Single Door Frames: Drill stop in strike jamb to receive three door silencers.

1 Double Door Frames: Drill stop in head jamb to receive two door silencers.
2
3 Fabricate concealed stiffeners and edge channels from either cold or hot rolled steel sheet.
4
5 Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware;
6 include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door
7 Hardware Schedule, and templates.
8
9 All frames, to have reinforced plates in heads to receive door closers.
10
11 Reinforce doors and frames to receive non-templated, mortised, and surface mounted door
12 hardware.
13
14 Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation
15 of hollow metal work for hardware.
16
17 Fillers for mortised lock sets and universal strikes will not be accepted on doors and frames
18 receiving surface applied hardware.
19
20 Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated.
21 Form corners of stops and moldings with butted hairline joints.
22
23 Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow
24 metal work.
25
26 Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed
27 lite is capable of being removed independently.
28
29 Provide fixed frame moldings on outside of exterior and on secure side of interior doors and
30 frames.
31
32 Provide loose stops and moldings on inside of hollow metal work.
33
34 Coordinate rabbet width between fixed and removable stops with glazing and installation
35 types indicated.
36
37 STEEL FINISHES
38
39 Clean, pretreat, and paint exposed surfaces of steel door and frame units, including galvanized
40 surfaces.
41
42 Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before
43 application of paint.
44
45 Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready
46 to receive finish paint.
47

1 Shop Primer: Manufacturer's standard, fast curing, lead and chromate free primer
2 complying with SDI A250.10; recommended by primer manufacturer for substrate;
3 compatible with substrate and field applied coatings despite prolonged exposure.
4

5 ACCESSORIES

6
7 Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
8

9 Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.
10

11 12 PART 3 - EXECUTION

13 14 EXAMINATION

15
16 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements
17 for installation tolerances and other conditions affecting performance of the Work.
18

19 Examine rough in for embedded items and built in anchors to verify actual locations before frame
20 installation.
21

22 Proceed with installation only after unsatisfactory conditions have been corrected.
23

24 PREPARATION

25
26 Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding,
27 filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed
28 faces.
29

30 Drill and tap doors and frames to receive non-templated, mortised, and surface mounted door
31 hardware.
32

33 INSTALLATION

34
35 General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place.
36 Comply with Drawings and manufacturer's written instructions.
37

38 Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with SDI
39 A250.11 as required by standards specified.
40

41 Set frames accurately in position; plumbed, aligned, and braced securely until permanent
42 anchors are set. After wall construction is complete, remove temporary braces, leaving
43 surfaces smooth and undamaged.
44

45 At fire rated openings, install frames according to NFPA 80.
46

47 Where frames are fabricated in sections because of shipping or handling limitations,
48 field splice at approved locations by welding face joint continuously; grind, fill, dress,
49 and make splice smooth, flush, and invisible on exposed faces.

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Install frames with removable stops located on secure side of opening.

Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

Install door silencers in frames before grouting.

Remove temporary braces necessary for installation only after frames have been properly set and secured.

Metal Stud Partitions: Solidly fill space between frames and studs with grout or expandable spray foam.

In Place Metal or Wood Stud Partitions: Secure slip on drywall frames in place according to manufacturer's written instructions. Solidly fill space between frames and studs with grout or expandable spray foam.

Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

Non-Fire Rated Steel Doors:

Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.

Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/32 inch.

At Bottom of Door: 5/8 inch plus or minus 1/32 inch.

Between Door Face and Stop: 1/16 inch plus or minus 1/32 inch.

Fire Rated Doors: Install doors with clearances according to NFPA 80.

Smoke Control Doors: Install doors and gaskets according to NFPA 105.

Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1 Secure stops with countersunk flat or oval head machine screws spaced uniformly not more
2 than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3

4 ADJUSTING AND CLEANING

5

6 Prime Coat Touch up: Immediately after erection, sand smooth rusted or damaged areas of prime
7 coat and apply touch up of compatible air drying, rust inhibitive primer.

8

9 Metallic Coated Surface Touch up: Clean abraded areas and repair with galvanizing repair paint
10 according to manufacturer's written instructions.

11

12 Remove grout and other bonding material from hollow metal work immediately after installation.

13

14 Final Adjustments: Check and readjust operating hardware items immediately before final
15 inspection. Leave work in complete and proper operating condition. Remove and replace defective
16 work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

17

18 Touch up Painting: Cleaning and touch up painting of abraded finish painted areas no more than
19 one week prior to owner occupancy.

20

21 Remove protective film from door hardware no more than one week prior to owner occupancy.

22

23

24

25 END OF SECTION

1 SECTION 081416 - FLUSH WOOD DOORS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes the following:

14
15 Solid core doors and transom and/or side panels with factory finished wood veneer.

16
17 Frames for light openings for flush wood doors, are specified in this Section.

18
19 Related sections included the following:

20
21 Division 08 Section "Hollow Metal Doors and Frames" for metal frames for wood doors.

22
23 Division 08 Section "Door Hardware" for finish hardware.

24
25 Division 08 Section "Glazing" for glass view panels in flush wood doors.

26
27 SUBMITTALS

28
29 Product Data: For each type of door. Include details of core and edge construction, louvers and
30 trim for openings. Include factory finishing specifications.

31
32 Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door;
33 construction details not covered in Product Data; location and extent of hardware blocking; and
34 other pertinent data.

35
36 Dimensions and locations of blocking.

37
38 Dimensions and locations of mortises and holes for hardware.

39
40 Dimensions and locations of cutouts.

41
42 Requirements for veneer matching.

43
44 Doors to be factory finished and finish requirements.

45
46 Fire protection ratings for fire rated doors.

47
48 Samples for Initial Selection: Color charts showing the full range of colors available for factory
49 finished stained finishes. Manufacturer must have a minimum of sixteen standard stain colors for

1 selection, if a minimum of sixteen are not available, then custom color must be provided at no
2 additional cost.

3
4 Samples for Verification:

5
6 Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for
7 each material and finish. For each wood species and transparent finish, provide set of
8 three samples showing typical range of color and grain to be expected in the finished work.

9
10 Frames for light openings, 6 inches long, for each material, type, and finish required.

11
12 Sample Warranty: For special warranty.

13
14 Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

15
16 QUALITY ASSURANCE

17
18 Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality
19 Certification Program. Provide AWI Quality Certification Labels or an AWI letter of licensing for
20 Project indicating that doors comply with requirements of grades specified.

21
22 Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

23
24 Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated;
25 including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for
26 grade of door, core construction, finish and other requirements exceeding those of NWWDA quality
27 standard.

28
29 Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by (UL or ITS
30 -WH) or by another testing and inspecting agency acceptable to authorities having jurisdiction, for
31 fire ratings indicated, based on testing according to NFPA 252.

32
33 DELIVERY, STORAGE, AND HANDLING

34
35 Comply with requirements of referenced standard and manufacturer's written instructions.

36
37 Package doors individually in plastic bags or cardboard cartons.

38
39 Mark each door on top and bottom rail with opening number used on Shop Drawings.

40
41 Protect doors during transit, storage and handling to prevent damage, soiling and deterioration.
42 Comply with requirements of referenced standards and recommendations of NWWDA pamphlet
43 "How to store, handle, finish, install and maintain wood doors", as well as with manufacturers
44 Instruction.

45
46 PROJECT CONDITIONS

47
48 Environmental Limitations:

1 Do not deliver or install doors until conditions for temperature and relative humidity have been
2 stabilized and will be maintained in storage and installation areas during remainder of construction
3 period to comply with the following requirements applicable to project's geographical location:
4

5 Referenced AWI quality standard including Section 100-S-3 "Moisture Content".
6

7 WARRANTY

8
9 Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in
10 which manufacturer agrees to repair or replace doors that are defective in materials or
11 workmanship, including delamination, warp, bow or cup more than 1/8 inch in a 42 by 84 inch
12 section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3 inch
13 span.
14

15 Warranty shall also include reinstallation and finishing which may be required due to repair
16 or replacement of defective doors where defect was not apparent prior to hanging.
17

18 Warranty shall be in effect during the following period of time from date of Substantial
19 Completion:
20

21 Solid Core Interior Doors: Life of installation.
22

23 Contractor's Responsibilities: Replace or refinish door where Contractor's work contributed to
24 rejection or to voiding of manufacturer's warranty.
25

26 PART 2 - PRODUCTS

27 MANUFACTURERS

28
29 Manufacturers: Subject to compliance with requirements, manufacturers offering products that
30 may be incorporated into the Work include the following:
31

32
33 Flush Wood Doors:
34

35
36 Algoma Hardwoods, Inc.
37 Eggers Industries.
38 Doormerica
39 Graham Wood Doors; an Assa Abloy Group company.
40 Marshfield Door Systems, Inc.
41 Mohawk Doors; a Masonite company.
42 Oshkosh Door Company.
43 VT Industries, Inc.
44

45 FLUSH WOOD DOORS, GENERAL

46
47 Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural
48 Wood Flush Doors". Note: Door manufacturers utilizing the AWI's, AWMAC's, and WI's
49 "Architectural Woodwork Standards" designation are acceptable, however all product data

1 submittals shall be provided with cross reference to indicate compliance with WDMA I.S.1-A,
2 "Architectural Wood Flush Doors"

3
4 WDMA I.S.1-A Performance Grade: All doors shall be Extra Heavy Duty.

5
6 Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified
7 testing agency, for fire protection ratings indicated, based on testing at positive pressure according
8 to NFPA 252 or UL 10C.

9
10 20, 45, 60 and 90 minute rated doors shall comply with Ohio Building Code (OBC - 2011),
11 and have a "Positive Pressure" fire rating. For this project all fire rated doors shall have
12 a "Category - A" Positive Pressure fire rating.

13
14 Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies,
15 provide certification by a qualified testing agency that doors comply with standard
16 construction requirements for tested and labeled fire-rated door assemblies except for size.

17
18 Temperature Rise Limit: at vertical exit enclosures and exit passageways, provide doors
19 that have a maximum transmitted temperature end point of not more than 450 deg F above
20 ambient after 30 minutes of standard fire test exposure.

21
22 Edge Construction: Provide edge construction with intumescent seals concealed by outer
23 stile. Comply with specified requirements for exposed edges.

24
25 Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated
26 without formed steel edges and astragals. Provide stiles with concealed intumescent
27 seals. Comply with specified requirements for exposed edges.

28
29 Smoke and Draft Control Door Assemblies: Listed and labeled for smoke and draft control, based
30 on testing according to UL 1784.

31
32 Structural Composite Lumber Core Doors (non-rated and 20 minute fire rated):

33
34 Structural Composite Lumber: WDMA I.S.1.0.

35
36 Screw Withdrawal, Edge: 400 lbf.

37
38 Mineral Core Doors (45, 60 and 90 minute fire rated):

39
40 Core: Noncombustible mineral product complying with requirements of referenced quality
41 standard and testing and inspecting agency for fire-protection rating indicated.

42
43 Blocking: Provide composite blocking with improved screw holding capability approved for
44 use in doors of fire-protection ratings indicated as follows:

45
46 5 inch top rail blocking.

47 5 inch bottom rail blocking, in doors indicated to have protection plates.

48 5 inch midrail blocking, in doors indicated to have armor plates.

49 5 inch midrail blocking, in doors indicated to have exit devices.

1 4 ½ x 10 inch lock block in doors indicated to have cylindrical or mortise locksets.

2
3 Edge Construction: At hinge stiles, provide laminated edge construction with improved
4 screw holding capability and split resistance. Comply with specified requirements for
5 exposed edges.

6
7 Screw Holding Capability: 475 lbf per WDMA T.M.-10.

8
9 Acoustical: The Sound Transmission Class (STC) specified shall be certified by the manufacturer
10 to be based on tests conducted at an independent testing agency in accordance with ASTM E90-90
11 and E413-87. Earlier tests not acceptable. Acoustical Doors with lites to be factory glazed to
12 maintain STC rating. Door may be fire labeled as indicated on drawings.

13
14 STC Rating: 41

15
16 VENEER FACED DOORS FOR TRANSPARENT FINISH

17
18 Interior Solid Core Doors:

19
20 Grade: WDMA Premium, with Grade A faces.

21
22 Species: Red oak

23
24 Cut: Plain sliced.

25
26 Match between Veneer Leaves: Book match.

27
28 Assembly of Veneer Leaves on Door Faces: Running match.

29
30 Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

31
32 Room Match: Match door faces within each separate room or area of building. Corridor
33 door faces do not need to match where they are separated by 10 feet or more.

34
35 Transom Match: Continuous match.

36
37 Exposed Vertical Edges: Same species as faces with edge type A. Stile shall have a
38 minimum of ¼ inch (after trimming) solid wood.

39
40 Core: Structural composite lumber, or mineral core as needed to provide fire-protection
41 rating indicated on drawings.

42
43 Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive
44 planed before veneering.

45
46 LIGHT FRAMES AND LOUVERS

47
48 Wood Beads for Light Openings in Non-Fire Rated and 20 Minute Fire Rated Doors:

1 Wood Species: Same species as door faces.

2
3 Profile: Lipped tapered beads, equivalent to W-3 Lip molding by Marshfield Wood Door
4 Systems, W-6 flush molding for full glass doors or were the door lite molding will interfere
5 with hardware lever handles, exit devices, or other hardware.

6
7 At 20 minute, fire rated, wood core doors, provide wood beads and metal glazing clips
8 approved for such use.

9
10 FABRICATION

11
12 Factory fit doors to suit frame opening sizes indicated. Comply with clearance requirements of
13 referenced quality standard for fitting unless otherwise indicated.

14
15 Comply with NFPA 80 requirements for fire-rated doors.

16
17 Factory machine doors for hardware that is not surface applied. Locate hardware to comply with
18 DHI-WDHS-3 or with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral
19 Core Wood Flush Doors.". Comply with final hardware schedules, door frame Shop Drawings,
20 BHMA-156.115-W and hardware templates.

21
22 Coordinate measurements of hardware mortises in metal frames to verify dimensions and
23 alignment before factory machining.

24
25 Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces,
26 and finish as specified for associated doors. Provide factory installed spring bolts for concealed
27 attachment into jambs of metal door frames. Finish exposed bottom edges of transoms and top
28 edges of rabbeted doors same as door stiles.

29
30 Openings: Factory cut and trim openings through doors.

31
32 Light Openings: Trim openings with moldings of material and profile indicated.

33
34 Glazing: Field installed glazing in door. Refer to applicable requirements in Division 08
35 Section "Glazing."

36
37 FACTORY FINISHING

38
39 General: Comply with AWI's "Architectural Woodwork Standards" for factory finishing. Complete
40 fabrication, including fitting doors for openings and machining for hardware that is not surface
41 applied, before finishing.

42
43 Seal all six surfaces and finish four exposed faces, edges, edges of cutouts, and mortises
44 of door. If not required by warranty, stains and fillers may be omitted on top and bottom
45 edges, edges of cutouts, and mortises.

46
47 Factory finish doors.

48
49 Clear Finish:

1 Grade: Premium.

2
3 Finish: WDMA TR-6 catalyzed polyurethane.

4
5 Staining: Color as selected by Owner's Representative from manufacturers standard
6 selection. Manufacturer must provide a minimum of ten (10) colors. If manufacturer does
7 not have ten (10) standard colors than custom color must be provided at no additional cost.

8
9 Effect: Open-grain finish.

10
11 Sheen: Satin.

12
13
14 PART 3 - EXECUTION

15
16 EXAMINATION

17
18 Examine doors and installed door frames before hanging doors.

19
20 Verify that frames comply with indicated requirements for type, size, location, and swing
21 characteristics and have been installed with level heads and plumb jambs.

22
23 Do not install doors in frame openings that are out of tolerance for size or alignment.
24 Reject doors with defects.

25
26 Proceed with installation only after unsatisfactory conditions have been corrected.

27
28 INSTALLATION

29
30 Hardware: For installation, see Division 08 Section "Door Hardware."

31
32 Manufacturer's Written Instructions: Install doors to comply with manufacturer's written
33 instructions, referenced quality standard, and as indicated.

34
35 Install fire rated doors in corresponding fire rated frames according to NFPA 80.

36
37 Install smoke and draft control doors according to NFPA 105.

38
39 Factory Fitted Doors: Align in frames for uniform clearance at each edge.

40
41 Factory Finished Doors: Restore finish before installation if fitting or machining is required at
42 Project site.

43
44 ADJUSTING

45
46 Operation: Rehang or replace doors that do not swing or operate freely.

- 1 Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may
- 2 be repaired or refinished if work complies with requirements and shows no evidence of repair or
- 3 refinishing.
- 4
- 5
- 6
- 7 END OF SECTION

1 SECTION 083613 - SECTIONAL OVERHEAD DOORS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 Extent of sectional overhead doors is shown on drawings.

14
15 Type(s) of sectional overhead doors include the following:

16
17 Steel frame and steel panels.

18
19 SUBMITTALS

20
21 Product Data: Submit manufacturer's product data, roughing-in diagrams, and installation
22 instructions for each type and size of overhead door. Include manufacturer's operating instructions
23 and maintenance data.

24
25 Shop Drawings: Submit shop drawings for special components and installations which are not fully
26 dimensioned or detailed in manufacturer's data.

27
28 Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or
29 built into masonry for installation of units. Provide setting drawings, templates, and directions for
30 installation of anchorage devices. Coordinate delivery with other work to avoid delay.

31
32
33 PART 2 - PRODUCTS

34
35 ACCEPTABLE MANUFACTURERS

36
37 Available Manufacturers: Subject to compliance with requirements, manufacturers offering
38 products which may be incorporated in the work include, but are not limited to, the following:

39
40 Manufacturer: Subject to compliance with requirements, provide products equal to "Amarr" Garage
41 Doors, Vertical Lift Standard 2" Angle Mount Series as manufacturer by one of the following:

42
43 Kinnear
44 Overhead Door Co.
45 Raynor Manufacturing Co.
46 Windsor Door Division; Ceco Corp.
47 Wayne-Dalton Door Co.

48
49 STEEL SECTIONS

1 Construct door sections from galvanized structural quality carbon steel sheets complying with
2 ASTM A 446, Grade A, or ASTM A 526, with a minimum yield strength of 33,000 psi, and a
3 minimum G90 zinc coating complying with ASTM A 525.

4
5 Steel Sheet Thickness: 22-gage.

6
7 Exterior Section Face: Ribbed or fluted.

8
9 Fabricate sections from a single sheet to provide units not more than 24" high, and nominal 2"
10 deep. Roll horizontal meeting edges to a continuous shiplap, rabbeted, or keyed weather seal, with
11 a reinforcing flange return.

12
13 Enclose open section with 16 gauge galvanized steel channel end stiles welded in place. Provide
14 intermediate stiles, cut to door section profile, spaced at not more than 48" o.c. and welded in
15 place.

16
17 Reinforce bottom section with a continuous channel or angle conforming to bottom section profile.

18
19 Reinforce sections with continuous horizontal and diagonal reinforcing, as required by door width
20 and design wind loading. Provide galvanized steel bars, struts, trusses or strip steel, formed to
21 depth, and bolted or welded in place.

22
23 Insulate inner core of steel sections with injected polyurethane foam type insulation with a minimum
24 R-value of 14.5.

25
26 Enclose insulation with 26GA interior steel sheet secured to door panel.

27
28 Finish door sections as follows:

29
30 Apply manufacturer's standard prime and finish coats, applied to interior and exterior door
31 faces.

32 33 TRACKS, SUPPORTS, AND ACCESSORIES

34
35 Tracks: Provide manufacturer's standard galvanized steel track system, sized for door size and
36 weight, and designed for clearances shown. Provide complete track assembly including brackets,
37 bracing and reinforcing for rigid support of ball bearing roller guides, for required door type and
38 size. Slot vertical sections of track at 2" on center for door drop safety device. Slope tracks at
39 proper angle from vertical, or otherwise design to ensure tight closure at jambs when door unit is
40 closed. Weld or bolt to track supports.

41
42 Track Reinforcement and Supports: Provide galvanized steel track reinforcement and support
43 members. Secure, reinforce and support tracks as required for size and weight of door to provide
44 strength and rigidity, and to ensure against sag, sway, and detrimental vibration during opening and
45 closing of doors.

46
47 Support and attach tracks to opening jambs with continuous angle welded to tracks and attached
48 to wall. Support horizontal (ceiling tracks) with continuous angle welded to track and supported by
49 laterally-braced attachments to overhead structural members at curve and end of tracks.

1 Weather Seals: Provide continuous rubber, neoprene, or flexible vinyl adjustable weatherstrip
2 gasket at top each panel section and compressible astragal on bottoms of each overhead door.

3
4 In addition, provide continuous flexible seals at door jamb edges for a fully weathertight
5 installation.
6

7 Vision Panels: See Drawing Interior Elevations.
8

9 HARDWARE

10
11 Provide heavy-duty, rust-resistant hardware, with galvanized or cadmium-plated or stainless steel
12 fasteners, to suit type of door.
13

14 Hinges: Provide heavy steel hinges at each end stile and at each intermediate stile, per
15 manufacturer's recommendations for size of door. Attach hinges to door sections through stiles
16 and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners
17 where access to nuts is not possible. Provide double-end hinges, where required, for doors
18 exceeding 16'-0" in width, unless otherwise recommended by door manufacturer.
19

20 Rollers: Provide heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted
21 with varying projections to suit slope of track. Extend roller shaft through both hinges where double
22 hinges are required. Provide roller tires to suit size of track (3" diameter for 3" track; 2" diameter
23 for 2" track) and as follows:
24

25 Case-hardened steel tires, for normal installations.
26

27 Pull Handles, Locks and Latches: For manually-operated doors, furnish lifting handles, locks, and
28 locking device as follows:
29

30 Lifting Handles: Galvanized steel.
31

32 Locking Bars: Full disc Cremone type, operable from inside only.
33

34 Fabricate locking device assembly with mortise lock, spring loaded dead bolt, chromium-plated
35 operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
36

37 COUNTERBALANCING MECHANISMS

38
39 Torsion Spring: Hang door assembly for operation by torsion spring counterbalance mechanism,
40 consisting of adjustable tension tempered steel torsion springs mounted on a case-hardened steel
41 shaft, and connected to door with galvanized aircraft type lift cable.
42

43 Provide cast aluminum or grey iron casting cable drums, grooved to receive cable. Mount
44 counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft
45 with one additional mid-point bracket for shafts up to 16' long and two (2) additional brackets at $\frac{1}{3}$
46 points to support shafts over 16' long, unless closer spacing recommended by door manufacturer.
47

48 Include a spring-loaded steel or bronze cam mounted to bottom door roller assembly on each side,
49 designed to stop door automatically if either cable breaks. Provide either a compression spring or

1 leaf spring bumper installed at end of each horizontal track to cushion door at end of opening
2 operation.

3
4

5 PART 3 - EXECUTION

6
7

8 INSTALLATION

9

10 Install door, track, and operating equipment complete with necessary hardware, jamb and head
11 mold stops, anchors, inserts, hangers, and equipment supports in accordance with final shop
12 drawings, manufacturer's instructions and as herein specified.

13

14 Fasten vertical track assembly to framing at not less than 24" on center. Hang horizontal track
15 from structural overhead framing with angle or channel hangers, welded and bolt-fastened in place.

16 Provide sway bracing, diagonal bracing, and reinforcing as required for rigid installation of track and
17 door operating equipment.

18

19 Upon completion of installation, including work by other trades, lubricate, test and adjust doors to
20 operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

21

22

23 END OF SECTION

1 SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 Section Includes:

- 14
15 Exterior and interior storefront framing.
- 16
17 Storefront framing for window walls.
- 18
19 Storefront framing for punched openings.

20
21 Related Sections:

- 22
23 Division 07 Section "Joint Sealants" for sealants used during installation.
- 24
25 Division 08 Section "Glazing" for glazing installed within storefront systems.
- 26
27 Division 08 Section "Door Hardware" for automatic entrances.

28
29 DEFINITIONS

30
31 ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance
32 Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility
33 Guidelines for Buildings and Facilities."

34
35 PERFORMANCE REQUIREMENTS

36
37 General Performance: Aluminum-framed systems shall withstand the effects of the following
38 performance requirements without exceeding performance criteria or failure due to defective
39 manufacture, fabrication, installation, or other defects in construction:

- 40
41 Movements of supporting structure indicated on Drawings including, but not limited to, story
42 drift and deflection from uniformly distributed and concentrated live loads.
- 43
44 Dimensional tolerances of building frame and other adjacent construction.

45
46 Failure includes the following:

- 47
48 Deflection exceeding specified limits.

1 Thermal stresses transferring to building structure.
2
3 Framing members transferring stresses, including those caused by thermal and
4 structural movements to glazing.
5
6 Glazing-to-glazing contact.
7
8 Noise or vibration created by wind and by thermal and structural movements.
9
10 Loosening or weakening of fasteners, attachments, and other components.
11
12 Sealant failure.
13
14 Failure of operating units.
15
16 Delegated Design: Design aluminum-framed systems, including comprehensive engineering
17 analysis by a qualified professional engineer, using performance requirements and design criteria
18 indicated.
19
20 Structural Loads:
21
22 Wind Loads: As indicated on Drawings.
23
24 Deflection of Framing Members:
25
26 Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6
27 inches and to 1/240 of clear span plus ¼ inch for spans greater than 13 feet 6 inches or an
28 amount that restricts edge deflection of individual glazing lites to ¾ inch, whichever is less.
29
30 Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or ⅛ inch, whichever is
31 smaller.
32
33 Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330
34 as follows:
35
36 When tested at positive and negative wind-load design pressures, systems do not evidence
37 deflection exceeding specified limits.
38
39 When tested at 150 percent of positive and negative wind-load design pressures, systems,
40 including anchorage, do not evidence material failures, structural distress, and permanent
41 deformation of main framing members exceeding 0.2 percent of span.
42
43 Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
44
45 Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing
46 and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a
47 minimum static-air-pressure difference of 6.24 lbf/sq. ft.
48

1 Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence
2 water penetration through fixed glazing and framing areas when tested according to ASTM 331 at
3 a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but
4 not less than 6.24 lbf/sq. ft.

5
6 Thermal Movements: Provide aluminum-framed systems that allow for thermal movements
7 resulting from the following maximum change (range) in ambient and surface temperatures. Base
8 engineering calculation on surface temperatures of materials due to both solar heat gain and
9 nighttime-sky heat loss.

10
11 Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

12
13 Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing,
14 anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

15
16 High Exterior Ambient-Air Temperature: That which produces an exterior
17 metal-surface temperature of 180 deg.

18
19 Low Exterior Ambient-Air Temperature: 0 deg F

20
21 Interior Ambient-Air Temperature: 75 deg F

22
23 Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas
24 having an average U-factor of not more than 0.44 Btu/sq. ft. x h x deg F when tested according to
25 AAMA 1503.

26 27 SUBMITTALS

28
29 Product Data: For each type of product indicated. Include construction details, material
30 descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed
31 systems.

32
33 Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and
34 attachments to other work.

35
36 Include details of provisions for system expansion and contraction and for drainage of
37 moisture in the system to the exterior. Include details showing coordination of all door and
38 window hardware to be installed.

39
40 Samples for Initial Selection: For units with factory-applied color finishes.

41
42 Samples for Verification: For each type of exposed finish required, in manufacturer's standard
43 sizes.

44 45 QUALITY ASSURANCE

46
47 Installer Qualifications: Entrances and storefront shall be installed by a firm that has not less than
48 five (5) years successful experience in the installation of systems similar to those required.

1 Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation
2 Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

3
4 Source Limitations for Aluminum-Framed Systems: Obtain from single source from single
5 manufacturer.

6
7 PROJECT CONDITIONS

8
9 Field Measurements: Verify actual locations of structural supports for aluminum-framed systems
10 by field measurements before fabrication and indicate measurements on Shop Drawings.

11
12 WARRANTY

13
14 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace
15 components of aluminum-framed systems that do not comply with requirements or that fail in
16 materials or workmanship within specified warranty period.

17
18 Failures include, but are not limited to, the following:

19
20 Structural failures including, but not limited to, excessive deflection.

21
22 Noise or vibration caused by thermal movements.

23
24 Deterioration of metals and other materials beyond normal weathering.

25
26 Adhesive or cohesive sealant failures.

27
28 Water leakage through fixed glazing and framing areas.

29
30 Failure of operating components.

31
32 Warranty Period: Two (2) years from date of Substantial Completion.

33
34 Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or
35 replace components on which finishes do not comply with requirements or that fail in materials or
36 workmanship within specified warranty period. Warranty does not include normal weathering.

37
38 Warranty Period: Ten (10) years from date of Substantial Completion. This applies only to
39 painted finishes, not anodized

40
41
42 PART 2 - PRODUCTS

43
44 MANUFACTURERS

45
46 Manufacturers: Subject to compliance with requirements, available manufacturers offering products
47 that may be incorporated into the Work include the following:

48
49 Kawneer North America; an Alcoa company; 451T system with operable glass inserts.

1 EFCO Corporation, a Pella Company; S-403 system with operable glass inserts.
2 YKK APP Inc; YES 45 TU system with operable glass inserts.
3 Tubelite.
4 United States Aluminum.
5 Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
6 Wausau Window and Wall Systems
7

8 MATERIALS

9
10 Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

11
12 Sheet and Plate: ASTM B 209.

13
14 Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.

15
16 Extruded Structural Pipe and Tubes: ASTM B 429.

17
18 Structural Profiles: ASTM B 308/B 308M.

19
20 Welding Rods and Bare Electrodes: AWS A5.10
21

22 Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with
23 SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select
24 surface preparation methods according to recommendations in SSPC-SP COM and prepare
25 surfaces according to applicable SSPC standard.
26

27 Structural Shapes, Plates, and Bars: ASTM A 36

28
29 Cold-Rolled Sheet and Strip: ASTM A 1008

30
31 Hot-Rolled Sheet and Strip: ASTM A 1011
32

33 FRAMING SYSTEMS

34
35 Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness
36 required and reinforced as required to support imposed loads.
37

38 Framing System:

39
40 Kawneer, 451T system with "glass vent" operable vents is model product specified.

41
42 Operation Types: Fixed, as shown on Drawings: provide all necessary operating hardware.
43

44 Construction: Thermally broken.
45

46 Glazing System: Retained mechanically with gaskets on four sides.
47

48 Glazing Plane: Dual, center.
49

1 Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining,
2 nonferrous shims for aligning system components.

3

4 Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-
5 bleeding fasteners and accessories compatible with adjacent materials.

6

7 Use self-locking devices where fasteners are subject to loosening or turning out from
8 thermal and structural movements, wind loads, or vibration.

9

10 Reinforce members as required to receive fastener threads.

11

12 Use exposed fasteners with countersunk Phillips screw heads, finished to match framing
13 system.

14

15 Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts,
16 complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

17

18 Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, ASTM A 240/A 240M of type
19 recommended by manufacturer.

20

21 Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer
22 for joint type.

23

24 Additional components for thermal expansion, water infiltration, or structural requirements: Provide
25 all structural, thermal and/or water infiltration breaks and necessary storefront components.
26 Provide clip angles/relieving angles, flashings, and extruded sills as recommended by manufacturer
27 to maintain warranty or as shown on drawings.

28

29 GLAZING SYSTEMS

30

31 Glazing: As specified in Division 08 Section "Glazing."

32

33 Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded,
34 of profile and hardness required to maintain watertight seal.

35

36 Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

37

38 Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which
39 sealants will not develop adhesion.

40

41 ACCESSORY MATERIALS

42

43 Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division
44 07 Section "Joint Sealants."

45

46 Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements
47 except containing no asbestos; formulated for 30-mil thickness per coat.

48

49 FABRICATION

1 Form or extrude aluminum shapes before finishing.
2
3 Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of
4 finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
5
6 Framing Members, General: Fabricate components that, when assembled, have the following
7 characteristics:
8
9 Profiles that are sharp, straight, and free of defects or deformations.
10
11 Accurately fitted joints with ends coped or mitered.
12
13 Means to drain water passing joints, condensation within framing members, and moisture
14 migrating within the system to exterior.
15
16 Physical and thermal isolation of glazing from framing members.
17
18 Accommodations for thermal and mechanical movements of glazing and framing to maintain
19 required glazing edge clearances.
20
21 Provisions for field replacement of glazing from exterior.
22
23 Fasteners, anchors, and connection devices that are concealed from view to greatest extent
24 possible.
25
26 Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
27
28 Storefront Framing: Fabricate components for assembly using shear-block system.
29
30 Aluminum Sill: Provide .068 aluminum sill where indicated on drawings and details and where
31 required to cover exposed sill areas. Finish to match storefront framing.
32
33 After fabrication, clearly mark components to identify their locations in Project according to Shop
34 Drawings.
35

36 ALUMINUM FINISHES

37
38 High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and
39 containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and
40 apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written
41 instructions. Provide 10 year warranty.
42

43 Color: As selected by Architect from manufacturer's full range.
44
45

46 PART 3 - EXECUTION

47 EXAMINATION

48
49

1 Examine areas and conditions, with Installer present, for compliance with requirements for
2 installation tolerances and other conditions affecting performance of the Work.

3

4 Proceed with installation only after unsatisfactory conditions have been corrected.

5

6 INSTALLATION

7

8 General:

9

10 Comply with manufacturer's written instructions.

11

12 Do not install damaged components.

13

14 Fit joints to produce hairline joints free of burrs and distortion.

15

16 Rigidly secure non-movement joints.

17

18 Install anchors with separators and isolators to prevent metal corrosion and electrolytic
19 deterioration.

20

21 Seal joints watertight unless otherwise indicated.

22

23 Metal Protection:

24

25 Where aluminum will contact dissimilar metals, protect against galvanic action by painting
26 contact surfaces with primer or applying sealant or tape, or by installing nonconductive
27 spacers as recommended by manufacturer for this purpose.

28

29 Where aluminum will contact concrete or masonry, protect against corrosion by painting
30 contact surfaces with bituminous paint.

31

32 Install components to drain water passing joints, condensation occurring within framing members,
33 and moisture migrating within the system to exterior.

34

35 Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section
36 "Joint Sealants" to produce weathertight installation.

37

38 Install components plumb and true in alignment with established lines and grades, and without warp
39 or rack.

40

41 Install glazing as specified in Division 08 Section "Glazing."

42

43 Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce
44 weathertight installation.

45

46 ERECTION TOLERANCES

47

48 Install aluminum-framed systems to comply with the following maximum erection tolerances:

49

1 Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch
2 over total length.

3
4 Alignment:

5
6 Where surfaces abut in line, limit offset from true alignment to 1/16 inch.

7
8 Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

9
10 Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

11
12 FIELD QUALITY CONTROL.

13
14 Testing Agency: A qualified independent testing and inspecting agency shall be engaged according
15 to Division 1 General Conditions to perform field tests and inspections.

16
17 Repair or remove work if test results and inspections indicate that it does not comply with specified
18 requirements.

19
20 Additional testing and inspecting, at Contractor's expense, will be performed to determine
21 compliance of replaced or additional work with specified requirements.

22
23 Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

24
25 Prepare test and inspection reports.

26
27 CLEANING:

28
29 Clean the completed system, inside and out, promptly after installation, exercising care to avoid
30 damage to coatings.

31
32 Clean glass surface after installation, complying with requirements contained in the "Glass and
33 Glazing" section for cleaning and maintenance. Remove excess glazing and sealant compounds,
34 dirt and other substances from aluminum surfaces.

35
36 PROTECTION

37
38 Institute protective measures required throughout the remainder of the construction period to
39 ensure that aluminum entrances and storefronts will be without damage or deterioration, other than
40 normal weathering, at time of acceptance.

41
42
43
44 END OF SECTION

1 SECTION 085113 - ALUMINUM WINDOWS

2
3

4 PART 1 - GENERAL

5
6

6 RELATED DOCUMENTS:

7
8

8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11

11 SUMMARY:

12
13

13 Extent of each type, grade and performance class of aluminum window units required is indicated
14 on the drawings.

15
16

16 Types of aluminum window units required include the following:

17
18

Fixed

19
20

20 Fixed windows are window units consisting of a glazed frame installed into one opening and are
21 not operable.

22
23

23 RELATED SECTIONS:

24
25

Refer to Division 7 - Section for "Joint Sealants" for sealants used during installation.

26
27

Refer to Division 8 - Section for "Glazing" installed within window units.

28
29

29 SUBMITTALS:

30
31

31 Shop Drawings: Submit shop drawings for each type of window including information not fully
32 detailed in the manufacturer's standard product data and the following:

33
34

Typical unit elevations at 3/4" scale

35
36

Full size section details of every typical composite member

37
38

Anchors

39
40

Hardware

41
42

Operators

43
44

Accessories

45
46

Glazing details

47

42 Product Data: manufacturer's specifications and test reports from an AAMA- accredited laboratory.

43
44

44 Samples for initial selection: For units with factory applied color finishes.

45
46

46 QUALITY ASSURANCE:

47

1 Standards: Requirements for aluminum windows, terminology and standards of performance, and
2 fabrication workmanship are those specified and recommended in ANSI/AAMA 101-93 and
3 applicable general recommendation published by AAMA and AA.

4
5 Performance Class: AW Architectural

6
7 Performance Grade: Not less than 60

8
9 Design Criteria: The drawings are based on a specific type and model of aluminum window. An
10 equivalent type of window by another un-listed manufacturer may be accepted provided that
11 deviations in dimensions and profiles are minor and do not materially detract from the design
12 concept or intended performances as judged solely by the Owner's Representative.

13
14 PROJECT CONDITIONS:

15
16 Field Measurements: Where possible, check actual window openings in construction work by
17 accurate field measurement before fabrication; show recorded measurements on final shop
18 drawings. Coordinate fabrication schedule with construction progress as directed by the Contractor
19 to avoid delay of work. Where necessary, proceed with fabrication without field measurements, and
20 coordinate fabrication tolerances to ensure proper fit of window units.

21
22 SYSTEM DESCRIPTION:

23
24 AAMA Designation: HC70/AW70

25
26 Windows: minimum of 2 1/4" frame depth; extruded aluminum with integral structural polyurethane
27 thermal break; vent flush with frame; equal-leg narrow frame.

28
29 Configuration: Fixed in same frame as shown on drawings.

30
31 Conformance to HC70 Specifications: in ANSI-101-93 and AAMA 910-93 when tests are performed
32 on a 3'-0" x 5'-0" minimum frame size with the following test results:

33
34 Air Infiltration: maximum .10 cfm/square foot when tested per ASTM E 283 at a static air
35 pressure difference of 6.24 psf.

36
37 Water Penetration: no uncontrolled water leakage when tested per ASTM E 547 and ASTM
38 E 331-00 at a static air pressure difference of 12 psf.

39
40 Uniform Load Deflection: A minimum static air pressure difference of 70 psf shall be applied
41 in the positive and negative direction in accordance with ASTM E330. There shall be no
42 deflection in excess of L.175 of the span of any framing member.

43
44 Uniform Load Structural Test: A minimum static air pressure difference of 105 psf shall be
45 applied in the positive and negative direction in accordance with ASTM E330. The unit shall
46 be evaluated after each load.

47
48 Component Testing: Window components shall be tested in accordance with procedures
49 described in ANSI/AAMA 101-93 for HC/AW grade windows.

1 Condensation Resistance Test: (CRF) when tested in accordance with AAMA 1503.1-88,
2 the condensation resistance factor shall not be less than 50.

3
4 Thermal Transmittance Test: (U-Value): When tested in accordance with AAMA 1503.1-88,
5 the thermal transmittance (U-Value) shall not be more than .60 BTU/hr/sf/°F.

6
7 WARRANTY

8
9 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace
10 aluminum windows that fail in materials or workmanship within specified warranty period. Failures
11 include, but are not limited to, the following:

12
13 Failure to meet performance requirements.

14
15 Structural failures including excessive deflection.

16
17 Water leakage, air infiltration, or condensation.

18
19 Faulty operation of movable sash and hardware.

20
21 Deterioration of metals, metal finishes, and other materials beyond normal weathering.

22
23 Insulating glass failure.

24
25 Warranty Period: Two (2) years from date of Substantial Completion.

26
27 Warranty Period for Metal Finishes: Five years from date of Substantial Completion.

28
29 Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or
30 replace components on which finishes do not comply with requirements or that fail in materials or
31 workmanship within specified warranty period. Warranty does not include normal weathering.

32
33 Warranty Period: 20 years from date of Substantial Completion.

34
35
36 PART 2 - PRODUCTS

37
38 MANUFACTURERS:

39
40 Manufacturers: Subject to compliance with requirements:

41
42 Kawneer Company, Inc.

43 Norcross, GA, 30092

44 1-404-449-5555

45 Series 8425T - SH/FX Single Hung/Fixed Window Unit

46
47 EFCO Corporation

48 Monett, Missouri

49 1-800-221-4169

1 Series 663
2
3 Traco
4 Cranberry Park
5 Warrendale, PA 15095
6 1-800-837-7002
7 Series 9700
8

9 MATERIALS:

10
11 Aluminum Extrusions: Provide commercial quality 6063-T5 alloy and temper recommended by the
12 window manufacturer for the strength, corrosion-resistance, and application of required finish, but
13 not less than 22,000 psi ultimate tensile strength and not less than 0.65" thickness at any location
14 for main frame and sash members.

15
16 The frame and ventilator depth shall be not less than 2-1/4" (57.2).

17
18 All frame and ventilator members shall have minimum wall thickness of .0125" (3.2) and
19 shall provide the structural strength sufficient to meet the specified performance
20 requirements.

21
22 All references to dimensions for wall thicknesses and other cross-sectional dimensions of
23 window members are nominal and in compliance with ANSI H35.2-1990.

24
25 All ventilators shall be tubular.

26
27 Ventilators shall be double weatherstripped with a resilient foam core clad with UV-
28 resistant elastomer.

29
30 All glass pockets shall be wept to provide positive drainage.

31
32 Mullions and Cover Plates: Shall be extruded aluminum of 6063-T5 alloy and temper of
33 profile and dimensions indicated on drawings. Mullions shall provide structural properties
34 to resist wind pressure required by performance criteria and standard.

35
36 Thermal Barrier: The thermal barrier shall be a minimum 3/8" separation consisting of a two-part,
37 chemically curing high density polyurethane which is mechanically and adhesively bonded to the
38 aluminum.

39
40 Fasteners: Provide aluminum, non-magnetic stainless steel, epoxy adhesive, or other materials
41 warranted by the manufacturer to be non-corrosive and compatible with aluminum window
42 members, trim, hardware, anchors and other components of window units.

43
44 Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125" thick,
45 reinforce the interior with aluminum or non-magnetic stainless steel to receive screw
46 threads, or provide standard non-corrosive pressed-in splined grommet nuts.
47

1 Exposed Fasteners: Except where unavoidable for application of hardware, do not use
2 exposed fasteners. For application of hardware, use fasteners that match the finish of the
3 member or hardware being fastened, as appropriate.
4

5 Interior Trims: Provide extruded aluminum, 6063-T5 alloy and temper extruded to profiles and
6 details indicated. Seal exterior joints with manufacturers standard sealant to assure water-tight
7 joints.
8

9 Anchors, Clips and Window Accessories: Fabricate anchors, clips and window accessories of
10 aluminum, non-magnetic stainless steel or hot-dip zinc coated steel or iron complying with the
11 requirements of ASTM A 386; provide sufficient strength to withstand design pressure indicated.
12

13 Compression Type Glazing Strips and Weatherstripping: Unless otherwise indicated, and at the
14 manufacturer's option, provide compressible stripping for glazing and weatherstripping such as
15 molded EPDM or neoprene gaskets complying with AAMA SG-1 or with ASTM D 2000 Designation
16 2BC415 to 3BC620, or molded PVC gaskets complying with ASTM D 2287, or molded expanded
17 EPDM or neoprene gaskets complying with ASTM C 509, Grade 4.
18

19 Sealant: For sealants required within fabricated window units, provide type recommended by the
20 manufacturer for joint size and movement. Sealant shall remain permanently elastic, non-shrinking,
21 and non-migrating, conforming to AAMA 803 and AAMA 808.
22

23 Hardware: Stainless steel four bar friction hinge complying with AAMA 904. Provide adjustable
24 slide friction shoes of nylon or other non-abrasive, non-staining, non-corrosive, durable material.
25 designed to permit ventilator operation for inside cleaning of outside glass face; two per ventilator.
26 Provide white bronze cam -action, sweep lock handle with strike for manual operation; two per
27 ventilator.
28

29 Weatherstrip: secured in extruded ports; double rows on vent perimeter of offset bulb gasket
30 utilizing a Neoprene foam rod for dimensional stability, a Santoprene cover for weather resistance
31 and a polycarbonate base for shrinkage resistance; continuous around vent corners with butt joint
32 bonded with silicone sealant.
33

34 FABRICATION: 35

36 General: Except to the extent that more specific or stringent requirements are indicated, provide
37 manufacturer's standard fabrication that complies with indicated standards and that produces units
38 that are reglazable without dismantling sash framing. Include a complete system for assembly of
39 components and anchorage of window units, and prepare sash for glazing except where preglazing
40 at the factory is indicated.
41

42 Sizes and Profiles: Required sizes for window units and profile requirements are indicated on the
43 drawings. Variable dimensions are indicated along with maximum and minimum dimensions as
44 required to achieve design requirements and coordination with other work.
45

46 Details shown are based upon standard details by one or more manufacturers. Similar
47 details by other manufacturers will be acceptable, provided they comply with size
48 requirements, minimum/maximum profile requirements, and performance standards as
49 indicated or specified.

1 FINISHES:

2
3 Clear Anodic Finish: AA-M12C22A41, (Mechanical Finish: nonspecular as fabricated; Chemical
4 Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or
5 thicker) complying with AAMA 611.
6

7
8 PART 3 - EXECUTION

9
10 INSPECTION:

11
12 Inspect openings before beginning installation. Verify that masonry opening is correct and the sill
13 plate is level.

14
15 Masonry surfaces shall be visibly dry and free of excess mortar, sand and other
16 construction debris.
17

18 INSTALLATION:

19
20 Comply with manufacturer's specifications and recommendations for installation of window units,
21 hardware, operators, and other components of the work.
22

23 Windows to be secured in opening thru window frame as interior snap trim securement is not
24 acceptable.
25

26 Set units plumb, level and true to line, without warp or rack of frames or sash. Provide proper
27 support and anchor securely in place.
28

29 Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic
30 action at points of contact with other materials by complying with the requirements specified
31 under paragraph "Dissimilar Materials" in the Appendix to AAMA 101-85.
32

33 ADJUSTING:

34
35 Adjust operating sash and hardware to provide a tight fit at contact points and at weatherstripping,
36 for smooth operation and a weathertight closure.
37

38 CLEANING:

39
40 Clean aluminum surfaces promptly after installation of windows. Exercise care to avoid damage
41 to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt and other
42 substances. Lubricate hardware and other moving parts.
43

44 Clean glass of preglazed units promptly after installation of windows; comply with requirements of
45 the "Glass and Glazing" section for cleaning and maintenance.
46

47 PROTECTION:

48

1 Initiate and maintain protection and other precautions required through the remainder of the
2 construction period, to ensure that, except for normal weathering, window units will be free of
3 damage or deterioration at the time of substantial completion.
4
5
6
7 END OF SECTION

1 SECTION 087100 - DOOR HARDWARE

2
3
4 PART 1 – GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and
9 Divisions 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY:

12
13 This Section includes the following:

- 14
15 Commercial door hardware.
16 Cylinders for doors specified in other Sections.
17 Electrified door hardware.

18
19 SUBMITTALS

20
21 Product Data: For each product indicated.

22
23 Shop Drawings: Include details of electrified door hardware and wiring diagrams.
24 Samples: For each exposed finish.

25
26 Door Hardware Schedule: Organized into door hardware sets indicating type, style, function,
27 size, label, hand, manufacturer, fasteners, location, and finish of each door hardware item.
28 Include description of each electrified door hardware function, including sequence of operation.

29
30 Keying Schedule: Detail Owner's final keying instructions for locks.

31
32 Product certificates.

33
34 Product Data and catalog cuts for each item on the schedule will be included and attached to
35 the hardware schedule.

36
37 QUALITY ASSURANCE

38
39 Supplier Qualifications: Person who is or employs a qualified DHI Architectural Hardware
40 Consultant.

41
42 Source Limitations: Obtain electrified door hardware from same manufacturer as mechanical
43 door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical
44 modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction,
45 are acceptable.

46
47 Keying Conference: Conduct conference at Project site. Incorporate keying conference
48 decisions into final keying schedule.

1
2 Pre-Installation Conference: Conduct conference at Project site.

3
4 Keys: Deliver keys to Owner by registered mail.

5
6 Templates: Obtain and distribute templates for doors, frames, and other work specified to be
7 factory prepared for installing door hardware.

8
9 Standards: Comply with BHMA A156 series standards, Grade 1.

10
11 Certified Products: Provide door hardware that is listed in BHMA directory of certified products.

12
13 WARRANTY

14
15 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or
16 replace components of door hardware that fails in materials or workmanship within warranty
17 period from date of Substantial Completion.

18
19 Warranty Period for Manual Closers: 10 years.

20
21 Warranty Period for Exit Devices: 3 years.

22
23 Warranty Period for Locks: 7 years.

24
25 All other hardware one year.

26
27
28 PART 2 – PRODUCTS

29
30 GENERAL

31
32 Standards: Manufacturers and model numbers listed are to establish a standard of performance
33 and material quality.

34
35 Substitutions: Products utilized for this project are to be those specified to insure the
36 standard of performance and material quality. If proposing a substitute, in addition to the
37 procedure identified in Division 1, submit the proposed product data as well as the
38 product data for the specified item and indicate basis for substitution. Provide sample if
39 requested.

40
41 No substitutions: Certain products have been selected for their unique characteristics,
42 warranties and particular project suitability and no substitutions will be allowed. Certain
43 products have been listed as required to match existing for continuity and/or future
44 performance and maintenance standards and no substitutions will be allowed. Certain
45 products have been listed because there is no known equal product and no substitutions
46 will be allowed.

47
48 Items specified, as "no substitution" shall be provided exactly as listed.

1
2 If a category lists only one product, then "no substitution" is implied and intended.

3
4 MANUFACTURERS

5
6 Manufacturers Used in the specification:

7

8 <u>Products</u>	9 <u>Manufacture Specified</u>	10 <u>Acceptable Equals</u>
11 Hinges	Ives	Hager, Stanley
12 Locksets	Schlage L9000 03N	Corbin-Russwin ML2000 LWM
13 Exit Devices	Von Duprin 99 Series	Precision Apex Falcon 25
14 Closers	LCN 4041XP MC	Sargent 281 x MC C-R DC8200 x MC
15 Overhead Stops	Glynn Johnson	Rixson, ABH
16 Pulls, Stops	Ives	Hager, Rockwood
17 Flushbolts	Ives	Hager, Rockwood
18 Thresholds/Seals	National Guard	Hager, Pemko
19 Power Transfers/Supplies	Von Duprin	Precision, Falcon
20 Auto. Operators	LCN	Tormax II
21 Wall Magnets	LCN	Rixson
22 Cylinders	Corbin-Russwin	No substitutions

23
24 DOOR HARDWARE

25
26 Scheduled Door Hardware: Provide door hardware according to Door Hardware Sets at the end
27 of Part 3. Manufacturers' names are abbreviated.

28
29 HINGES, BUTTS AND PIVOTS

30
31 General: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and
32 frames, provide only template-produced units.

33
34 Hinge Base Metal: Unless otherwise indicated, provide the following:

35
36 Exterior Hinges: Stainless steel, with stainless-steel pin.

37
38 Interior Hinges: Steel, with steel pin.

39
40 Hinges for Fire-Rated Assemblies: Steel, with steel pin.

41
42 Non-removable Pins: Provide set screw in hinge barrel that prevents removal of pin while door
43 is closed; for out-swinging exterior doors.

44
45 Screws: Phillips flat-head screws; screw heads finished to match surface of hinges.

46
47 Metal Doors and Frames: Machine screws (drilled and tapped holes).

1 MECHANICAL LOCKS AND LATCHES

2
3 Mortise Locks:

4
5 Locks shall be ANSI A156.13, Grade 1 mortise locksets, Manufactured from heavy
6 gauge steel, containing components of steel with a zinc dichromate plating for corrosion
7 resistance.

8
9 Locks to have a standard 2-3/4" backset with a full 3/4" throw stainless steel mechanical
10 anti-friction latch bolt. Deadbolt shall be a full 1" throw, constructed of stainless steel.

11
12 Lever trim shall be cast or forged in the design specified, with 2-1/8" diameter roses.
13 Levers to be thru-bolted to assure proper alignment. Trim shall be applied by threaded
14 bushing "no exposed screws".

15
16 BOLTS

17
18 Shall have forged bronze faceplate with extruded brass lever wrought brass guide and strike.
19 Flush bolts for hollow metal doors shall be extension rod type door up to 7'6" in height shall
20 have 12" steel or brass rods, manual flush bolts for doors over 7'6" in height shall be increased
21 by 6" for each additional 6" of door height. Wood doors shall have corner-wrap type. Provide
22 dust proof strikes for all bottom bolts.

23
24 EXIT DEVICES

25
26 Panic Exit Devices: Listed and labeled for panic protection, based on testing according to UL
27 305.

28
29 Fire Exit Devices: Complying with NFPA 80 that are listed and labeled for fire and panic
30 protection, based on testing according to UL 305 and NFPA 252.

31
32 All lever design shall match mortise or cylindrical lock lever designs.

33
34 All devices to incorporate a security dead-latching feature. Provide roller strikes for all rim and
35 surface mounted vertical rod devices, ASA strikes for mortise devices, and manufacturer's
36 standard strikes for concealed vertical rod devices.

37
38 Removable Mullions: BHMA A156.3.

39
40 Fire-Exit Removable Mullions: Complying with NFPA 80 that are listed and labeled for
41 fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions
42 shall be used only with exit devices for which they have been tested.

43
44 Carry-Open Bars: Provide carry-open bars for inactive leaves of pairs of doors, unless
45 automatic or self-latching bolts are used.

46
47 CLOSERS

1 Surface-Mounted Closers:
2

3 Spring power shall be continuously adjustable over the full range of closer sizes, and allow for
4 reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-
5 proof, non-critical valves. Closers shall have separate adjustment for latch speed, general
6 speed, and back check.
7

8 All closers will not be seen on the public side or hallway side of the door. The appropriate drop
9 plate or mounting plates will be used as conditions dictate.
10

11 PROTECTIVE TRIM UNITS

12
13 Protective Trim Units: Sized 2" inches less than door width on push side and 1" inch less than
14 door width on pull side, by height scheduled or indicated. Fasten with exposed machine or self-
15 tapping screws.
16

17 STOPS AND HOLDERS

18
19 Stops and Holders: Provide floor stops for doors, unless wall or other type stops are scheduled
20 or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops
21 are not appropriate, provide overhead holders.
22

23 Silencers for Door Frames: Neoprene or rubber; fabricated for drilled-in application to frame.
24

25 DOOR GASKETING AND THRESHOLDS

26
27 Door Gasketing: Provide continuous weather-strip gasketing on exterior doors and provide
28 smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide non-
29 corrosive fasteners for exterior applications and elsewhere as indicated.
30

31 CYLINDERS, KEYING, AND STRIKES

32
33 Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
34

35 Keying System: To existing Corbin-Russwin key system
36

37 FABRICATION

38
39 Base Metals: Furnish metals of a quality equal to or greater than that of specified door
40 hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard
41 materials if different from specified standard.
42

43 Fasteners: Phillips flat-head screws with finished heads to match surface of door hardware,
44 unless otherwise indicated. Provide steel machine or wood screws or steel through bolts for
45 fire-rated applications.
46

47 Spacers or Sex Bolts: For through bolting of hollow metal doors.
48

1 Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended
2 Fasteners for Wood Doors."
3

4 Finishes: Comply with BHMA A156.18.
5
6

7 PART 3 - EXECUTION

8 INSTALLATION

10
11 Examine doors and frames for compliance with requirements for installation tolerances, labeled
12 fire door assembly construction, wall and floor construction, and other conditions affecting
13 performance. Examine roughing-in for electrical power systems to verify actual locations of
14 wiring connections before electrified door hardware installation.
15

16 Steel Door and Frame Preparation: Comply with DHI A115 series. Drill and tap doors and
17 frames for surface-applied hardware according to SDI 107.
18

19 Wood Door Preparation: Comply with DHI A115-W series.
20

21 Mounting Heights: Comply with the following requirements, unless otherwise indicated:
22

23 Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural
24 Hardware for Standard Steel Doors and Frames."
25

26 Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders'
27 Hardware for Custom Steel Doors and Frames."
28

29 Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for
30 Wood Flush Doors."
31

32 Adjust and reinforce attachment substrates as necessary for proper installation and operation.
33 Drill and countersink units that are not factory prepared for anchorage fasteners. Space
34 fasteners and anchors according to industry standards.
35

36 Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant
37 complying with requirements specified in Division 7 Section "Joint Sealants."
38

39 Adjust door control devices to compensate for final operation of heating and ventilating
40 equipment and to comply with accessibility requirements.
41

42 Door Closers: Adjust sweep period so that from an open position of 70 degrees, the
43 door will take at least three seconds to move to a point 3 inches (75 mm) from the latch,
44 measured to the leading edge of the door.
45

46 FIELD QUALITY CONTROL

47
48 Inspections: Owner will engage a qualified independent Architectural Hardware Consultant to

1 perform inspections and to prepare inspection reports.

2

3 DOOR HARDWARE SCHEDULE AS FOLLOWS:

4

5

HARDWARE SCHEDULE

6

7 Hardware Group No. 01

8

9 Each To Have:

10

11 Qty	Description	Catalog Number	Finish	Mfr
12 3	EA	HINGE5BB1 4.5 X 4.5	652	IVE
13 1	EA	CLASSROOM LOCK L9070L 03N	626	SCH
14 1	EA	CYLINDER AS REQUIRED	626	C-R
15 1	EA	SURFACE CLOSER 4040XP REG	689	LCN
16		OR PA AS REQ MC		
17 1	EA	MOP PLATE 8400 4" X 1" LDW	630	IVE
18 1	EA	KICK PLATE 8400 8" X 2" LDW	630	IVE
19 1	EA	WALL STOP WS406/407CVX	630	IVE
20 1	SET	SEALS5050CL	CLR	NGP

21

22

23

24 Hardware Group No. 02

25

26 Each to Have:

27

27 Qty	Description	Catalog Number	Finish	Mfr
28 6	EA	HINGE5BB1 4.5 X 4.5	652	IVE
29 1	SET	AUTO FLUSH BOLT FB41P	630	IVE
30 1	EA	DUST PROOF STRIKE DP2	626	IVE
31 1	EA	CLASSROOM LOCK L9070L 03N	626	SCH
32 1	EA	CYLINDER AS REQUIRED	626	C-R
33 1	EA	COORDINATOR COR X FL	628	IVE
34 2	EA	MOUNTING BRACKET MB	689	IVE
35 2	EA	SURFACE CLOSER 4040XP REG		
36		OR PA AS REQ MC		
37		(180 DEGREE OPENING)	689	LCN
38 2	EA	KICK PLATE 8400 8" X 1" LDW	630	IVE
39 2	EA	FIRE/LIFE WALL MAG SEM7840	689	LCN
40 1	SET	SEALS5050CL	CLR	NGP
41 1	SET	SEALS9550DKB	DKB	NGP

42

43 TIE INTO FIRE ALARM SYSTEM

44

45

46 Hardware Group No. 03

47

48 Each to Have:

1	Qty	Description	Catalog Number	Finish	Mfr
2	6	EA	HW HINGE 5BB1HW 5 X 4.5	652	IVE
3	1	SET	AUTO FLUSH BOLT FB41P	630	IVE
4	1	EA	DUST PROOF STRIKE DP2	626	IVE
5	1	EA	CLASSROOM LOCK L9070L 03N	626	SCH
6	1	EA	CYLINDER AS REQUIRED	626	C-R
7	1	EA	COORDINATOR COR X FL	628	IVE
8	2	EA	MOUNTING BRACKET MB	689	IVE
9	2	EA	SURFACE CLOSER 4040XP REG		
10			OR PA AS REQ MC		
11			(180 DEGREE OPENING)	689	LCN
12	2	EA	KICK PLATE 8400 8" X 1" LDW	630	IVE
13	2	EA	FIRE/LIFE WALL MAG SEM7840	689	LCN
14	1	SET	SEALS5050CL	CLR	NGP
15	1	SET	SEALS9550DKB	DKB	NGP

16
17 TIE INTO FIRE ALARM SYSTEM
18
19

20 Hardware Group No. 04
21 Each to Have:

23	Qty	Description	Catalog Number	Finish	Mfr
24	6	EA	HW HINGE 5BB1HW 5 X 4.5	652	IVE
25	2	EA	FIRE EXIT HARDWARE		
26			9927-EO-F-LBR-499F	626	VON
27	2	EA	SURFACE CLOSER 4040XP REG		
28			OR PA AS REQ MC	689	LCN
29	2	EA	FIRE/LIFE WALL MAG SEM7840	689	LCN
30	1	SET	SEALS5050CL	CLR	NGP
31	1	SET	SEALS9550DKB	DKB	NGP

32
33 TIE INTO FIRE ALARM SYSTEM
34
35

36 Hardware Group No. 05
37 Each to Have:

39	Qty	Description	Catalog Number	Finish	Mfr
40	3	EA	HINGE5BB1 4.5 X 4.5	652	IVE
41	1	EA	STOREROOM LOCK L9080L 03N	626	SCH
42	1	EA	CYLINDER AS REQUIRED	626	C-R
43	1	EA	WALL STOP WS406/407CVX	630	IVE

44
45
46 Hardware Group No. 06
47 Each to Have:
48

1	Qty	Description	Catalog Number	Finish	Mfr
2	3	EA	HINGE5BB1 4.5 X 4.5	652	IVE
3	1	EA	OFFICE/ENTRY LOCK		
4			L9050L 03N L583-363	626	SCH
5	1	EA	CYLINDER AS REQUIRED	626	C-R
6	1	EA	WALL STOP WS406/407CVX	630	IVE

7
8
9
10 Hardware Group No. 07
11 Each to Have:

12	Qty	Description	Catalog Number	Finish	Mfr
13	3	EA	HINGE5BB1 4.5 X 4.5	652	IVE
14	1	EA	OFFICE/ENTRY LOCK		
15			L9050L 03N L583-363	626	SCH
16	1	EA	CYLINDER AS REQUIRED	626	C-R
17	1	EA	OH STOP & HOLDER 100H	630	GLY

18
19
20
21
22 Hardware Group No. 08
23 Each to Have:

24	Qty	Description	Catalog Number	Finish	Mfr
25	6	EA	HINGE5BB1 4.5 X 4.5	652	IVE
26	2	EA	MANUAL FLUSH BOLT FB458	626	IVE
27	1	EA	DUST PROOF STRIKE DP2	626	IVE
28	1	EA	STOREROOM LOCK L9080L 03N	626	SCH
29	1	EA	HALF DUMMY TRIM L0170 03N	626	SCH
30	1	EA	CYLINDER AS REQUIRED	626	C-R
31	2	EA	OH STOP & HOLDER 100H	630	GLY

32
33
34
35 Hardware Group No. 09
36 Each to Have:

37	Qty	Description	Catalog Number	Finish	Mfr
38	6	EA	HINGE5BB1 4.5 X 4.5	652	IVE
39	2	EA	FIRE EXIT HARDWARE		
40			9927-L-F-LBR-03-499F	626	VON
41	2	EA	CYLINDER AS REQUIRED	626	C-R
42	2	EA	SURFACE CLOSER 4011T MC		
43			(180 DEGREE)		
44	(PULL SIDE MOUNT)	689	LCN
45	2	EA	FIRE/LIFE WALL MAG SEM7840	689	LCN
46	1	SET	SEALS5050CL	CLR	NGP
47	1	SET	SEALS9550DKB	DKB	NGP

1
2 TIE INTO FIRE ALARM SYSTEM
3
4

5
6 Hardware Group No. 10
7 Each to Have:

8	9 Qty	Description	Catalog Number	Finish	Mfr
10	6	EA	HW HINGE 5BB1HW 5 X 4.5	652	IVE
11	2	EA	PANIC HARDWARE		
12			3347A-L-BE-LBR-03	626	VON
13	2	EA	SURFACE CLOSER 4040XP REG		
14			OR PA AS REQ MC		
15			(PULL SIDE MOUNT)	689	LCN
16	2	EA	WALL STOP/HOLDER WS40	626	IVE

17
18
19
20 Hardware Group No. 11
21 Each to Have:

22	23 Qty	Description	Catalog Number	Finish	Mfr
24	3	EA	HINGE5BB1 4.5 X 4.5	652	IVE
25	1	EA	DEADBOLT 4910	628	ADA
26	2	EA	CYLINDER AS REQUIRED	626	C-R
27	2	EA	90 DEG OFFSET PULL		
28			8190HD 12" O (B-B MOUNT)	630	IVE
29	1	EA	OH STOP & HOLDER 100H 630 GLY		

30
31 NOT AN EXIT
32
33

34 Hardware Group No. 12
35 Each to Have:

36	37 Qty	Description	Catalog Number	Finish	Mfr
38	6	EA	HINGE5BB1 4.5 X 4.5	652	IVE
39	1	EA	PANIC HARDWARE		
40			CD-3347A-L-DT-LBR-03	626	VON
41	1	EA	PANIC HARDWARE		
42			CD-3347A-L-LBR-03-33AWDA	626	VON
43	3	EA	CYLINDER AS REQUIRED	626	C-R
44	2	EA	SURFACE CLOSER 4040XP REG		
45			OR PA AS REQ MC X D.P. X 61	689	LCN
46	2	EA	WALL STOP WS406/407CVX	630	IVE

47
48

1 Hardware Group No. 13

2 Each to Have:

3

4 Qty	Description	Catalog Number	Finish	Mfr
5 3	EA	HINGE5BB1 4.5 X 4.5	652	IVE
6 1	EA	DEADLOCK 4910 X 4569 X 4066	628	ADA
7 1	EA	CYLINDER AS REQUIRED	626	C-R
8 1	EA	ELECTRIC STRIKE		
9		6211AL FSE DS	630	VON
10 2	EA	90 DEG OFFSET PULL		
11		8190HD 12" O (B-B MOUNT)	630	IVE
12 1	EA	OH STOP 100S	630	GLY
13 1	EA	SURFACE CLOSER		
14		4040XP REG OR PA AS REQ MC	689	LCN

15

16 REMOTE DOOR RELEASE FURNISHED ELSEWHERE

17

18

19 Hardware Group No. 14

20 Each to Have:

21

22 Qty	Description	Catalog Number	Finish	Mfr
23 3	EA	HINGE5BB1 4.5 X 4.5	652	IVE
24 1	EA	DEADLOCK 4910 X 4569 X 4066	628	ADA
25 1	EA	CYLINDER AS REQUIRED	626	C-R
26 1	EA	ELECTRIC STRIKE		
27		6211AL FSE DS	630	VON
28 1	EA	90 DEG OFFSET PULL 8190HD		
29		12" O (B-B MOUNT)	630	IVE
30 1	EA	OH STOP 100S	630	GLY
31 1	EA	SURFACE CLOSER 4040XP REG		
32		OR PA AS REQ MC X D.P. X 61	689	LCN

33

34 REMOTE DOOR RELEASE FURNISHED ELSEWHERE

35

36

37

38 Hardware Group No. 15

39 Each to Have:

40

41 Qty	Description	Catalog Number	Finish	Mfr
42 6	EA	HW HINGE		
43		5BB1HW 4.5 X 4.5 NRP	630	IVE
44 2	EA	POWER TRANSFER EPT10	689	VON
45 1	EA	ELEC PANIC HARDWARE		
46		RX-EL-HD-3347A-EO	626	VON
47 1	EA	ELEC PANIC HARDWARE		
48		RX-EL-HD-3347A-NL-OP-388	626	VON

1	1	EA	CYLINDER AS REQUIRED	626	C-R
2	2	EA	0 DEG OFFSET PULL		
3			8190HD 12" O	630	IVE
4	2	EA	OH STOP 100S	630	GLY
5	2	EA	SURFACE CLOSER 4040XP REG		
6			OR PA AS REQ MC X D.P. X 61	689	LCN
7	1	EA	PANIC THRESHOLD 896S	AL	NGP
8	1	EA	POWER SUPPLY		
9			PS914 900-2RS	LGR	VON
10			CARD READER FURNISHED ELSEWHERE		
11		EA	SEALS BY DOOR SUPPLIER		

12
13 DOORS LOCKED/UNLOCKED MANUALLY OR BY ACCESS CONTROL SYSTEM AT
14 DESIGNATED TIMES

15
16
17 Hardware Group No. 16
18 Each to Have:

20	Qty	Description	Catalog Number	Finish	Mfr
21	6	EA	HW HINGE 5BB1HW 4.5 X 4.5	652	IVE
22	2	EA	POWER TRANSFER EPT10	689	VON
23	1	EA	ELEC PANIC HARDWARE		
24			RX-EL-HD-3347A-EO	626	VON
25	1	EA	ELEC PANIC HARDWARE		
26			RX-EL-HD-3347A-NL-OP-388	626	VON
27	1	EA	CYLINDER AS REQUIRED	626	C-R
28	2	EA	90 DEG OFFSET PULL		
29			8190HD 12" O	630	IVE
30	2	EA	OH STOP 100S	630	GLY
31	2	EA	SURFACE CLOSER 4040XP REG		
32			OR PA AS REQ MC X D.P. X 61	689	LCN
33	1	EA	POWER SUPPLY		
34			PS914 900-2RS	LGR	VON
35			CARD READER FURNISHED ELSEWHERE		

36
37 DOORS LOCKED/UNLOCKED MANUALLY OR BY ACCESS CONTROL SYSTEM AT
38 DESIGNATED TIMES

39
40 DOOR/HARDWARE INDEX

42	Door #	HWSet #
43	100	15
44	100A	16
45	101	13
46	101A	14
47	103	06
48	104	06

1	104A	07
2	105	06
3	105A	07
4	106	08
5	106A	08
6	107	11
7	108	12
8	109	05
9	118	09
10	119	10
11	122	01
12	123	02
13	124	03
14	126	04
15		
16		
17		
18	END OF SECTION	

Door/Hardware Index

Door #	HWSet #
100	15
100A	16
101	13
101A	14
103	06
104	06
104A	07
105	06
105A	07
106	08
106A	08
107	11
108	12
109	05
118	09
119	10
122	01
123	02
124	03
126	04

1 SECTION 088000 - GLAZING

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY:

12
13 Extent of glass and glazing work is indicated on drawings and schedules.

14
15 Types of work in this section include glass and glazing for:

16
17 Aluminum storefront systems, interior and exterior.

18
19 Window units, interior and exterior

20
21 Entrances and other doors and sidelites

22
23 SYSTEM DESCRIPTION:

24
25 Provide glass and glazing that has been produced, fabricated and installed to withstand normal
26 thermal movement, wind loading and impact loading (where applicable), without failure including
27 loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight,
28 deterioration of glass and glazing materials and other defects in the work.

29
30 Normal thermal movement is defined as that resulting from an ambient temperature range
31 of 120° F and from a consequent temperature range within glass and glass framing
32 members of 180° F.

33
34 SUBMITTALS:

35
36 Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass
37 product required, including installation and maintenance instructions.

38
39 Samples: Supplier shall submit, for verification purposes, 12" square samples of each type of glass
40 indicated except for clear single pane units, install shall submit 12" long samples of each color
41 required (except black) for each type of sealant or gasket exposed to view. Install sealant or
42 gasket sample between two strips of material representative of adjoining framing system in color.

43
44 QUALITY ASSURANCE:

45
46 Mirror Glass:

1 Safety Glazing Standard: Where safety glass mirrors are indicated or required by
2 authorities having jurisdiction, provide types of products indicated which comply with ANSI
3 Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.
4

5 Thermal Performance Properties:
6

7 Solar heat gain coefficient: NFRL 200; ≤ 0.40
8

9 Insulating Glass Certification Program: Provide insulating glass units permanently marked either
10 on spacers or at least one component pane of units with appropriate certification label of inspecting
11 and testing organization indicated below:
12

13 Insulating Glass Certification Council (IGCC)
14

15 Single Source Responsibility for Glass: Supplier to ensure consistent quality of appearance and
16 performance, provide materials produced by a single manufacturer or fabricator for each kind and
17 condition of glass indicated and composed of primary glass obtained from a single source for each
18 type and class required.
19

20 DELIVERY, STORAGE, AND HANDLING:
21

22 Glass and glazing during storage and handling to comply with manufacturer's directions and as
23 required to prevent edge damage to glass, and damage to glass and glazing materials from effects
24 of moisture including condensation, temperature changes, direct exposure to sun, and from other
25 causes.
26

27 PROJECT CONDITIONS:
28

29 Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature
30 conditions are outside the limits permitted by glazing material manufacturer or when joint
31 substrates are wet due to rain, frost, condensation or other causes.
32

33 WARRANTY:
34

35 General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may
36 have under the Contract Documents.
37

38 Manufacturer's Special Project Warranty on Insulating Glass: Supplier shall provide written
39 warranty signed by manufacturer of insulating glass agreeing to furnish replacements for those
40 insulating glass units developing manufacturing defects. Manufacturing defects are defined as
41 failure of hermetic seal or air space (beyond that due to glass breakage) as evidenced by intrusion
42 of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass
43 coatings, if any, and other visual indications of seal failure or performance; provided the
44 manufacturer's instructions for handling, installing, protecting and maintaining units have been
45 complied with during the warranty period. Manufacturing defects shall also include glass breakage
46 not caused by building user activity or vandalism after substantial completion.
47

48 Warranty Period: Manufacturer's standard but not less than 10 years after date of
49 substantial completion.

1
2 PART 2 - PRODUCTS

3
4 MANUFACTURERS:

5
6 Manufacturers: Subject to compliance with requirements, manufacturers offering products which
7 may be incorporated in the work include the following:

8
9 Manufacturers of Clear and Tinted Float Glass:

10
11 LOF Glass, Inc.
12 Pilkington Group
13 PPG Industries, Inc.
14 Visteon/Versalux

15
16 Manufacturers of Heat-Treated Glass:

17
18 LOF Glass, Inc.
19 Pilkington Group
20 PPG Industries, Inc.
21 Visteon/Versalux

22
23 Manufacturers of Insulating Glass:

24
25 LOF Glass, Inc.
26 Pilkington Group
27 PPG Industries, Inc.
28 Visteon/Versalux

29
30 Manufacturers of Fire Rated Glass:

31
32 Pilkington Group (Distributed by TGP: Technical Glass Products)
33 Safti Div., O'Keefe's Inc., Architectural Building Products
34 Schott Technical Glass Solutions (Distributed by Interedge Technologies/AGC Flat
35 Glass)
36 Vetrotech - Saint Gobain

37
38 GLASS PRODUCTS, GENERAL:

39
40 Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements,
41 including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh
42 and pattern.

43
44 Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048
45 requirements, including those indicated by reference to kind, condition, type, quality, class, and,
46 if applicable, form, finish, and pattern.

47
48 Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for
49 Category II materials, and with other requirements specified. Use materials that have a proven

1 record of no tendency to bubble, discolor, or lose physical and mechanical properties after
2 fabrication and installation. Construct glass with polyvinyl butyral interlayer to comply with interlayer
3 manufacturer's written recommendations.

4
5 Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and
6 tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated
7 or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

8
9 PRIMARY GLASS PRODUCTS:

10
11 Clear Float Glass: Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).

12
13 HEAT-TREATED GLASS PRODUCTS:

14
15 Manufacturing Process: Manufacture heat-treated glass as follows:

16
17 By vertical (tong-held) or horizontal (roller hearth) process, at manufacturer's option,
18 except provide horizontal process where indicated as "tong-less" or "free of tong marks".

19
20 Uncoated Clear Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent
21 glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below:

22
23 Kind FT (fully tempered) where indicated.

24
25 LAMINATED GLASS PRODUCTS

26
27 Clear, translucent and tinted laminated glass with two plies of fully tempered float glass.

28
29 Thickness of Each Glass Ply: 3.0 mm

30
31 Interlayer Thickness: 0.060 inch

32
33 Provide safety glazing labeling.

34
35 Colors and opacity to be selected by Architect from Manufacturers' full range.

36
37 SEALED INSULATING GLASS UNITS:

38
39 General: Provide preassembled units consisting of organically sealed panes of glass enclosing a
40 hermetically sealed dehydrated air space and complying with ASTM E 774 for performance
41 classification indicated as well as with other requirements specified for glass characteristics, air
42 space, sealing system, sealant, spacer material, corner design and desiccant. Provide a total
43 system visibility transmission of .78 minimum.

44
45 For properties of individual glass panes making up units, refer to product requirements
46 specified elsewhere in this section applicable to types, classes, kinds and conditions of
47 glass products indicated.

1 Provide heat-treated panes of kind and at locations indicated or, if not indicated, provide
2 heat-strengthened panes where recommended by manufacturer for application indicated
3 and tempered where indicated or where safety glass is designated or required.
4

5 Performance characteristics designated for coated insulating glass are nominal values
6 based on manufacturer's published test data for units with 1/4" thick panes of glass and 1/2"
7 thick air space.
8

9 U-values indicated are expressed in the number of Btu's per hour per sq. ft. per °F
10 difference.
11

12 Performance Classification per ASTM E 774: Class A
13

14 Thickness of Each Pane: 1/8"
15

16 Air Space Thickness: 3/4"
17

18 Glass Coating: Low E on #3 surface of units without integral blinds and not in classrooms.
19

20 Sealing System: Manufacturer's standard
21

22 Spacer Material: Manufacturer's standard metal
23

24 Desiccant: Manufacturer's standard; either molecular sieve or silica gel or blend of both.
25

26 Corner Construction: Manufacturer's standard corner construction.
27

28 Coated Insulating Glass Units: Manufacturer's standard units complying with the following
29 requirements:
30

31 Exterior Pane: Clear float glass
32

33 Kind/RG (REGULAR ANNEALED) when no indication given
34

35 Kind/FT (FULLY TEMPERED) where indicated
36

37 Interior Pane of Glass: Clear float glass with Low E metallic coating at non-blind locations.
38

39 Kind/RG (REGULAR ANNEALED) when no indication given
40

41 Kind/FT (FULLY TEMPERED) where indicated.
42

43 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES: 44

45 General: Provide products of type indicated and complying with the following requirements:
46

47 Compatibility: Select glazing sealants and tapes of proven compatibility with other materials
48 with which they will come into contact, including glass products, seals of insulating glass

1 units, and glazing channel substrates, under conditions of installation and service, as
2 demonstrated by testing and field experience.

3
4 Suitability: Comply with recommendations of sealant and glass manufacturers for selection
5 of glazing sealants and tapes which have performance characteristics suitable for
6 applications indicated and conditions at time of installation.

7
8 Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing,
9 elastomeric sealant of base polymer indicated which complies with ASTM C 920
10 requirements, including those for Type, Grade, Class and Uses.

11
12 Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as
13 selected by Owner's Representative from manufacturer's standard colors.

14
15 One-Part Non-Acid-Curing Silicone Glazing Sealant: Type S; Grade NS, Class 25; Uses NT, G,
16 A, and, as applicable to uses indicated, 0; and complying with the following requirements for
17 modulus and additional joint movement capability:

18
19 40%

20
21 Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free
22 butyl-polyisobutylene formulation with a solids content of 100% complying with AAMA A 804.1; in
23 extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged
24 on rolls with a release paper on one side; with or without continuous spacer rod as recommended
25 by manufacturers of tape and glass for application indicated.

26
27 Products: Subject to compliance with requirements, glazing sealants which may be incorporated
28 in the work include the following:

29
30 One-Part Non-Acid Curing Low-Modulus Silicone Glazing Sealant:

31
32 "Chem-Calk 1000"; Bostik Construction Products Division
33 "Dow Corning 790"; Dow Corning Corporation
34 "864"; Pecora Corporation
35 "Omniseal"; Sonneborn Building Products Div., Rexnord Chemical
36 "Spectrum 1"; Tremco, Inc.

37
38 Preformed Butyl-Polyisobutylene Glazing Tape Without Spacer Rod:

39
40 "Chem-Tape 40"; Bostik Construction Products Division
41 "Extru-Seal"; Pecora Corporation
42 "PTI 303" Glazing Tape; Protective Treatments, Inc.
43 "Tremco 440 Tape"; Tremco Inc.

44
45 MISCELLANEOUS GLAZING MATERIALS:

46
47 Compatibility: Provide materials with proven record of compatibility with surfaces contacted in
48 installation.

1 Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

2
3 Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing
4 sealants, 80 to 90 Shore A durometer hardness.

5
6 Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for
7 compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant
8 manufacturers for application indicated.

9
10 Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant,
11 of size and hardness required to limit lateral movement (side-walking) of glass.

12
13 Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or
14 plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

15
16
17 PART 3 - EXECUTION

18
19 EXAMINATION:

20
21 Require glazer to inspect work of glass framing erector for compliance with manufacturing and
22 installation tolerances, including those for size, squareness, offsets at corners; for presence and
23 functioning of weep system; for existence of minimum required face or edge clearances; and for
24 effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to
25 performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions
26 have been corrected.

27
28 PREPARATION:

29
30 Clean glazing channels and other framing members to receive glass, immediately before glazing.
31 Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces
32 where elastomeric sealants are indicated for use.

33
34 GLAZING, GENERAL:

35
36 Comply with combined printed recommendations of glass manufacturers, of manufacturers of
37 sealants, gaskets and other glazing materials, except where more stringent requirements are
38 indicated, including those of referenced glazing standards.

39
40 Glazing channel dimensions as indicated in details are intended to provide for necessary bite on
41 glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable
42 tolerances. Adjust as required by job conditions at time of installation.

43
44 Protect glass from edge damage during handling and installation; use a rolling block in rotating
45 glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use
46 suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate
47 glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks
48 so that these are located at top of opening. Remove from project and dispose of glass units with

1 edge damage or other imperfections of kind that, when installed, weakens glass and impairs
2 performance and appearance.

3
4 Apply primers to joint surfaces where required for adhesion of sealants, as determined by
5 preconstruction sealant-substrate testing.

6
7 GLAZING:

8
9 Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each
10 corner, but with edge nearest corner not closer than 6" from corner, unless otherwise required. Set
11 blocks in thin course of sealant which is acceptable for heel bead use.

12
13 Provide spacers inside and out, of correct size and spacing to preserve required face clearances,
14 for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing
15 tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on
16 glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less
17 than final compressed thickness of tape.

18
19 Provide edge blocking to comply with requirements of referenced glazing standard, except where
20 otherwise required by glass unit manufacturer.

21
22 Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

23
24 Provide compressible filler rods or equivalent back-up material, as recommended by sealant and
25 glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from
26 adhering to joints back surface as well as to control depth of sealant for optimum performance,
27 unless otherwise indicated.

28
29 Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond
30 of sealant to glass and channel surfaces.

31
32 Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install
33 pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and
34 moisture pockets.

35
36 PROTECTION AND CLEANING:

37
38 Protect exterior glass from breakage immediately upon installation by use of crossed streamers
39 attached to framing and held away from glass. Do not apply markers to surfaces of glass.
40 Remove nonpermanent labels and clean surfaces.

41
42 Protect glass from contact with contaminating substances resulting from construction operations.
43 If, despite such protection, contaminating substances do come into contact with glass, remove
44 immediately by method recommended by glass manufacturer.

45
46 Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at
47 frequent intervals during construction, but not less often than once a month, for build-up of dirt,
48 scum, alkali deposits or staining. When examination reveals presence of these forms of residue,
49 remove by method recommended by glass manufacturer.

- 1 Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways
- 2 during construction period, including natural causes, accidents and vandalism.
- 3
- 4 Wash glass on both faces not more than 4 days prior to date scheduled for inspections intended
- 5 to establish date of substantial completion in each area of project. Wash glass by method
- 6 recommended by glass manufacturer.
- 7
- 8
- 9
- 10 END OF SECTION

1 SECTION 092900 - GYPSUM BOARD

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes the following:

14
15 Interior gypsum wallboard.

16
17 Tile backing panels.

18
19 Non-load-bearing steel framing.

20
21 Related Sections include the following:

22
23 Division 06 Section "Rough Carpentry" for wood framing and furring.

24
25 DEFINITIONS

26
27 Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board
28 assemblies not defined in this Section or in other referenced standards.

29
30 SUBMITTALS

31
32 Product Data: For each type of product indicated.

33
34 Shop Drawings: Show locations, fabrication, and installation of control and expansion joints
35 including plans, elevations, sections, details of components, and attachments to other units of
36 Work.

37
38 QUALITY ASSURANCE

39
40 Moisture and Mold Resistant Assemblies: Provide and install moisture and mold-resistant gypsum
41 board assemblies with moisture-resistant surfaces complying with ASTM C 630 and ASTM C1177
42 where indicated on Drawings and in all locations which might be subject to moisture exposure during
43 construction.

44
45 Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings,
46 provide materials and construction identical to those tested in assembly indicated according to

1 ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having
2 jurisdiction.

3
4 Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval
5 Guide, Building Products" or UL's "Fire Resistance Directory" or GA-600, "Fire Resistance
6 Design Manual."
7

8 Sound Transmission Characteristics: for gypsum board assemblies with STC rating, provide
9 materials and construction identical to those tested in assembly indicated according to ASTM E 90
10 and classified according to ASTM E 413 by a qualified independent testing agency.
11

12 STC Rated Assemblies: Indicated by design designations from GA-600, "Fire resistance
13 Design Manual."
14

15 Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at
16 least 100 sq. ft. in surface area to demonstrate aesthetic effects and qualities of materials and
17 execution.
18

19 Install mockups for the following applications:
20

21 Surfaces with texture finishes.
22

23 Surfaces indicated to receive non-textured paint finishes.
24

25 Surfaces indicated to receive textured paint finishes.
26

27 Simulate finished lighting conditions for review of mockups.
28

29 Approved mockups may become part of the complete Work if undisturbed at time of
30 Substantial Completion.
31

32 DELIVERY, STORAGE, AND HANDLING 33

34 Deliver materials in original packages, containers, or bundles bearing brand name and identification
35 of manufacturer or supplier.
36

37 Store materials inside under cover and keep them dry and protected against damage from weather,
38 direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack
39 gypsum panels flat to prevent sagging.
40

41 PROJECT CONDITIONS 42

43 Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board
44 manufacturer's written recommendations, whichever are more stringent.
45
46

1 PART 2 - PRODUCTS

2
3 MANUFACTURERS

4
5 Available Manufacturers: Subject to compliance with requirements, manufacturers offering
6 products that may be incorporated into the Work include the following:

7
8 Steel Framing and Furring:

9
10 Clark Steel Framing Systems.
11 Consolidated Systems, Inc.
12 Dale Industries, Inc. - Dale/Incor.
13 Dietrich Industries, Inc.
14 MarinoWare; Division of Ware Ind.
15 National Gypsum Company.
16 Scafco Corporation.
17 Unimast, Inc.
18 Western Metal Lath & Steel Framing Systems.

19
20 Grid Suspension Systems:

21
22 Chicago Metallic Co
23 USG Corporation
24 National Rolling Mills Company

25
26 Gypsum Board and Related Products:

27
28 Lafarge North America Inc.
29 G-P Gypsum Corp.
30 National Gypsum Company.
31 United States Gypsum Co.

32
33 Cementitious Backer Units:

34
35 United States Gypsum Co.; Durock Cement Board
36 Custom Building Products; Wonder Board
37 FinPan, Inc.; Util-A-Crete Concrete Backer Board

38
39 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

40
41 Components, General: Comply with ASTM C 754 for conditions indicated.

42
43 Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch diameter wire, or
44 double strand of 0.0475-inch diameter wire.

45
46 Hanger Attachments to Concrete: As follows:

1 Powder-Actuated Fasteners: Suitable for application indicated, fabricated from
2 corrosion-resistant materials, with clips or other devices for attaching hangers of type
3 indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed
4 by construction as determined by testing according to ASTM E 1190 by a qualified
5 independent testing agency.
6

7 Hangers: As follows:
8

9 Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch
10 diameter.
11

12 Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653, G40, hot-dip
13 galvanized zinc coating.
14

15 Cold Rolled Channels: 0.0538-inch bare steel thickness, with minimum ½ -inch wide
16 flange, ¾ inch deep.
17

18 Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
19

20 Minimum Base Metal Thickness: 0.0312 inch.
21

22 Resilient Furring Channels: ½ -inch deep members designed to reduce sound transmission.
23

24 Configuration: Asymmetrical, with face attached to single flange by a slotted leg
25 (web).
26

27 Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main
28 beams and cross-furring members that interlock.
29

30 Available Products: Subject to compliance with requirements, products that may be
31 incorporated into the Work include the following:
32

33 Armstrong World Industries, Inc.; Furring Systems/Drywall heavy duty fire rated.
34

35 Chicago Metallic Corporation; Fire Front 670 System.
36

37 USG Interiors Inc./Donn Corporation; DGLW Drywall Suspension System
38

39 STEEL PARTITION AND SOFFIT FRAMING 40

41 Components, General: As follows:
42

43 Comply with ASTM C 754 for conditions indicated.
44

45 Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with
46 manufacturer's standard corrosion-resistant zinc coating.

1 Steel Studs and Runners: ASTM C 645.
2
3 Minimum Base Metal Thickness: 0.0312 inch.
4
5 Depth: 3 5/8 inches or as indicated on drawings.
6
7 Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch deep flanges.
8
9 Proprietary Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum
10 board applied to interior partitions resulting from deflection of structure above; in thickness
11 indicated for studs and in width to accommodate depth of studs.
12
13 Product: Subject to compliance with requirements, products that may be incorporated into
14 the Work include the following:
15
16 Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
17 Metal-Lite, Inc.; Slotted Track.
18 Veritrack LTD, by The Steel Network
19
20 Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
21
22 Minimum Base Metal Thickness: 0.0450 inch
23
24 Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum 1/2 inch wide flange.
25
26 Depth: 1 1/2 inches
27
28 Clip Angle: 1 1/2 by 1 1/2 inch, 0.068-inch thick, galvanized steel.
29
30 Hat-Shaped, Rigid Furring Channels: ASTM C 645.
31
32 Minimum Base Metal Thickness: 0.0179 inch
33
34 Depth: 7/8 inch or as indicated on drawings.
35
36 Resilient Furring Channels: 1/2 inch deep, steel sheet members designed to reduce sound
37 transmission.
38
39 Configuration: Asymmetrical, with face attached to single flange by a slotted leg (web).
40
41 Cold-Rolled Furring Channels: 0.0538-inch bare steel thickness, with minimum 1/2 inch wide flange.
42
43 Depth: 3/4 inch .
44
45 Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel
46 thickness of 0.0312 inch.

1 Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.0625-inch diameter wire, or
2 double strand of 0.0475-inch diameter wire.

3
4 Z-Shaped Furring: With slotted or non-slotted web, face flange of 1 ¼ inches, wall attachment
5 flange of 7⁄8 inch, minimum bare metal thickness of 0.0179 inch, and depth required to fit insulation
6 thickness indicated.

7
8 Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and
9 other properties required to fasten steel members to substrates.

10 11 INTERIOR GYPSUM WALLBOARD

12
13 Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area
14 and correspond with support system indicated.

15
16 Gypsum Wallboard: ASTM C 36 and ASTM C 1396.

17
18 Regular Type:

19
20 Thickness: 5⁄8" or as indicated on drawings.

21
22 Long Edges: Tapered

23
24 Location: Vertical surfaces, unless otherwise indicated.

25
26 Type X:

27
28 Thickness: 5⁄8" or as indicated on drawings.

29
30 Long Edges: Tapered

31
32 Location: Where required for fire-resistance-rated assembly.

33
34 Water Resistant Gypsum Backing Board: ASTM 1178 or C 1177 and as follows to be
35 installed in damp locations or where indicated:

36
37 Type: Regular, unless otherwise indicated.

38
39 Thickness: 5⁄8 inch unless otherwise indicated.

40
41 Flexible Gypsum Wallboard: ASTM C 36, manufactured to bend to fit tight radii and to be more
42 flexible than standard regular-type panels of the same thickness.

43
44 Thickness: ¼ inch.

45
46 Long Edges: Tapered.

1 Location: Apply in double layer at curved assemblies.

2
3 Abuse-Resistant Gypsum Wallboard: ASTM C 79, manufactured to produce greater resistance
4 to surface indentation and through-penetration than standard gypsum panels.

5
6 Core: $\frac{5}{8}$ inch.

7
8 Long Edges: Tapered.

9
10 Location: To be installed in all vertical applications below 8'-0".

11
12 Surface Abrasion: ASTM DX 060, 0.090 inch.

13
14 Surface Indentation: ASTM D 1037, 0.13 inch, maximum.

15
16 Soft Body Impact ASTM E 695 Surface Failure: 180 foot-pounds.

17
18 TILE BACKING PANELS

19
20 Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area
21 and correspond with support system indicated.

22
23 Water-Resistant Gypsum Backing Board: ASTM C 630 and ASTM C1396.

24
25 Core: $\frac{1}{2}$ inch regular, $\frac{5}{8}$ " type "X"

26
27 Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M.

28
29 Core: $\frac{5}{8}$ inch.

30
31 Cementitious Backer Units: ANSI A118.9.

32
33 Thickness: $\frac{1}{2}$ inch.

34
35 TRIM ACCESSORIES

36
37 Interior Trim: ASTM C 1047.

38
39 Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

40
41 Shapes:

42
43 Cornerbead: Use at outside corners, unless otherwise indicated.

44
45 Bullnose Bead: Use at outside corners where indicated.

1 LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed
2 panel edges.

3
4 L-Bead: L-shaped; exposed long leg receives joint compound; use.

5
6 Expansion (Control) Joint: Use where indicated.

7
8 Curved-Edge Cornerbead: With notched or flexible flanges; use at curved
9 openings.

10
11 F-Shaved Reveal

12
13 Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

14
15 Available Manufacturers: Subject to compliance with requirements, manufacturers offering
16 products that may be incorporated into the Work include the following:

17
18 Fry Reglet Corp.
19 Gordon, Inc.
20 MM Systems Corporation.
21 Pittcon Industries.

22
23 Aluminum: Alloy and temper with not less than the strength and durability properties of
24 ASTM B 221, alloy 6063-T5.

25
26 Finish: Corrosion-resistant primer compatible with joint compound and finish materials
27 specified.

28
29 JOINT TREATMENT MATERIALS

30
31 General: Comply with ASTM C 475.

32
33 Joint Tape:

34
35 Interior Gypsum Wallboard: Paper

36
37 Exterior Gypsum Soffit Board: Paper

38
39 Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

40
41 Tile Backing Panels: As recommended by panel manufacturer.

42
43 Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible
44 with other compounds applied on previous or for successive coats.

45
46 Pre-filling: At open joints and damaged surface areas, use setting-type taping compound.

1 Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim
2 flanges, use drying-type, all-purpose compound.

3
4 Use setting-type compound for installing paper-faced metal trim accessories.

5
6 Fill Coat: For second coat, use drying-type, all-purpose compound.

7
8 Finish Coat: For third coat, use drying-type, all-purpose compound.

9
10 Joint Compound for Tile Backing Panels:

11
12 Water-Resistant Gypsum Backing Board: Use setting-type taping and setting-type,
13 sandable topping compounds.

14
15 Glass-Mat, Water-Resistant Backing Panel: As recommended by manufacturer.

16
17 Cementitious Backer Units: As recommended by manufacturer.

18
19 ACOUSTICAL SEALANT

20
21 Available Products: Subject to compliance with requirements, products that may be incorporated
22 into the Work include the following:

23
24 Acoustical Sealant for Exposed and Concealed Joints:

25
26 Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.

27
28 United States Gypsum Co.; SHEETROCK Acoustical Sealant.

29
30 Acoustical Sealant for Concealed Joints:

31
32 Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.

33
34 Pecora Corp.; BA-98.

35
36 Tremco, Inc.; Tremco Acoustical Sealant.

37
38 Acoustical Sealant for Exposed and Concealed Joints: Non-sag, paintable, non-staining, latex
39 sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through
40 perimeter joints and openings in building construction as demonstrated by testing representative
41 assemblies according to ASTM E 90.

42
43 AUXILIARY MATERIALS

44
45 General: Provide auxiliary materials that comply with referenced installation standards and
46 manufacturer's written recommendations.

1 Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum
2 panels to continuous substrate.

3
4 Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

5
6 Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033
7 to 0.112 inch thick.

8
9 For fastening cementitious backer units, use screws of type and size recommended by
10 panel manufacturer.

11
12 Isolation Strip at Exterior Walls:

13
14 Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener
15 penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

16
17 Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced
18 by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock
19 wool.

20
21 Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

22 23 24 PART 3 - EXECUTION

25 26 EXAMINATION

27
28 Examine areas and substrates, with Installer present, and including welded hollow-metal frames,
29 cast-in anchors, and structural framing, for compliance with requirements and other conditions
30 affecting performance. Proceed with installation only after unsatisfactory conditions have been
31 corrected.

32 33 PREPARATION

34
35 Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of
36 overhead structure to ensure that inserts and other provisions for anchorages to building structure
37 have been installed to receive ceiling hangers at spacing required to support ceilings and that
38 hangers will develop their full strength.

39
40 Furnish concrete inserts and other devices indicated to other trades for installation in
41 advance of time needed for coordination and construction.

42 43 INSTALLING STEEL FRAMING, GENERAL

44
45 Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing
46 installation.

1 Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies
2 to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or
3 similar construction. Comply with details indicated and with gypsum board manufacturer's written
4 recommendations or, if none available, with United States Gypsum's "Gypsum Construction
5 Handbook."
6

7 Isolate steel framing from building structure at locations indicated to prevent transfer of loading
8 imposed by structural movement.
9

10 Isolate ceiling assemblies where they abut or are penetrated by building structure.
11

12 Isolate partition framing and wall furring where it abuts structure, except at floor. Install
13 slip-type joints at head of assemblies that avoid axial loading of assembly and laterally
14 support assembly.
15

16 Use deep-leg deflection track where indicated.
17

18 Do not bridge building control and expansion joints with steel framing or furring members. Frame
19 both sides of joints independently.
20

21 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING 22

23 Suspend ceiling hangers from building structure as follows:
24

25 Install hangers plumb and free from contact with insulation or other objects within ceiling
26 plenum that are not part of supporting structural or ceiling suspension system. Splay
27 hangers only where required to miss obstructions and offset resulting horizontal forces by
28 bracing, counter-splaying, or other equally effective means.
29

30 Where width of ducts and other construction within ceiling plenum produces hanger
31 spacings that interfere with the location of hangers required to support standard suspension
32 system members, install supplemental suspension members and hangers in form of
33 trapezes or equivalent devices. Size supplemental suspension members and hangers to
34 support ceiling loads within performance limits established by referenced standards.
35

36 Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye
37 screws, or other devices and fasteners that are secure and appropriate for substrate, and
38 in a manner that will not cause them to deteriorate or otherwise fail.
39

40 Secure hangers to structure, including intermediate framing members, by attaching to
41 inserts, eye screws, or other devices and fasteners that are secure and appropriate for
42 structure and hanger, and in a manner that will not cause hangers to deteriorate or
43 otherwise fail.
44

45 Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger
46 inserts that extend through forms.

- 1
2 Do not attach hangers to steel deck tabs.
3
4 Do not attach hangers to steel roof deck. Attach hangers to structural members.
5
6 Do not connect or suspend steel framing from ducts, pipes, or conduit.
7
8 Installation Tolerances: Install steel framing components for suspended ceilings so members for
9 panel attachment are level to within $\frac{1}{8}$ inch in 12 feet measured lengthwise on each member and
10 transversely between parallel members.
11
12 Sway-brace suspended steel framing with hangers used for support.
13
14 For exterior soffits, install cross bracing and framing to resist wind uplift.
15
16 Screw furring to wood framing.
17
18 Wire-tie or clip furring channels to supports, as required to comply with requirements for
19 assemblies indicated.
20
21 Install suspended steel framing components in sizes and spacings indicated, but not less than that
22 required by the referenced steel framing and installation standards.
23
24 Hangers: 48 inches
25
26 Carrying Channels (Main Runners): 48 inches on center.
27
28 Furring Channels (Furring Members): 16 inches on center.
29
30 Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets
31 vertical surfaces. Mechanically join main beam and cross-furring members to each other and
32 butt-cut to fit into wall track.
33

34 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

- 35
36 Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board
37 assemblies abut other construction.
38
39 Where studs are installed directly against exterior walls, install foam-gasket isolation strip
40 between studs and wall.
41
42 Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary
43 not more than $\frac{1}{8}$ inch from the plane formed by the faces of adjacent framing.
44
45 Extend partition framing full height to structural supports or substrates above suspended ceilings,
46 except where partitions are indicated to terminate at suspended ceilings. Continue framing over

1 frames for doors and openings and frame around ducts penetrating partitions above ceiling to
2 provide support for gypsum board.

3

4 Cut studs ½ inch short of full height to provide perimeter relief. Do not fasten studs to top
5 track to allow independent movement of studs and track.

6

7 For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof
8 slabs and decks or other continuous solid-structure surfaces to obtain ratings, install
9 framing around structural and other members extending below floor/roof slabs and decks,
10 as needed to support gypsum board closures and to make partitions continuous from floor
11 to underside of solid structure.

12

13 Terminate partition framing at suspended ceilings where indicated.

14

15 Install steel studs and furring at the following spacings:

16

17 Single-Layer Construction: 16 inches on center, unless otherwise indicated.

18

19 Multilayer Construction: 16 inches on center, unless otherwise indicated.

20

21 Cementitious Backer Units: 16 inches on center, unless otherwise indicated.

22

23 Install steel studs so flanges point in the same direction and leading edge or end of each panel can
24 be attached to open (unsupported) edges of stud flanges first.

25

26 Curved Partitions:

27

28 Cut top and bottom track (runners) through leg and web at 2-inch intervals for arc length.
29 In cutting lengths of track, allow for uncut straight lengths of not less than 12 inches at ends
30 of arcs.

31

32 Bend track to uniform curve and locate straight lengths so they are tangent to arcs.

33

34 Support outside (cut) leg of track by clinching steel sheet strip, 1-inch high-by-thickness
35 of track metal, to inside of cut legs using metal lock fasteners.

36

37 Begin and end each arc with a stud, and space intermediate studs equally along arcs at
38 stud spacing recommended in writing by gypsum board manufacturer for radii indicated.
39 On straight lengths of not less than two (2) studs at ends of arcs, place studs 6 inches on
40 center.

41

42 Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable
43 written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb
44 anchor clips on door frames; install runner track section (for cripple studs) at head and secure to
45 jamb studs.

46

- 1 Install two studs at each jamb, unless otherwise indicated.
2
3 Install cripple studs at head adjacent to each jamb stud, with a minimum ½ inch clearance
4 from jamb stud to allow for installation of control joint.
5
6 Extend jamb studs through suspended ceilings and attach to underside of floor or roof
7 structure above.
8
9 Frame openings other than door openings the same as required for door openings, unless
10 otherwise indicated. Install framing below sills of openings to match framing required above door
11 heads.
12
13 Z-Furring Members:
14
15 Erect insulation vertically and hold in place with Z-furring members spaced 24 inches on
16 center.
17
18 Except at exterior corners, securely attach narrow flanges of furring members to wall with
19 concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners
20 spaced 24 inches on center.
21
22 At exterior corners, attach wide flange of furring members to wall with short flange
23 extending beyond corner; on adjacent wall surface, screw-attach short flange of furring
24 channel to web of attached channel. At interior corners, space second member no more
25 than 12 inches from corner and cut insulation to fit.
26
27 Until gypsum board is installed, hold insulation in place with 10-inch staples fabricated from
28 0.0625-inch diameter, tie wire and inserted through slot in web of member.
29

30 APPLYING AND FINISHING PANELS, GENERAL

- 31
32 Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
33
34 Install sound attenuation blankets before installing gypsum panels, unless blankets are readily
35 installed after panels have been installed on one side.
36
37 Install ceiling board panels across framing to minimize the number of abutting end joints and to
38 avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent
39 panels not less than one framing member.
40
41 Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends
42 with not more than 1/16 inch of open space between panels. Do not force into place.
43
44 Locate edge and end joints over supports, except in ceiling applications where intermediate
45 supports or gypsum board back-blocking is provided behind end joints. Do not place tapered

1 edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not
2 make joints other than control joints at corners of framed openings.

3
4 Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open
5 (unsupported) edges of stud flanges first.

6
7 Attach gypsum panels to framing provided at openings and cutouts.

8
9 Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists
10 and headers. Float gypsum panels over these members using resilient channels, or provide control
11 joints to counteract wood shrinkage.

12
13 Form control and expansion joints with space between edges of adjoining gypsum panels.

14
15 Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above
16 ceilings, etc.), except in chases braced internally.

17
18 Unless concealed application is indicated or required for sound, fire, air, or smoke ratings,
19 coverage may be accomplished with scraps of not less than 8 sq. ft. in area.

20
21 Fit gypsum panels around ducts, pipes, and conduits.

22
23 Where partitions intersect open concrete coffers, concrete joists, and other structural
24 members projecting below underside of floor/roof slabs and decks, cut gypsum panels to
25 fit profile formed by coffers, joists, and other structural members; allow ¼- to ⅜ -inch wide
26 joints to install sealant.

27
28 Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except
29 floors. Provide ¼ to ½ -inch wide spaces at these locations, and trim edges with U-bead edge trim
30 where edges of gypsum panels are exposed. Seal joints between edges and abutting structural
31 surfaces with acoustical sealant.

32
33 Floating Construction: Where feasible, including where recommended in writing by manufacturer,
34 install gypsum panels over wood framing, with floating internal corner construction.

35
36 STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and
37 at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical
38 sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C
39 919 and manufacturer's written recommendations for locating edge trim and closing off
40 sound-flanking paths around or through gypsum board assemblies, including sealing partitions
41 above acoustical ceilings.

42
43 Space fasteners in gypsum panels according to referenced gypsum board application and finishing
44 standard and manufacturer's written recommendations.

45
46 Space screws a maximum of 12 inches on center for vertical applications.

1 Space fasteners in panels that are tile substrates a maximum of 8 inches on center.

2
3 PANEL APPLICATION METHODS

4
5 Single-Layer Application:

6
7 On ceilings, apply gypsum panels before wall/partition board application to the greatest
8 extent possible and at right angles to framing, unless otherwise indicated.

9
10 On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise
11 indicated or required by fire-resistance-rated assembly, and minimize end joints.

12
13 Stagger abutting end joints not less than one framing member in alternate courses
14 of board.

15
16 At stairwells and other high walls, install panels horizontally, unless otherwise
17 indicated or required by fire-resistance-rated assembly.

18
19 On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end
20 joints. Locate edge joints over furring members.

21
22 Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

23
24 Exterior Soffits and Ceilings: Apply exterior gypsum soffit board panels perpendicular to supports,
25 with end joints staggered and located over supports.

26
27 Install with ¼ inch open space where panels abut other construction or structural
28 penetrations.

29
30 Fasten with corrosion-resistant screws.

31
32 Tile Backing Panels:

33
34 Water-Resistant Gypsum Backing Board: Install at showers, tubs, and where indicated.
35 Install with ¼ inch gap where panels abut other construction or penetrations.

36
37 Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation
38 instructions and install at where indicated. Install with 1/4-inch gap where panels abut other
39 construction or penetrations.

40
41 Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

42
43 Areas Not Subject to Wetting: Install standard gypsum wallboard panels to produce a flat
44 surface except at showers, tubs, and other locations indicated to receive water-resistant
45 panels.

1 Where tile backing panels abut other types of panels in the same plane, shim surfaces to
2 produce a uniform plane across panel surfaces.

3 4 INSTALLING TRIM ACCESSORIES

5
6 General: For trim with back flanges intended for fasteners, attach to framing with same fasteners
7 used for panels. Otherwise, attach trim according to manufacturer's written instructions.

8
9 Control Joints: Install control joints at locations indicated on Drawings or if not indicated install
10 control joints according to ASTM C 840 and in specific locations approved by Owner's
11 Representative for visual effect.

12 13 FINISHING GYPSUM BOARD ASSEMBLIES

14
15 General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener
16 heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for
17 decoration. Promptly remove residual joint compound from adjacent surfaces.

18
19 Pre-fill open joints and damaged surface areas.

20
21 Apply joint tape over gypsum board joints, except those with trim having flanges not intended for
22 tape.

23
24 Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840,
25 for locations indicated:

26
27 Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where
28 indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and
29 sound-rated assemblies.

30
31 Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners,
32 and trim flanges where panels are substrate for tile and where indicated.

33
34 Level 3: Embed tape and apply separate first and fill coats of joint compound to tape,
35 fasteners, and trim flanges where indicated.

36
37 Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to
38 tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless
39 otherwise indicated.

40
41 Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to
42 tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface
43 where indicated.

44
45 Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for
46 use as exposed soffit board.

1 Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written
2 instructions.

3

4 Cementitious Backer Units: Finish according to manufacturer's written instructions.

5

6 FIELD QUALITY CONTROL

7

8 Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Owner's
9 Representative will conduct an above-ceiling observation and report deficiencies in the Work
10 observed. Do not proceed with installation of gypsum board to ceiling support framing until
11 deficiencies have been corrected.

12

13 Notify Owner's Representative seven days in advance of date and time when Project, or
14 part of Project, will be ready for above-ceiling observation.

15

16 Before notifying Owner's Representative, complete the following in areas to receive gypsum
17 board ceilings:

18

19 Installation of 80 percent of lighting fixtures, powered for operation.

20

21 Installation, insulation, and leak and pressure testing of water piping systems.

22

23 Installation of air-duct systems.

24

25 Installation of air devices.

26

27 Installation of mechanical system control-air tubing.

28

29 Installation of ceiling support framing.

30

31

32

33 END OF SECTION

1 SECTION 093000 - TILING

2

3

4 PART 1 - GENERAL

5

6 RELATED DOCUMENTS

7

8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10

11 SUMMARY

12

13 This Section includes the following:

14

15 Glazed wall tile.

16

17 DEFINITIONS

18

19 General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply
20 to Work of this Section unless otherwise specified.

21

22 ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C,
23 ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI
24 A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI
25 A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

26

27 Module Size: Actual tile size plus joint width indicated.

28

29 Face Size: Actual tile size, excluding spacer lugs.

30

31 SUBMITTALS

32

33 General: Submit the following in accordance with Conditions of Contract and Division 1
34 Specification Sections.

35

36 Product data for each type of product specified.

37

38 QUALITY ASSURANCE

39

40 Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and
41 variety of tile from a single source with resources to provide products of consistent quality in
42 appearance and physical properties without delaying progress of the Work.

43

44 Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform
45 quality from one manufacturer for each cementitious and admixture component and from one
46 source or producer for each aggregate.

1 Installer Qualifications: Engage an experienced Installer who has successfully completed tile
2 installations similar in material, design, and extent to that indicated for Project.

3
4 ADAAG: Recommended static coefficient of friction.

5
6 DELIVERY, STORAGE, AND HANDLING

7
8 Deliver and store packaged materials in original containers with seals unbroken and labels intact
9 until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

10
11 Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

12
13 Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from
14 contacting backs or edges of other units. If despite these precautions coating does contact
15 bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

16
17 PROJECT CONDITIONS

18
19 Maintain environmental conditions and protect work during and after installation to comply with
20 referenced standards and manufacturer's printed recommendations.

21
22 Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

23
24 Maintain temperatures at 50 deg F (10 deg C) or more in tiled areas during installation and for 7
25 days after completion, unless higher temperatures are required by referenced installation standard
26 or manufacturer's instructions.

27
28 EXTRA MATERIALS

29
30 Deliver extra materials to Owner. Furnish extra materials that match products installed as
31 described below, packaged with protective covering for storage and identified with labels clearly
32 describing contents.

33
34 Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount
35 installed, for each type, composition, color, pattern, and size.

36
37
38 PART 2 - PRODUCTS

39
40 MANUFACTURERS

41
42 Source Limitations for Tile: Obtain tile of each color or finish from single source or producer.

43
44 Obtain tile of each type and color or finish from same production run and of consistent
45 quality in appearance and physical properties for each contiguous area.

1 Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for
2 each mortar, adhesive, and grout component from single manufacturer and each aggregate from
3 single source or producer.

4
5 Obtain setting and grouting materials, except for unmodified Portland cement and
6 aggregate, from single manufacturer.

7
8
9 PRODUCTS, GENERAL

10
11 ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions,
12 and other characteristics indicated.

13
14 Provide tile complying with Standard grade requirements unless otherwise indicated.

15
16 ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02,
17 ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA
18 installation methods specified in tile installation schedules, and other requirements specified.

19
20 Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package
21 so tile units taken from one package show same range in colors as those taken from other
22 packages and match approved Samples.

23
24 Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard
25 with manufacturer unless otherwise indicated.

26
27 Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile
28 assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for
29 installation indicated and has a record of successful in-service performance.

30
31 TILE PRODUCTS

32
33 Glazed Wall Tile

34
35 Manufacturers: Subject to compliance with requirements, available manufacturers offering
36 products that may be incorporated into the Work include, but are not limited to, the
37 following:

- 38
39 American Marazzi Tile, Inc.
40 American Olean Corporation.
41 Dal-Tile Corporation.
42 Jeffrey Court Inc.
43 Porcelanite.
44 Seneca Tiles, Inc.
45 United States Ceramic Tile Co.
46 Crossville

1 Module Size: 4-1/4 by 4-1/4 inches.
2
3 Face Size Variation: Rectified.
4
5 Thickness: 5/16 inch
6
7 Face: Pattern of design indicated, with manufacturer's standard edges.
8
9 Finish: Bright, clear, Mat, opaque.
10
11 Tile Color and Pattern: As selected by Architect from manufacturer's full range. See wall
12 elevations for pattern of blue, yellow and white field.
13
14 Grout Color: As selected by Architect from manufacturer's full range.
15
16 Mounting: Factory, back mounted.
17
18 Mounting: Pregouted sheets of tiles are factory assembled and grouted with
19 manufacturer's standard white silicone rubber.
20
21 Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable.
22 Provide shapes as follows, selected from manufacturer's standard shapes:
23
24 Base for Thinset Mortar Installations: coved, module size 4-1/4 by 4-1/4 inches.
25
26 External Corners for Thinset Mortar Installations: Surface bullnose, same size as adjoining
27 flat tile.
28
29 Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces
30 designed to fit with stretcher shapes.
31

32 SETTING MATERIALS

33
34 Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
35

36 Manufacturers: Subject to compliance with requirements, available manufacturers offering
37 products that may be incorporated into the Work include, but are not limited to, the
38 following:
39

40 Ardex Americas.
41 Boiardi Products Corporation; a QEP company.
42 Bonsal American; an Oldcastle company.
43 Bostik, Inc.
44 C-Cure.
45 Custom Building Products.
46 Jamo Inc.

1 Laticrete International, Inc.
2 MAPEI Corporation.
3 Merkrete Systems; Parex USA, Inc.
4 Southern Grouts & Mortars, Inc.
5 Summitville Tiles, Inc.
6 TEC; H. B. Fuller Construction Products Inc.
7

8 Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic
9 additive to which only water must be added at Project site.
10

11 Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene butadiene
12 rubber liquid-latex additive at Project site.
13

14 For wall applications, provide mortar that complies with requirements for nonsagging mortar
15 in addition to the other requirements in ANSI A118.4.
16

17 Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.
18

19 Manufacturers: Subject to compliance with requirements, available manufacturers offering
20 products that may be incorporated into the Work include, but are not limited to, the
21 following:
22

23 Atlas Minerals & Chemicals, Inc.
24 Boiardi Products Corporation; a QEP company.
25 Bonsal American; an Oldcastle company.
26 Bostik, Inc.
27 C-Cure.
28 Custom Building Products.
29 Jamo Inc.
30 Laticrete International, Inc.
31 MAPEI Corporation.
32 Merkrete Systems; Parex USA, Inc.
33 Southern Grouts & Mortars, Inc.
34 Summitville Tiles, Inc.
35 TEC; H. B. Fuller Construction Products Inc.
36

37 Provide product capable of withstanding continuous and intermittent exposure to
38 temperatures of up to 140 and 212 deg F (60 and 100 deg C), respectively, and certified
39 by manufacturer for intended use.
40

41 Grout for PregROUTED Tile Sheets: Same product used in factory to pregrout tile sheets.
42

43 MISCELLANEOUS MATERIALS 44

45 Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based
46 formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

1 Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout
2 surfaces, specifically approved for materials and installations indicated by tile and grout
3 manufacturers.

4
5 Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change
6 color or appearance of grout.

7
8 Products: Subject to compliance with requirements, available products that may be incorporated
9 into the Work include, but are not limited to, the following:

10
11 Bonsal American, an Oldcastle company; Grout Sealer.

12
13 Custom Building Products; Grout and Tile Sealer

14
15 Jamo Inc.; Grout and Tile Sealer

16
17 Southern Grouts & Mortars, Inc.; Clear Penetrating Sealer and Grout Release.

18
19 Summitville Tiles, Inc.;SL-99, Summitseal II

20
21 TEC, H. B. Fuller Construction Products Inc.; Grout Guard Plus Penetrating Grout Sealer

22
23 Grout sealers shall comply with requirements of FloorScore certification.

24
25 MIXING MORTARS AND GROUT

26
27 Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers'
28 written instructions.

29
30 Add materials, water, and additives in accurate proportions.

31
32 Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other
33 procedures to produce mortars and grouts of uniform quality with optimum performance
34 characteristics for installations indicated.

35
36
37 PART 3 - EXECUTION

38
39 EXAMINATION

40
41 Examine substrates, areas, and conditions where tile will be installed, with Installer present, for
42 compliance with requirements for installation tolerances and other conditions affecting performance
43 of the Work.

44
45 Verify that substrates for setting tile are firm; dry; clean; free of coatings that are
46 incompatible with tile-setting materials, including curing compounds and other substances

1 that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by
2 ANSI A108.01 for installations indicated.

3
4 Verify that surfaces that received a steel trowel finish have been mechanically
5 scarified.

6 Verify that protrusions, bumps, and ridges have been removed by sanding or
7 grinding.

8
9 Verify that installation of grounds, anchors, recessed frames, electrical and
10 mechanical units of work, and similar items located in or behind tile has been
11 completed.

12
13 Verify that joints and cracks in tile substrates are coordinated with tile joint locations;
14 if not coordinated, adjust joint locations in consultation with Architect.

15
16 Proceed with installation only after unsatisfactory conditions have been corrected.

17 18 PREPARATION

19
20
21 Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged
22 so tile units taken from one package show same range of colors as those taken from other
23 packages and match approved Samples. If not factory blended, either return to manufacturer or
24 blend tiles at Project site before installing.

25 26 CERAMIC TILE INSTALLATION

27
28 Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA
29 installation methods specified in tile installation schedules. Comply with parts of the ANSI A108
30 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation
31 methods, specified in tile installation schedules, and apply to types of setting and grouting materials
32 used.

33
34 Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible
35 surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned
36 joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars,
37 or covers overlap tile.

38
39 Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

40
41 Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are
42 flush.

43
44 Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile
45 fields in both directions in each space or on each wall area. Lay out tile work to minimize the use
46 of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1 For tile mounted in sheets, make joints between tile sheets same width as joints within tile
2 sheets so joints between sheets are not apparent in finished work.

3
4 Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same
5 size, align joints.

6
7 Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on
8 floor, base, walls, or trim, align joints unless otherwise indicated.

9
10 Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

11
12 Glazed Wall Tile: 1/16 inch

13
14 Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

15
16 Expansion Joints: Provide expansion joints and other sealant-filled joints, including control,
17 contraction, and isolation joints, where indicated. Form joints during installation of setting materials,
18 mortar beds, and tile. Do not saw-cut joints after installing tiles.

19
20 Grout Sealer: Apply grout sealer to [cementitious] grout joints in tile floors according to grout-sealer
21 manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove
22 excess sealer and sealer from tile faces by wiping with soft cloth.

23 24 25 WATERPROOFING INSTALLATION

26
27 Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to
28 produce waterproof membrane of uniform thickness that is bonded securely to substrate.

29
30 Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting
31 materials over it.

32 33 ADJUSTING AND CLEANING

34
35 Remove and replace tile that is damaged or that does not match adjoining tile. Provide new
36 matching units, installed as specified and in a manner to eliminate evidence of replacement.

37
38 Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free
39 of foreign matter.

40
41 Remove grout residue from tile as soon as possible.

42
43 Clean grout smears and haze from tile according to tile and grout manufacturer's written
44 instructions but no sooner than 10 days after installation. Use only cleaners recommended
45 by tile and grout manufacturers and only after determining that cleaners are safe to use by
46 testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and

1 plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after
2 cleaning.

3
4 PROTECTION

5
6 Protect installed tile work with kraft paper or other heavy covering during construction period to
7 prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral
8 protective cleaner to completed tile walls and floors.

9
10 Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

11
12 Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile
13 surfaces.

14
15 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

16
17 Interior Wall Installations, Wood or Metal Studs or Furring:

18
19 Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious
20 backer units or fiber-cement backer board.

21
22 Thinset Mortar: Latex-portland cement mortar.

23
24 Grout: Water-cleanable epoxy grout.

25
26
27
28 END OF SECTION

1 SECTION 095113 - ACOUSTICAL PANEL CEILINGS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY:

12
13 Extent of each type of acoustical ceiling is shown and scheduled on drawings.

14
15 Types of acoustical ceilings specified in this section include the following:

16
17 Acoustical panel ceilings, exposed suspension

18
19 SUBMITTALS:

20
21 Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and
22 suspension system required.

23
24 Samples for Verification Purposes: Submit the following:

25
26 6" square samples of each acoustical panel type, pattern and color.

27
28 Set of 12" long samples of exposed runners and moldings for each color and system type
29 required.

30
31 QUALITY ASSURANCE:

32
33 Fire Performance Characteristics: Provide acoustical ceiling components that are identical to those
34 tested for the following fire performance characteristics, according to ASTM test method indicated,
35 by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify
36 acoustical ceiling components with appropriate marking of applicable testing and inspecting
37 agency.

38
39 Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension
40 system components with other work supported by, or penetrating through, ceilings, including, but
41 not limited to light fixtures, HVAC equipment, fire-suppression or detection system components (if
42 any), and partition system (if any) prior to ceiling system installation. Refer to Architectural,
43 Electrical and Plumbing Drawings to establish ceiling system installation parameters.
44 Communicate with other trades to verify the current installation of their respective equipment. The
45 ceiling heights listed on the Bid Documents are provided to indicate the "Design" intent. No
46 Additional Funds will be approved by the Owner's Representative for revisions to the ceiling system
47 height or layout due to a lack of coordination. This includes the removal and reinstallation of
48 ceilings installed under this contract that require adjustment due to required clearances or
49 configuration of work installed by other trades.

1 DELIVERY, STORAGE AND HANDLING:

2
3 Deliver acoustical ceiling units to project site in original, unopened packages and store them in a
4 fully enclosed space where they will be protected against damage from moisture, direct sunlight,
5 surface contamination or other causes.

6
7 Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized
8 moisture content.

9
10 Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

11
12 WARRANTY:

13
14 Ceiling Products: Ceiling acoustical panels are warranted to be free from defects in materials or
15 factory workmanship, or sagging and warping as a result thereof. Ceiling acoustical panels shall
16 also be warranted to be free from growth of mold, mildew, and gram positive and gram negative
17 odor and stain causing bacteria. Ceiling suspension system shall be warranted to be free from the
18 occurrence of 50% red rust as defined by ASTM D610 test procedures.

19
20 All ceiling products shall be installed in accordance with manufacturer specifications in
21 effect that the time of installation. Product installation shall be carried out within a
22 temperature range between 32° F and 120°. Prior to installation, the ceiling product must
23 be kept clean and dry and between 32° and 120°. It is not necessary for the area to be
24 enclosed or for the HVAC systems to be functioning. However, all wet work (plastering,
25 concrete, etc) must be complete and dry. Such installations shall not be exposed to
26 abnormal conditions of chemical fumes, vibrations, presence of standing water, or liquid
27 moisture coming into direct contact with the ceiling.

28
29 Submit a written warranty executed by the manufacturer, agreeing to replace acoustical panels that
30 fall within the warranty period.

31
32 Warranty period for acoustical panels and grid systems shall be a minimum of twenty (20) years
33 after the date of Substantial Completion.

34
35 EXTRA MATERIALS:

36
37 Deliver extra materials to Owner's Representative. Furnish extra materials described below
38 matching products installed and packaged in unopened cartons bearing the manufacturers labels.

39
40 Acoustical Ceiling Units: Furnish quantity of full size units equal to 3.0% of the amount
41 acoustical panel material installed and 40 pieces each of 4'-0" long tees and 2'-0" long tees.

42
43
44 PART 2 - PRODUCTS

45
46 ACOUSTICAL CEILING UNITS, GENERAL:

47
48 Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration
49 indicated which are prepared for mounting method designated and which comply with FS SS-S-118

1 requirements, including those indicated by reference to type, form, pattern, grade (NRC or NIC' as
2 applicable), light reflectance coefficient (LR), edge detail, and joint detail (if any).

3
4 Mounting Method for Measuring NRC: No. 7 (mechanically mounted on special metal
5 support), FS SS-S-118; or Type E-400 mounting as per ASTM E 795.
6

7 Colors, Textures, and Patterns: Provide products to match appearance characteristics indicated
8 or, if not otherwise indicated, as selected by Owner's Representative from manufacturer's standard
9 colors, surface textures, and patterns available for acoustical ceiling units and exposed metal
10 suspension system members of quality designated.

11
12 ACOUSTICAL PANELS:

13
14 Manufacturers: Subject to compliance with requirements, provide products of one of the following:

15
16 Armstrong World Industries, Inc.
17 BPB USA; CertainTeed Corporation.
18 USG Interiors Inc.; United States Gypsum Co
19

20 Type I (As shown on Drawings)

21
22 Armstrong Fine Fissured High NRC (1714)
23 Size: 24" x 48" x 3/4"
24 NRC: not less than .70
25 CAC: not less than 40
26 Light Reflectance: not less than 0.85 per ASTM E 1477
27 Edge Detail: square
28 Flame Spread: 0-25 per ASTM E 84, Class 'A' per ASTM E1264
29

30 Other Acceptable manufacturers include:

31
32 CertainTeed - Fine Fissured High NRC (HHF-497 DP)
33 USG Corp - Radar ClimaPlus, High NRC, High CAC (22441)
34

35 Type II (As shown on Drawings)

36
37 Armstrong Fine Fissured High NRC (1713)
38 Size: 24" x 24" x 3/4"
39 NRC: not less than .70
40 CAC: not less than 35
41 Light Reflectance: not less than 0.85 per ASTM E 1477
42 Edge Detail: square
43 Flame Spread: 0-25 per ASTM E 84, Class 'A' per ASTM E1264
44

45 Other Acceptable manufacturers include:

46
47 CertainTeed - Fine Fissured High NRC (HHF-457 DP)
48 USG Corp - Radar ClimaPlus, High NRC (22421)
49

1 METAL SUSPENSION SYSTEMS, GENERAL:

2
3 Standard for Metal Suspension Systems: Provide metal suspension systems of type, structural
4 classification and finish indicated which comply with applicable ASTM C 635 requirements.

5
6 Finishes and Colors: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal
7 Products" for recommendations for applying and designating finishes. Provide manufacturer's
8 standard factory-applied finish for type of system indicated. For exposed suspension members and
9 accessories with painted finish, provide color indicated or, if not otherwise indicated, as selected
10 by Owner's Representative from manufacturer's full range of standard colors.

11
12 EXPOSED METAL DIRECT-HUNG SUSPENSION SYSTEMS:

13
14 Non-Fire-Rated, Double Web Steel Suspension System: Main and cross runners roll formed from
15 cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653, with prefinished 15/16 wide
16 aluminum caps on flanges. Wall moldings shall be prefinished aluminum with hemmed edges.
17 Suspension system shall have outside (square and radiused) corner caps as required by wall
18 construction.

19
20 Structural Classification: Intermediate-Duty System

21 Main Beam: Web height shall be a minimum of 1 ½"

22
23 4' Cross Tee: Web height shall be a minimum of 1 ½"

24
25 2" Cross Tee: Web height shall be a minimum of 1 ½"

26
27 End condition of cross runners: override

28
29 Wall Molding: 7/8" x 7/8"

30
31 Face Design: Flat, flush.

32
33 Finish: Painted, match color of acoustical unit

34
35 Manufacturers: Subject to compliance with requirements, provide products of one of the following:

36
37 Armstrong World Industries, Inc.; Prelude XL 7300/ Prelude Fire Guard XL 8300

38
39 Chicago Metallic Corporation.; Snap Grid 200/Fire Front 250

40
41 USG Interiors Inc./Donn Corporation.; DX/DXL

42 Perimeter Trim - Ceiling Clouds: Design Item is Axiom Classic Trim Channel: 6", straight and
43 curved, commercial quality. Armstrong World Industries, Inc. Components: Edge trim system with
44 ¼" recess, 6063 trim channel, extruded aluminum, factory paint finish to match the ceiling grid.
45 Attachment to grid system is provided by Axiom tee-bar connection clips (AXVTBC) or hanging
46 clips (AXHGC), which lock into the Axiom vector edge trim channel and are screw attached to the
47 web of the intersecting Armstrong suspension system members. Section of trim are joined at the
48 vertical face using the Axiom splice plate (AX4 SPLICE).

1 ACCESSORIES

2
3 Attachment Devices: Power-actuated fasteners or cast-in-place, post-installed (expansion or
4 bonded) anchors. Fastener/anchor of type suitable for application indicated on drawings.
5 Fastener/anchor shall be fabricated from corrosion-resistant materials, with clips or other accessory
6 devices for attaching hangers of type indicated. Size fastener/anchor for 5-times design load
7 indicated in ASTM C 635, Table 1, Direct Hung , and with capability to sustain, without failure, a
8 load equal to 5 times that imposed by ceiling construction, as determined by testing per ASTM E
9 1190, ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting
10 agency.

11
12 Wire Hangers, Braces, and Ties: Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc
13 coating, soft temper and pre-stretched. Select wire diameter so its stress at 3 times hanger design
14 load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not
15 less than 12 gauge, 0.106" diameter.

16
17 Edge Moldings and Trim: Provide manufacturer's standard metal molding for edges and
18 penetrations of ceiling which fits with type of edge detail and suspension system required to
19 conform with the project construction details.

20
21 Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips.

22
23 ACOUSTICAL SEALANT

24
25 Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in
26 reducing airborne sound transmission through perimeter joints and openings in building
27 construction as demonstrated by testing representative assemblies according to ASTM E 90.

28
29 Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.

30
31 Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable,
32 synthetic-rubber sealant.

33
34 Products: Subject to compliance with requirements, provide one of the following:

35
36 Acoustical Sealant for Concealed Joints:

37
38 OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
39 Pecora Corporation; BA-98.
40 Tremco, Inc.; Tremco Acoustical Sealant.

41
42
43 PART 3 - EXECUTION

44
45 EXAMINATION

46
47 Examine substrates, areas, and conditions, including structural framing to which acoustical panel
48 ceilings attach or abut, with Installer present, for compliance with requirements specified in this and
49 other Sections that affect ceiling installation and anchorage and with requirements for installation

1 tolerances and other conditions affecting performance of acoustical panel ceilings. Proceed with
2 installation only after unsatisfactory conditions have been corrected.

3
4 PREPARATION

5
6 Measure each ceiling area and establish layout of acoustical panels to balance border widths at
7 opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply
8 with layout shown on reflected ceiling plans.

9
10 INSTALLATION

11
12 General: Install acoustical panel ceilings to comply with ASTM C 636 and design requirements
13 indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook".

14
15 Suspend ceiling hangers from building's structural members and as follows:

16
17 Install hangers plumb and free from contact with insulation or other objects within ceiling
18 plenum that are not part of supporting structure or of ceiling suspension system.

19
20 Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to
21 miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other
22 equally effective means.

23
24 Where width of ducts and other construction within ceiling plenum produces hanger
25 spacings that interfere with location of hangers at spacings required to support standard
26 suspension system members, install supplemental suspension members and hangers in
27 form of trapezes or equivalent devices.

28
29 Secure wire hangers to ceiling suspension members and to supports above with a minimum
30 of three tight turns. Connect hangers directly either to structures or to inserts, eye screws,
31 or other devices that are secure and appropriate for substrate and that will not deteriorate
32 or otherwise fail due to age, corrosion, or elevated temperatures.

33
34 Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers
35 to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or
36 power-actuated fasteners that extend through forms into concrete.

37
38 When steel framing does not permit installation of hanger wires at spacing required, install
39 carrying channels or other supplemental support for attachment of hanger wires.

40
41 Do not attach hangers to steel roof deck. Do not attach hangers to steel deck tabs. Attach
42 hangers to structural members.

43
44 Space hangers not more than 48 inches o.c. along each member supported directly from
45 hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of
46 each member.

47
48 Size supplemental suspension members and hangers to support ceiling loads within
49 performance limits established by referenced standards and publications.

1 Install suspension system runners so they are square and securely interlocked with one
2 another. Remove and replace dented, bent, or kinked members.

3
4 **Additional hanger wires shall be installed at each corner of all recessed and/or**
5 **surface mounted electrical fixtures by this Contractor. The additional light fixture**
6 **hanger wire will be "tied off" to light fixtures by Electrical Contractor.**
7

8 Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and
9 where necessary to conceal edges of acoustical panels.

10
11 Mechanically fasten moldings to substrate at intervals not more than 16 inches o.c. and not
12 more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8
13 inch in 12 feet.

14
15 Do not use exposed fasteners, including pop rivets, on moldings and trim.

16
17 Miter inside corners accurately and connect securely.

18
19 Install corner caps at all outside corners. Provide square or radius configuration as
20 required by wall condition.

21
22 Install acoustical panels with undamaged edges and fit accurately into suspension system runners
23 and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise
24 fit.

25
26 For square-edged panels, install panels with edges fully hidden from view by flanges of
27 suspension system runners and moldings.

28
29 Install hold-down clips in areas as noted in specification and as indicated on drawings, in
30 areas required by authorities having jurisdiction, and for fire-resistance ratings; space as
31 recommended by panel manufacturer's written instructions, unless otherwise indicated.

32
33 Eliminate air movement and light and sound leaks at edges of ceiling by applying acoustical
34 sealant in a continuous ribbon concealed on back of vertical legs of moldings before they
35 are installed.

36
37 CLEANING
38

39 Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension
40 system members. Comply with manufacturer's written instructions for cleaning and touch up of
41 minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned
42 and repaired to permanently eliminate evidence of damage.

43
44
45
46 END OF SECTION

1 SECTION 096500 - RESILIENT FLOORING

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 DESCRIPTION OF WORK:

12
13 Extent of resilient flooring and accessories is shown on drawings and in schedules.

14
15 QUALITY ASSURANCE:

16
17 Manufacturer: Provide each type of resilient flooring and accessories as produced by a single
18 manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

19
20 Installer's Qualifications: Engage Installer who is certified in writing by resilient flooring
21 manufacturer as qualified for installation of sheet vinyl employing heat welded seams.

22
23 Fire Test Performance: Unless otherwise indicated, provide flooring material to meet the following
24 fire test performance criteria as tested by a recognized independent testing laboratory:

25
26 ASTM E 648 (Critical Radiant Flux) of 0.45 watts per sq. cm. or greater, Class I

27
28 ASTM E 662 (Smoke Generation) Maximum specific Optical Density of 450 or less.

29
30 SUBMITTALS:

31
32 Product Data: Submit manufacturer's technical data for each type of resilient flooring and
33 accessory.

34
35 Samples for Verification Purposes: Submit sample of each type, color and pattern of resilient
36 flooring required, showing full-range of color and pattern variations.

37
38 PROJECT CONDITIONS:

39
40 Maintain minimum temperature of 65° F in spaces to receive resilient flooring for at least 48 hours
41 prior to installation, during installation, and for not less than 48 hours after installation. Store
42 resilient flooring materials in spaces where they will be installed for at least 48 hours before
43 beginning installation. Subsequently, maintain minimum temperature of 55° F in areas where work
44 is completed.

45
46 Install resilient flooring and accessories after other finishing operations, including painting, have
47 been completed. Do not install resilient flooring over concrete slabs until the latter have been cured
48 and are sufficiently dry to achieve bond with adhesive as determined by resilient flooring
49 manufacturer's recommended bond and moisture test.

1
2 PART 2 - PRODUCTS

3
4 MANUFACTURERS:

5
6 Manufacturer: Subject to compliance with requirements, provide products as follows:

7
8 Manufacturer of Rubber Wall Base:

9
10 Johnsonite, Inc. - "Tightlock" Wall Base
11 RC Musson Rubber Co.
12 Roppe
13 Mannington

14
15 Manufacturer of Rubber Tile:

16
17 Johnsonite, Inc. - "Micotone"
18 Nora Systems Inc. - "Noraplan Environcare"
19 Mannington Commercial - "Color Spec"
20 Roppe - "Fiesta Rubber Floor Tile"

21
22 RESILIENT FLOORING COLORS AND PATTERNS:

23
24 Provide colors and patterns as indicated on drawings, or if not otherwise indicated, as selected by
25 owner's representative from manufacturer's standards.

26
27 RESILIENT BASE: Provide rubber base complying with ASTM F-1861 Type TP and TV, Group 1
28 (solid) and as follows:

29
30 Type: Tightlock

31
32 Style: Resilient (Coved profile at resilient floor, stright profile at carpet - note that resilient
33 rubber tightlock is referenced in Johnsonite SPA quote #51267.)

34
35 Height: 4 3/8"

36
37 Length: 75' roll

38
39 Thickness: 1/4" tapered wedge

40
41 INSTALLATION ACCESSORIES

42
43 Trowelable Leveling and Patching Compounds: Latex-modified, Portland-cement-based formulation
44 provided or approved by floor covering manufacturer for applications indicated.

45
46 Adhesives: Water-resistant type recommended by manufacturer to suit resilient vinyl floor covering
47 and substrate conditions indicated.

48
49 Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.

1 Leveling and Patching Compounds: Latex type as recommended by flooring manufacturer.

2
3

4 PART 3 - EXECUTION

5
6

6 EXAMINATION

7
8

8 Examine substrates, with Installer present, for compliance with requirements for maximum moisture
9 content and other conditions affecting performance of the Work.

10
11

11 Verify that finishes of substrates comply with tolerances and other requirements specified in other
12 Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits
13 that might interfere with adhesion of floor coverings.

14
15

15 Proceed with installation only after unsatisfactory conditions have been corrected.

16
17

17 PREPARATION

18
19

19 Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor
20 coverings.

21
22

22 Concrete Substrates: Prepare according to ASTM F 710.

23
24

24 Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

25
26

26 Remove substrate coatings and other substances that are incompatible with adhesives and
27 that contain soap, wax, oil, or silicone, using mechanical methods recommended by
28 manufacturer. Do not use solvents.

29
30

30 Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed
31 with installation only after substrates pass testing.

32
33

33 Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed
34 with installation only after substrates pass testing.

35
36

36 Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation
37 only after substrates have maximum moisture-vapor-emission rate of 3 lb of
38 water/1000 sq. ft. in 24 hours.

39
40

40 Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with
41 installation only after substrates have a maximum 75 percent relative humidity level
42 measurement.

43
44

44 Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound
45 as recommended by resilient flooring manufacturer and remove bumps and ridges to produce a
46 uniform and smooth substrate.

47
48

48 Do not install floor coverings until they are same temperature as space where they are to be
49 installed.

1 Move floor coverings and installation materials into spaces where they will be installed at least 48
2 hours in advance of installation.

3

4 Sweep and vacuum clean substrates to be covered by floor coverings immediately before
5 installation.

6

7 INSTALLATION TILE FLOORING:

8

9 Install resilient flooring using method indicated in strict compliance with manufacturer's printed
10 instructions. Extend resilient flooring into toe spaces, door reveals, and into closets and similar
11 openings.

12

13 Scribe, cut, and fit resilient flooring to permanent fixtures, built-in furniture and cabinets, pipes,
14 outlets and permanent columns, walls and partitions.

15

16 Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting
17 by repeating on finish flooring as marked on sub-floor. Use chalk or other non-permanent marking
18 device.

19

20 Install resilient flooring on covers for telephone and electrical ducts, and other such items occurring
21 within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring
22 installed in these covers. Tightly cement edges to perimeter of floor around covers and to covers.

23

24 Tightly cement resilient flooring to subbase without open cracks, voids, raising and puckering at
25 joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient
26 flooring at perimeter of each covered area to assure adhesion.

27

28 Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at
29 opposite edges of room are of equal width. Adjust as necessary to avoid use of cut widths less
30 than ½ tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

31

32 Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and
33 packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped or deformed
34 tile are not acceptable.

35

36 Lay tile with grain running in one direction.

37

38 Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring
39 manufacturer's directions.

40

41 INSTALLATION OF ACCESSORIES:

42

43 Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or
44 areas where base is required. Install base in lengths as long as practicable, with preformed corner
45 units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base
46 to substrate throughout length of each piece, with continuous contact at horizontal and vertical
47 surfaces.

48

1 On masonry surfaces, or other similar irregular substrates, fill voids along top edge of
2 resilient wall base with manufacturer's recommended adhesive filler material.

3
4 Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips
5 at edges of flooring which would otherwise be exposed.

6
7 Apply resilient accessories at stair as indicated and in strict accordance with manufacturer's
8 installation instructions.

9
10 CLEANING AND PROTECTION:

11
12 Perform following operations immediately upon completion of resilient flooring:

13
14 Sweep or vacuum floor thoroughly.

15
16 Do not wash floor until time period recommended by resilient flooring manufacturer has
17 elapsed to allow resilient flooring to become well-sealed in adhesive.

18
19 Damp-mop floor being careful to remove black marks and excessive soil.

20
21 Remove any excess adhesive or other surface blemishes, using appropriate cleaner
22 recommended by resilient flooring manufacturers.

23
24 Protect flooring against damage during construction period to comply with resilient flooring
25 manufacturer's directions.

26
27 Protect resilient flooring against damage from rolling loads for initial period following
28 installation by covering with plywood or hardboard. Use dollies to move stationary
29 equipment or furnishings across floors.

30
31 Clean resilient flooring not more than 4 days prior to date scheduled for inspections intended to
32 establish date of substantial completion in each area of project. Clean resilient flooring by method
33 recommended by resilient flooring manufacturer.

34
35 EXTRA STOCK:

36
37 Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same
38 manufactured lot as materials installed and enclosed in protective packaging with appropriate
39 identifying labels.

40
41 Tile Flooring: Furnish not less than one box for each 50 boxes or fraction thereof, for each
42 type, color, pattern and size installed.

43
44
45
46 END OF SECTION

1 SECTION 096813 - TILE CARPETING

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY:

12
13 Extent of tile carpeting is indicated on drawings and schedules.

14
15 RELATED SECTIONS:

16
17 Resilient base, tile carpeting/resilient transition molding and tile carpeting reducer molding:
18 is specified in Division 9 Section "Resilient Flooring".

19
20 SUBMITTALS:

21
22 Product Data: For the following, including installation recommendations for each type of substrate:

23
24 Carpet: For each type indicated. Include manufacturer's written data on physical characteristics,
25 durability, and fade resistance.

26
27 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified
28 testing agency.

29
30 Shop Drawings: Show the following:

31
32 Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where
33 cutouts are required in carpet.

34 Existing flooring materials to be removed.

35 Existing flooring materials to remain.

36 Carpet type, color, and dye lot.

37 Locations where dye lot changes occur.

38 Seam locations, types, and methods.

39 Type of subfloor.

40 Type of installation.

41 Pattern type, repeat size, location, direction, and starting point.

42 Pile direction.

43 Type, color, and location of insets and borders.

44 Type, color, and location of edge, transition, and other accessory strips.

45 Transition details to other flooring materials.

46
47 Maintenance Data: For carpet to include in maintenance manuals. Include the following:

1 Methods for maintaining carpet, including cleaning and stain-removal products and
2 procedures and manufacturer's recommended maintenance schedule.

3
4 Precautions for cleaning materials and methods that could be detrimental to carpet.

5
6 QUALITY ASSURANCE:

7
8 Installer Qualifications: Firm and individual specializing in carpet installation with not less than four
9 (4) years of experience in installation of carpeting similar to that required for this project.

10
11 Tile carpeting shall have a minimum average flux of not less than 0.2 watts/sq. cm. per ASTM E-
12 648 (floor radiant panel test) requirements shall meet Federal Flammability Test, Fed. Std. DOC-
13 FF-1-70.

14
15 Chemical Emission/Indoor Air Quality: All tile carpeting adhesives and accessories supplied for the
16 project must be in compliance with the Carpet and Rug Institute (CRI) Indoor Air Quality Carpet
17 Testing Program. The program label and registration number serve as evidence of compliance of
18 CRI's "Green Label Plus". Carpet shall meet or exceed Carpet and Rug Institute's (CRI)
19 appearance retention rating of 3.5 ARR.

20
21 DELIVERY, STORAGE, AND HANDLING:

22
23 Deliver materials to project site in original factory wrappings and containers, clearly labeled with
24 identification of manufacturer, brand name, quality or grade, fire hazard classification, and lot
25 number. Store materials in original undamaged packages and containers, inside well-ventilated
26 area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked
27 off ground to prevent sagging and warping. Maintain temperature in storage area above 40
28 degrees Fahrenheit.

29
30 Comply with instructions and recommendations of manufacturer for special delivery, storage, and
31 handling requirements.

32
33 SEQUENCING AND SCHEDULING:

34
35 Sequence tile carpeting installation with other work to minimize possibility of damage and soiling
36 during remainder of construction period.

37
38 PROJECT CONDITIONS:

39 Substrate Conditions:

40
41
42 Moisture Emission rate of 3 lb/1,000 sf per 24 hours or less.

43
44 PH of 5-9 when substrate wetted with potable water and PHydriion paper applied.

45
46 WARRANTY:

47
48 Special Project Warranty: Submit a written warranty, executed by the Contractor, Installer and the
49 Manufacturer, agreeing to repair or replace tile carpeting which fails in materials or workmanship

1 within the specified warranty period. This warranty shall be in addition to and not a limitation of
2 other rights the Owner may have against the Contractor under the Contract Documents.

3
4 Warranty period is a minimum of 15 years after the date of substantial completion against
5 edge ravel, static, backing delamination, surface wear (10% face yarn loss by weight), stain
6 resistance, lightfastness and 20 pound average tuff bind under wet or dry conditions,
7

8 Replacement Materials: After completion of work, deliver not less than 3% of each type, color, and
9 pattern of extra tile carpeting, exclusive of material required to properly complete installation.
10 Furnish replacement materials from same production run as materials installed. Package
11 replacement materials with protective covering, identified with appropriate labels.
12

13 14 PART 2 - PRODUCTS

15 16 MODULAR CARPET TILE:

17 18 Specifications:

19
20 Construction: Tufted Textured Loop. Multi-color and solids for accents.

21
22 Face Yarn: Type 6, 6 Nylon/Type 6 Nylon with Stain Resistant and Antimicrobial Properties.

23
24 Dye Method: Yarn dyed and/or solution dyed.

25
26 Tufted Yarn Weight: 14 oz minimum.

27
28 Backing: Primary pre-coat is to be 100% non-aqueous closed cell polymer with reinforced
29 vinyl composite closed cell polymer backing.
30

31 Tile carpeting to have a grey scale rating of 4 or better on product's darkest colors after 180
32 standard fading hours as compared to AATCC grey scale for evaluation of change in color.
33 AATCC 16E-1982
34

35 Primary and secondary backings to be a thermal plastic or vinyl composition.

36
37 Non water soluble

38
39 Impervious to water damage

40
41 Provide a liquid barrier

42
43 Minimum of 16 standard colors of which eight (8) must have grey scale rating of over 6.
44

45 Performance Test Results:

46
47 Static: 3.0 kv resistance when tested under the Standard Shuffle Test AATCC 134 at 70°F
48 - 20% R.H.
49

1 Flammability: Passes DOC-FF-1-70 Pill Test.

2
3 Flooring Radiant Panel Test: Meets NFPA Class 1 when tested under ASTM E-648 glue
4 down.

5
6 Smoke Density: NBS Smoke Chamber NFPA-258 - Less than 450 Flaming Mode.

7
8 Manufacturers Field/Accent:

9
10 Patcraft - VIM I0301, color Spectrum 00431 (sample viewed here
11 <http://www.patcraft.com/ProductSpec/Show/I0301>)

12
13 Interface - Sidetrack, color Stratosphere/Track 103257 (sample can be viewed here
14 <http://www.interface.com/US/en-US/detail/Sidetrack-7642001999G15S001>)

15
16 Mannington - Elemental Brights II, color Lithium 14099 (sample can be viewed her
17 <https://www.mannington.com/commercial/colorway.aspx?id=2611>)

18
19 Manufacturer to provide Architect with coordinating solid accent carpet tile for those not listing a
20 coordinating series.

21
22 ACCESSORIES:

23
24 Trowelable Leveling and Patching Compounds: epoxy modified, hydraulic-cement based
25 formulation as approved or recommended by carpet manufacturer.

26
27 Tile Carpeting/Resilient Transition Molding: Install transition molding as required by change in floor
28 finish. See Division 9 Section "Resilient Flooring" for manufacturers of accessories which are
29 acceptable.

30
31 Tile Carpeting Reducer Molding: Install transition molding as required by change in floor surface.
32 See Division 9 Section "Resilient Flooring" for manufacturers of accessories which are acceptable.

33
34 Installation Adhesive: Water-resistant, non-staining, pressure-sensitive type to suit products and
35 subfloor conditions indicated, that complies with flammability requirements for installed carpet tile
36 and is recommended by carpet tile manufacturer for releasable installation. See quality assurance
37 for chemical emission/indoor air quality requirements. The adhesive is to be approved by the tile
38 carpeting manufacturer that is awarded this Contract.

39
40 Miscellaneous Materials: As recommended by manufacturers of tile carpeting, cushions, and other
41 tile carpeting products; selected by Installer to meet project circumstances and requirements.

42
43
44 PART 3 - EXECUTION

45
46 EXAMINATION:

1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements
2 for maximum moisture content, alkalinity range, installation tolerances, and other conditions
3 affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.

4
5 Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

6
7 Slab substrates are dry and free of curing compounds, sealers, hardeners, and other
8 materials that may interfere with adhesive bond. Determine adhesion and dryness
9 characteristics by performing bond and moisture tests recommended by carpet cushion
10 manufacturer.

11
12 Slab substrates comply with requirements specified in "Cast-in-Place Concrete" for slabs
13 receiving carpet.

14
15 Slab substrates are free ridges, depressions, scale, and foreign deposits.

16
17 Proceed with installation only after unsatisfactory conditions have been corrected.

18
19 PREPARATION:

20
21 General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet
22 manufacturer's written installation instructions for preparing substrates.

23
24 Use trowelable leveling and patching compounds, according to manufacturer's written instructions,
25 to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and
26 depressions $\frac{1}{8}$ inch wide or wider, and protrusions more than $\frac{1}{32}$ inc, unless more stringent
27 requirements are required by manufacturer's written instructions.

28
29 Clear away debris and scrape up cementitious deposits from surfaces to receive carpeting.
30 Remove coatings, including curing compounds, and other substances that are incompatible with
31 adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical
32 methods recommended in writing by carpet manufacturer.

33
34 Broom and vacuum clean substrates to be covered immediately before installing carpet.

35
36 Check concrete surfaces to ensure no dusting through installed carpet; apply sealer where required
37 to prevent dusting.

38
39 INSTALLATION:

40
41 Comply with manufacturer's recommendations for seam locations and direction of carpet; maintain
42 uniformity of carpet direction and lay of pile. Follow seaming diagram as submitted and approved.
43 At doors, center seams under doors; do not place seams in traffic direction at doorway.

44
45 Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture
46 including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as
47 recommended by carpet manufacturer.

1 Extend tile carpeting under open-bottomed obstructions and under removable flanges and
2 furnishings, and into toe spaces, door reveals, alcoves and closets of each space.

3

4 Install carpet edge guard where edge of carpet is exposed; anchor guards to substrate. In every
5 area where carpet butts to another floor material provide aluminum angle trim or transition strip.

6

7 Expansion Joints: Do not bridge building expansion joints with continuous carpeting; provide for
8 movement. Provide extruded trim with flexible pre-moulded joint covering.

9

10 CLEANING:

11

12 Remove and dispose of debris and unusable scraps. Vacuum tile carpeting using commercial
13 machine with face-beater element. Remove spots and replace tile carpeting where spots cannot
14 be removed. Remove any protruding face yarn using sharp scissors.

15

16 PROTECTION:

17

18 Provide protective methods and materials needed to ensure that tile carpeting will be without
19 deterioration or damage at time of substantial completion.

20

21

22

23 END OF SECTION

1 SECTION 099100 - PAINTING

2
3
4 PART 1- GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY:

12
13 Extent of painting work is indicated on drawings and schedules, and as herein specified.

14
15 Work includes painting and finishing of interior and exterior exposed items and surfaces throughout
16 project, except as otherwise indicated. This includes painting of all exposed walls, ceilings, doors,
17 door frames, vision lites and columns, including metal deck, bar joints, plumbing lines and
18 ductwork. Painting of an existing room as identified in the finish schedule is to include the painting
19 of all the aforementioned components.

20
21 Surface preparation, priming and coats of paint specified are in addition to shop-priming
22 and surface treatment specified under other sections of work.

23
24 **Contractor to include in the cost painting of one (1) accent wall in each room. Accent wall**
25 **will be one color from floor to ceiling.**

26
27 Work includes field painting of exposed bare and covered pipes and ducts (including color coding),
28 and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed
29 under mechanical and electrical work, except as otherwise indicated.

30
31 "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels,
32 stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish
33 coats.

34
35 Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface
36 not to be painted, paint exposed surfaces whether or not colors are designated in "schedules".
37 Where items or surfaces are not specifically mentioned, paint the same as similar adjacent
38 materials or areas. If color or finish is not designated, the Owner's Representative will select these
39 from standard colors or finishes available.

40
41 Following categories of work are not included as part of field-applied finish work.

42
43 Pre-Finished Items: Unless otherwise indicated, do not include painting when
44 factory-finishing or installer-finishing is specified for such items as (but not limited to) metal
45 toilet enclosures, pre-finished partition systems, acoustic materials, architectural woodwork
46 and casework, elevator entrance doors and frames, elevator equipment, and finish
47 mechanical and electrical equipment, including light fixtures, switchgear and distribution
48 cabinets.

1 Concealed Surface: Unless otherwise indicated, painting is not required on surfaces such
2 as walls or ceilings in concealed areas and generally inaccessible areas, foundation
3 spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
4

5 Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized
6 aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials
7 will not require finish painting.
8

9 Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical
10 and electrical parts, such as valve and damper operators, linkages, sinkages, sensing
11 devices, motor and fan shafts will not require finish painting.
12

13 Following categories of work are included under other sections of these specifications.
14

15 Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included
16 under various sections for structural steel, metal fabrications, hollow metal work and similar
17 items.
18

19 Unless otherwise specified, shop priming of fabricated components such as architectural
20 woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical
21 equipment or accessories is included under other sections of these specifications.
22

23 Mechanical and Electrical Work: Painting of mechanical and electrical work is specified in
24 Divisions 22, 23 and 26 respectively.
25

26 Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual,
27 or any equipment identification, performance rating, name, or nomenclature plates.
28

29 QUALITY ASSURANCE: 30

31 Single Source Responsibility: Provide primers and other undercoat paint produced by same
32 manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only
33 within recommended limits.
34

35 Coordination of Work: Review other sections of these specifications in which prime paints are to
36 be provided to ensure compatibility of total coatings systems for various substrates. Upon request
37 from other trades, furnish information or characteristics of finish materials provided for use, to
38 ensure compatible prime coats are used.
39

40 SUBMITTALS: 41

42 Product Data: Submit manufacturer's technical information including paint label analysis and
43 application instructions for each material proposed for use.
44

45 Samples: Prior to beginning work, submit color chips for surfaces to be painted. Use
46 representative colors when preparing samples for review. Submit samples for Owner's
47 Representative's review of color and texture only. Provide a listing of material and application for
48 each coat of each finish sample.
49

1 On actual wall surfaces and other exterior and interior building components, duplicate
2 painted finishes of prepared samples. Provide full-coat finish samples on at least 100 sq.
3 ft. of surface, as directed, until required sheen, color and texture is obtained; simulate
4 finished lighting conditions for review of in-place work.

5
6 Final acceptance of colors will be from samples applied on the job.

7
8 DELIVERY AND STORAGE:

9
10 Deliver materials to job site in original, new and unopened packages and containers bearing
11 manufacturer's name and label, and following information:

- 12
13 Name or title of material.
14 Fed. Spec. number, if applicable.
15 Manufacturer's stock number and date of manufacturer.
16 Manufacturer's name.
17 Contents by volume, for major pigment and vehicle constituents.
18 Thinning instructions.
19 Application instructions.
20 Color name and number.

21
22 Store materials not in actual use in tightly covered containers. Maintain containers used in storage
23 of paint in a clean condition, free of foreign materials and residue.

24
25 Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily
26 rags and waste daily. Take all precautions to ensure that workmen and work areas are
27 adequately protected from fire hazards and health hazards resulting from handling, mixing
28 and application of paints.

29
30 JOB CONDITIONS:

31
32 Apply water-base paints only when temperature of surfaces to be painted and surrounding air
33 temperatures are between 50° F and 90° F, unless otherwise permitted by paint manufacturer's
34 printed instructions.

35
36 Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air
37 temperatures are between 45° F and 95° F, unless otherwise permitted by paint manufacturer's
38 printed instructions.

39
40 Do not apply paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp
41 or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.

42
43 Painting may be continued during inclement weather if areas and surfaces to be painted
44 are enclosed and heated within temperature limits specified by paint manufacturer during
45 application and drying periods.

46
47
48 PART 2 - PRODUCTS

1 MANUFACTURERS:

2
3 Manufacturer: Subject to compliance with requirements, provide products of one of the following:

- 4
5 PPG Industries, Pittsburgh Paints (PPG).
6 Sherwin-Williams Company (SW).
7 Devoe (ICI Paints)

8
9 MATERIALS:

10
11 Material Quality: Provide best quality grade of various types of coatings as regularly manufactured
12 by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification
13 as a standard, best-grade product will not be acceptable.

14
15 Proprietary names used to designate colors or materials are not intended to imply that
16 products of named manufacturers are required to exclusion of equivalent products of other
17 manufacturers. The manufactures product numbers listed are from PPG Industries, and
18 are a guide only.

19
20 Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

21
22 Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and
23 anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical
24 restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication
25 or finishing shop:

26
27 Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by
28 weight of total aromatic compounds (hydrocarbon compounds containing one or more
29 benzene rings).

30
31 Restricted Components: Paints and coatings shall not contain any of the following:

- 32
33 Acrolein.
34 Acrylonitrile.
35 Antimony.
36 Benzene.
37 Butyl benzyl phthalate.
38 Cadmium.
39 Di (2-ethylhexyl) phthalate.
40 Di-n-butyl phthalate.
41 Di-n-octyl phthalate.
42 1,2-dichlorobenzene.
43 Diethyl phthalate.
44 Dimethyl phthalate.
45 Ethylbenzene.
46 Formaldehyde.
47 Hexavalent chromium.
48 Isophorone.
49 Lead.

- 1 Mercury.
- 2 Methyl ethyl ketone.
- 3 Methyl isobutyl ketone.
- 4 Methylene chloride.
- 5 Naphthalene.
- 6 Toluene (methylbenzene).
- 7 1,1,1-trichloroethane.
- 8 Vinyl chloride.
- 9

10
11 PART 3 - EXECUTION

12
13 INSPECTION:

14
15 Applicator must examine areas and conditions under which painting work is to be applied and notify
16 Contractor in writing of conditions detrimental to proper and timely completion of work. Do not
17 proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to
18 Applicator.

19
20 Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions
21 within any particular area.

22
23 Do not paint over gobbers from mortar joints, concrete splashes from floor pour, dirt, rust, scale,
24 grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable
25 paint film.

26
27 SURFACE PREPARATION:

28
29 General: Perform preparation and cleaning procedures in accordance with paint manufacturer's
30 instructions and as herein specified, for each particular substrate condition.

31
32 Provide barrier coats over incompatible primers or remove and re-prime as required. Notify
33 Owner's Representative in writing of any anticipated problems in using the specified coating
34 systems with substrates primed by others.

35
36 Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and
37 similar items in place and not to be finish-painted, or provide surface-applied protection
38 prior to surface preparation and painting operations. Remove, if necessary, for complete
39 painting of items and adjacent surfaces. Following completion of painting of each space
40 or area, reinstall removed items.

41
42 Clean surfaces to be painted before applying paint or surface treatments. Remove oil and
43 grease prior to mechanical cleaning. Program cleaning and painting so that contaminants
44 from cleaning process will not fall onto wet, newly-painted surfaces.

45
46 Repair cracks and holes in existing surfaces to be painted with like material such that
47 finished surface is smooth and consistent with adjacent surface.
48

1 Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block, cement plaster
2 and cement board to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by
3 roughening as required to remove glaze.

4
5 Determine alkalinity and moisture content of surfaces to be painted by performing
6 appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and
7 burning of finish paint, correct this condition before application of paint. Do not paint over
8 surfaces where moisture content exceeds that permitted in manufacturer's printed
9 directions.

10
11 Clean concrete floor surfaces scheduled to be painted with a commercial solution of
12 muriatic acid, or other etching cleaner. Flush floor with clean water to neutralize acid, and
13 allow to dry before painting.

14
15 Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers,
16 mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed
17 to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white
18 shellac or other recommended knot sealer, before application of priming coat. After priming, fill
19 holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when
20 dried.

21
22 Prime, stain, or seal wood required to be job-painted immediately upon delivery to job.
23 Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets,
24 counters, cases, paneling.

25
26 When transparent finish is required, use spar varnish for back-priming.

27
28 Back-prime paneling on interior partitions only where masonry, plaster, or other wet wall
29 construction occurs on backside.

30
31 Seal tops, bottoms, and cut-outs of un-primed wood doors with a heavy coat of varnish or
32 equivalent sealer immediately upon delivery to job.

33
34 Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease,
35 dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

36
37 Touch-up shop-applied prime coats wherever damaged or bare, where required by other
38 sections of these specifications. Clean and touch-up with same type shop primer.

39
40 Galvanized Surfaces: Shall be clean in accordance with SSPC-SPI. If a passivator is applied to
41 the substrate material, mechanical abrasion is required prior to coating.

42 43 MATERIALS PREPARATION:

44
45 Mix and prepare painting materials in accordance with manufacturer's directions.

46
47 Maintain containers used in mixing and application of paint in a clean condition, free of foreign
48 materials and residue.

1 Stir materials before application to produce a mixture of uniform density, and stir as required during
2 application. Do not stir surface film into material. Remove film and, if necessary, strain material
3 before using.

4
5 APPLICATION:
6

7 General: Apply paint in accordance with manufacturer's directions. Use applicators and
8 techniques best suited for substrate and type of material being applied.
9

10 Paint colors, surface treatments, and finishes, are indicated in "schedules" of the contract
11 documents.
12

13 Provide finish coats which are compatible with prime paints used.
14

15 Apply addition coats when undercoats, stains or other conditions show through final coat
16 of paint, until paint film is of uniform finish, color and appearance. Give special attention
17 to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners
18 receive a dry film thickness equivalent to that of flat surfaces.
19

20 Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.
21 Paint surfaces behind permanently- fixed equipment or furniture with prime coat only before
22 final installation of equipment.
23

24 Paint interior surfaces of ducts, where visible through registers or grilles, with a flat,
25 non-specular black paint.
26

27 Paint back sides of access panels or electrical panels, and removable or hinged covers to
28 match exposed surfaces.
29

30 Sand lightly between each succeeding enamel or varnish coat.
31

32 Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up
33 painted, unless otherwise indicated.
34

35 Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pre-treated or
36 otherwise prepared for painting as soon as practicable after preparation and before subsequent
37 surface deterioration.
38

39 Allow sufficient time between successive coatings to permit proper drying. Do not re-coat
40 until paint has dried to where it feels firm, does not deform or feel sticky under moderate
41 thumb pressure, and application of another coat of paint does not cause lifting or loss of
42 adhesion of the undercoat.
43

44 Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended
45 spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as
46 recommended by coating manufacturer.
47

1 Mechanical and Electrical Work: Painting of mechanical and electrical items shall be by the
2 painting contractor and work is limited to those items exposed in mechanical equipment rooms and
3 in occupied spaces. Do not paint labels, etc. - mask properly to protect.

4
5 Mechanical items to be painted include, but are not limited to, the following:

6
7 Piping, pipe hangers, and supports.

8
9 Heat exchangers.

10
11 Tanks.

12
13 Ductwork, insulation.

14
15 Motor, mechanical equipment, and supports.

16
17 Accessory items.

18
19 Electrical items to be painted include, but are not limited to, the following:

20
21 Conduit and fittings.

22
23 Switchgear.

24
25 Prime Coats: Apply prime coat of material which is required to be painted or finished, and which
26 has not been prime coated by others.

27
28 Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed
29 areas in first coat, to assure a finish coat with no burn-through or other defects due to
30 insufficient sealing.

31
32 Finish Coats: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling
33 such as laps, irregularity in texture, skid marks, or other surface imperfections.

34
35 Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform
36 finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs,
37 sags, ropiness or other surface imperfections will not be acceptable.

38
39 Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even
40 luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel,
41 nail holes, or other surface imperfections.

42
43 Provide satin finish for final coats, unless otherwise indicated.

44
45 Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or
46 repaint work not in compliance with specified requirements.

47
48 FIELD QUALITY CONTROL:

1 The right is reserved by Owner's Representative to invoke the following material testing procedure
2 at any time, and any number of times during period of field painting:
3

4 Engage services of an independent testing laboratory to sample paint being used. Samples
5 of materials delivered to project site will be taken, identified and sealed, and certified in
6 presence of Contractor.
7

8 Testing laboratory will perform appropriate tests for any or all of following characteristics:
9 Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated
10 weathering, dry opacity, accelerated yellowness, re-coating, skinning, color retention, alkali
11 resistance and quantitative materials analysis.
12

13 If test results show that material being used does not comply with specified requirements,
14 Contractor may be directed to stop painting work, and remove non-complying paint; pay for testing;
15 repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces
16 if, upon repainting with specified paint, the two coatings are non-compatible.
17

18 CLEAN-UP AND PROTECTION:
19

20 Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and
21 rags at end of each work day.
22

23 Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove
24 spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise
25 damage finished surfaces.
26

27 Protection: Protect work of other trades, whether to be painted or not, against damage by painting
28 and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as
29 acceptable to Owner's Representative.
30

31 Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary
32 protective wrappings provided by others for protection of their work, after completion of
33 painting operations.
34

35 At completion of work of other trades, touch-up and restore all damaged or defaced painted
36 surfaces.
37

38 INTERIOR PAINT SCHEDULE:
39

40 General: Provide the following paint systems for the various substrates, as indicated.
41

42 DFT = Dry Film Thickness
43

44 Concrete Masonry Units:
45

46 1st coat - Block Filler
47

48 ICI Paints: 3010 Ultra Hide Block Filler
49

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PPG: 6-7 Speedhide I/E Block Filler (DFT 5.1 to 14.7)

SW: Preprite Block Filler B25W25 Series (DFT 8.0 to 10.0Mils)

2nd coat - Eggshell Latex

ICI Paints: 1423 Dulux Standard; Eggshell

PPG: SpeedCraft 5-411 Series; Eggshell (DFT 1.1 to 1.3)

SW: ProMar 400 E/S B20-400 Series

3rd coat - Eggshell Latex

ICI Paints: 1423 Dulux Standard; Eggshell

PPG: SpeedCraft 5-411 Series; Eggshell (DFT 1.1 to 1.3)

SW: ProMar 400 E/S B20-400 Series

Apply filler coat at rate to ensure complete coverage with pores filled, not less than 8.0 mils dry film thickness. 2nd and 3rd coats shall not be less than 2.5 mils. Total 10.5 mils. On existing painted walls, the 1st coat shall be: **Zinsser - Bulls Eye 1-2-3**.

1st coat - Block Filler

ICI Paints: 4015 Devoe Coatings Block Filler; Epoxy

PPG: Pitt-Glaze WB Acrylic; Epoxy 16-551 Series (DFT 2.0 to 3.0)

SW: HD Block Filler; B42 Series (DFT 10.0 to 18.0 Mils)

2nd coat - Water Borne Epoxy

ICI Paints: 4408 Devoe Coatings; Water Borne Epoxy

PPG: Pitt-Glaze WB Acrylic; Epoxy 16-551 Series (DFT 2.0 to 3.0)

SW: Waterbased; B70/B60 Series; Catalyzed Epoxy (DFT 2.5 to 3.0 Mils)

3rd coat - Water Borne Epxoy

ICI Paints: 4408 Devoe Coatings; Water Borne Epoxy

PPG: Pitt-Glaze WB Acrylic; Epoxy 16-551 Series (DFT 2.0 to 3.0)

SW: Waterbased; B70/B60 Series; Catalyzed Epoxy (DFT 2.5 to 3.0 Mils)

1 Apply filler coat at rate to ensure complete coverage with pores filled, not less than 10.0
2 mils dry film thickness. 2nd and 3rd coats shall not be less than 5.0 mils. Total 15.0 mils.
3 On existing painted walls, the 1st coat shall be: **Zinsser - Bulls Eye 1-2-3.**

4
5 Gypsum Drywall Systems:

6
7 1st coat - Latex Primer

8
9 ICI Paints: 1030-1200 PVA Primer

10
11 PPG: SpeedHide 6-2 Int. Latex Sealer (DFT 1.0 to 1.3)

12
13 SW: ProMar 200Zero VOC Primer B28W2600 Series (DFT 0.9 to 1.3)

14
15 2nd coat - Eggshell Latex

16
17 ICI Paints: 1423 Dulux Standard Eggshell

18
19 PPG: Speedcraft 5-411 Series; Eggshell (DFT 1.1 to 1.3)

20
21 SW: ProMar 400 E/S B20-400 Series

22
23 3rd coat - Eggshell Latex

24
25 ICI Paints: 1423 Dulux Standard Eggshell; 1221 Dulux Standard Flat (for Ceilings)

26
27 PPG: Speedcraft 5-411 Series Eggshell (DFT 1.1 to 1.3)

28
29 SW: ProMar 400 E/S B20-400 Series

30
31 On existing painted walls, the 1st coat shall be: **Zinsser Bulls Eye 1-2-3.**

32
33 Ferrous Metal:

34
35 1st coat - Rust Inhibitive Primer:

36
37 ICI Paints: 4020 Devoe Coatings; Devflex Prime and Finish

38
39 PPG: Pitt-Tech DTM Primer 90-172 Series (DFT 2.0 to 3.0)

40
41 SW: SW ProCryl Universal Metal Primer B66-310 Series

42
43 2nd coat - Semi-Gloss Enamel

44
45 ICI Paints: 4212 Devoe Coatings; Devflex Eggshell

46
47 PPG: Speedhide 6-3511 Series (DFT 1.3 to 1.5)

1 SW: SW ProMar 200 Zero VOC Eg-Shel B20W2600 Series

2

3 3rd coat - Semi-Gloss Enamel

4

5 ICI Paints: 4212 Devoe Coatings; Devflex Eggshell

6

7 PPG: Speedhide 6-3511 Series (DFT 1.3 to 1.5)

8

9 SW: SW ProMar 200 Zero VOC Eg-Shel B20W2600 Series

10

11 Stained Woodwork:

12

13 1st coat - Interior Oil Stain

14

15 ICI Paints: 1700 Wood Pride Stain

16

17 PPG: Olympic Premium Interior Oil Wood Stain 44500

18

19 SW: Minmax 250 Stain

20

21 2nd coat - Polyurethane

22

23 ICI Paints: 1802 Woodpride Poly

24

25 PPG: Olympic Premium Interior WB Poly Clear 42786 Satin (DFT 0.8 to 1.1)

26

27 SW: Wood Classics Waterbased Polyurethane Satin (A68V90), Gloss (A68F91)
28 (DFT 0.8 to 1.0 Mils)

29

30 3rd coat - Polyurethane

31

32 ICI Paints: 1802 Woodpride Poly

33

34 PPG: Olympic Premium Interior WB Poly Clear 42786 Satin (DFT 0.8 to 1.1)

35

36 SW: Wood Classics Waterbased Polyurethane Satin (A68V90), Gloss (A68F91)
37 (DFT 0.8 to 1.0 Mils)

38

39 Duct Work:

40

41 Prime Coat

42

43 ICI Paints: 4020 Devoe Coatings; Devflex Prime and Finish

44

45 PPG: Pitt Tech DTM Primer 90-712 Series (DFT2.0 to 3.0)

46

47 SW: SW ProCryl Universal Metal Primer B66-310 Series

48

49 1st coat - Flat Dryfall

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ICI Paints: 1280-1200 ICI Paints; Flat Waterborne Dryfall.

PPG: Speedhide Interior Flat Latex Dryfall 6-715x1 (DFT 3.0 to 4.5)

SW: Low VOC B42W81 (Flat) (DFT 3.0 to 4.5 Mils)

END OF SECTION

1 SECTION 101100 - VISUAL DISPLAY SURFACES

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 Section Includes:

14
15 Markerboards

16
17 Tackboards

18
19 Visual display rails

20
21 SUBMITTALS

22
23 Product Data: For each type of product indicated. Include construction details, material
24 descriptions, dimensions of individual components and profiles, and finishes for visual display
25 surfaces.

26
27 Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and
28 attachments to other work.

29
30 Show locations of panel joints.

31
32 Show locations of special-purpose graphics for visual display surfaces.

33
34 Include sections of typical trim members.

35
36 Samples for Initial Selection: For each type of visual display surface indicated, for units with factory
37 applied color finishes, and as follows:

38
39 Actual sections of porcelain enamel face sheet tackboard assembly.

40
41 Include accessory Samples to verify color selected.

42
43 Product Schedule: For visual display surfaces. Use same designations indicated on Drawings.

44
45 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified
46 testing agency, for surface-burning characteristics of fabrics.

47
48 Maintenance Data: For visual display surfaces to include in maintenance manuals.

1 Warranties: Sample of special warranties.

2
3 QUALITY ASSURANCE

4
5 Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

6
7 Surface Burning Characteristics: As determined by testing identical products according to ASTM
8 E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing
9 agency.

10
11 Flame Spread Index: 25 or less.

12
13 Smoke Developed Index: 50 or less.

14
15 DELIVERY, STORAGE, AND HANDLING

16
17 Deliver in manufacturer's original, unopened and undamaged containers with identification labels
18 intact.

19
20 Deliver factory built visual display surfaces, including factory applied trim where indicated,
21 completely assembled in one piece without joints, where possible. If dimensions exceed maximum
22 manufactured panel size, provide two or more pieces of equal length. When overall dimensions
23 require delivery in separate units, prefit components at the factory, disassemble for delivery, and
24 make final joints at the site.

25
26 Store materials protected from exposure to harmful weather conditions and at temperature and
27 humidity conditions recommended by the manufacturer.

28
29 Store visual display surfaces vertically with packing materials between each unit.

30
31 PROJECT CONDITIONS

32
33 Environmental Limitations: Do not deliver or install visual display surfaces until spaces are
34 enclosed and weather tight, wet work in spaces is complete and dry, work above ceilings is
35 complete, and temporary HVAC system is operating and maintaining ambient temperature and
36 humidity conditions at occupancy levels during the remainder of the construction period.

37
38 Field Measurements: Verify actual dimensions of construction contiguous with visual display
39 surfaces by field measurements before fabrication.

40
41 Allow for trimming and fitting where taking field measurements before fabrication might
42 delay the Work.

43
44 WARRANTY

45
46 Special Warranty for Porcelain Enamel Face Sheets: Manufacturer's standard form in which
47 manufacturer agrees to repair or replace porcelain enamel face sheets that fail in materials or
48 workmanship within specified warranty period.

1 Failures include, but are not limited to, the following:

2 Surfaces lose original writing and erasing qualities.

3 Surfaces exhibit crazing, cracking, or flaking.

4 Warranty Period: 50 years from date of Substantial Completion.

5
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9
10 PART 2 - PRODUCTS

11
12 MATERIALS, GENERAL

13
14 Porcelain Enamel Face Sheet: Manufacturer's standard steel sheet complying with ASTM A424
15 or A463. Porcelain enamel coating shall be fused to steel at manufacturers' standard firing
16 temperature, but not less than 1000° F. Coat the exposed face with a 3 coat process consisting
17 of primer, ground coat and color cover coat, and the concealed face with a 2 coat process
18 consisting of primer and ground coat. Uncoated steel thickness shall be 0.024 inch.

19
20 Provide finish listed below.

21
22 Markerboard Gloss Finish: Low gloss; dry erase markers wipe clean with dry cloth or
23 standard eraser. Suitable for use as projection screen.

24
25 Plastic Impregnated Cork Sheet: Seamless, homogeneous, self sealing sheet consisting of
26 granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto
27 burlap fabric backing; with washable vinyl finish and integral color throughout with surface burning
28 characteristics indicated.

29
30 Particleboard: ANSI A208.1, Grade M-1.

31
32 Fiberboard: complying with ASTM C 208.

33
34 Backing: aluminum sheet

35
36 Extruded Aluminum: ASTM B 221, Alloy 6063.

37
38 Laminating Adhesive: Manufacturer's standard, moisture resistant thermoplastic type.

39
40 CHALKBOARD ASSEMBLIES

41
42 Porcelain Enamel Chalkboards: Balanced, high pressure, factory laminated chalkboard assembly
43 of three ply construction consisting of 0.005 aluminum foil sheet, 1/2 inch fiberboard or
44 particleboard core material, and porcelain enamel face sheet with matte finish. Boards 16'-0" and
45 shorter shall have fiberboard core. Boards over 16'-0" shall have particleboard core.

46
47 Manufacturers: Subject to compliance with requirements, provide products by one of the
48 following:

1 Claridge Products and Equipment, Inc. - Series 4 (with 2" tackstrip)
2 Educational Equipment Corp. - Series RBP-1
3 Marsh Industries, Inc.; Visual Products Group - Series 1262
4

5 MARKERBOARD ASSEMBLIES
6

7 Porcelain Enamel Markerboards: Balanced, high-pressure, factory laminated markerboard
8 assembly of three ply construction consisting 0.005 aluminum foil sheet 1/2 inch fiberboard or
9 particleboard core material, and porcelain enamel face sheet with low gloss finish. Boards 16'-0"
10 and shorter shall have fiberboard core. Boards over 16'-0" shall have particleboard core.
11

12 Manufacturers: Subject to compliance with requirements, provide products by one of the
13 following:
14

15 Claridge Products and Equipment, Inc. - Series 4 (with 2" tackstrip)
16 Educational Equipment Corp. - Series RBP-1
17 Marsh Industries, Inc.; Visual Products Group - Series 1262
18

19 TACKBOARD ASSEMBLIES
20

21 Plastic Impregnated Cork Tackboard: 1/4 inch thick, burlap backed plastic impregnated cork sheet
22 factory laminated to 1/4 inch thick fiberboard backing.
23

24 Manufacturers: Subject to compliance with requirements, provide products by one of the
25 following:
26

27 Claridge Products and Equipment, Inc.
28 Educational Equipment Corp.
29 Marsh Industries, Inc.
30

31 VISUAL DISPLAY RAILS (AKA: Tackstrips)
32

33 General: Manufacturer's standard, aluminum framed, tackable burlap backed plastic impregnated
34 cork visual display surface fabricated into narrow rail shape and designed for displaying material.
35

36 Manufacturers: Subject to compliance with requirements, provide products by one of the
37 following:
38

39 Claridge Products and Equipment, Inc.
40 Educational Equipment Corp.
41 Marsh Industries, Inc.; Visual Products Group.
42

43 ACCESSORIES
44

45 Aluminum Frames and Trim: Fabricated from not less than 0.062 inch thick, extruded aluminum;
46 standard size and shape.
47

48 Factory Applied Trim: Manufacturer's standard.
49

- 1 Chalktray: Manufacturer's standard, continuous.
2
3 Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.
4
5 Map Rail: Extruded aluminum 2 inch rail. Provide the following accessories:
6
7 Display Rail: Continuous and integral with map rail; fabricated from plastic impregnated
8 cork.
9
10 End Stops: Located at each end of map rail.
11
12 Map Hooks: Two map hooks for every 48 inches of map rail or fraction thereof.
13
14 Flag Holder: One for each room.
15
16 Paper Holder: Extruded aluminum; designed to hold paper by clamping action.
17
18 Eraser: Provide 2 inch by 5 inch brush eraser - one for each board.
19

20 FABRICATION

- 21
22 Porcelain Enamel Visual Display Assemblies: Laminate porcelain enamel face sheet and backing
23 sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof
24 adhesive. Adhesive shall be hot applied to both face sheet and core material with 80% coverage
25 of 1.5 to 2.0 mils adhesive on each substrate.
26
27 Visual Display Boards: Factory assemble visual display boards unless otherwise indicated.
28
29 Factory applied trim shall be assembled and attached to visual display boards at
30 manufacturer's factory before shipment.
31
32 Factory Assembled Visual Display Units: Coordinate factory assembled units with trim and
33 accessories indicated. Join parts with a neat, precision fit.
34
35 Make joints only where total length exceeds maximum manufactured length. Fabricate with
36 minimum number of joints, balanced around center of board, as acceptable to owner's
37 representative.
38
39 Provide manufacturer's standard concealed steel spline vertical joint system between
40 abutting sections of chalkboards and/or markerboards. Particleboard shall be routed to
41 receive the steel spline to assure alignment of writing surfaces joined in the same plane.
42
43 Provide manufacturer's standard mullion trim at joints between chalkboards, markerboards
44 and tackboards of combination units.
45
46 Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a
47 minimum. Miter corners to a neat, hairline closure.
48

1 Factory applied trim shall be assembled and attached to visual display units at
2 manufacturer's factory before shipment.

3 4 GENERAL FINISH REQUIREMENTS

5
6 Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for
7 recommendations for applying and designating finishes.

8
9 Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary
10 protective covering before shipping.

11
12 Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations
13 in appearance of adjoining components are acceptable if they are within the range of approved
14 Samples and are assembled or installed to minimize contrast.

15 16 ALUMINUM FINISHES

17
18 Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

19 20 21 PART 3 - EXECUTION

22 23 EXAMINATION

24
25 Verify that interior temperature and humidity approximate anticipated normal conditions of intended
26 building occupancy.

27
28 Examine substrates and conditions, with Installer present, for compliance with requirements for
29 installation tolerances, surface conditions of wall, and other conditions affecting performance of the
30 Work.

31
32 Examine walls and partitions for proper preparation and backing for visual display surfaces.

33
34 Proceed with installation only after unsatisfactory conditions have been corrected.

35 36 PREPARATION

37
38 Comply with manufacturer's written instructions for surface preparation.

39
40 Clean substrates of substances that could impair the performance of and affect the smooth,
41 finished surfaces of visual display boards, including dirt, mold, and mildew.

42 43 INSTALLATION, GENERAL

44
45 General: Install visual display surfaces in locations and at mounting heights indicated on Drawings,
46 or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb.
47 Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories
48 necessary for complete installation.

1 Mounting Height for Grades 4-6: 30 inches above finished floor to top of chalktray.

2
3 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

4
5 Visual Display Boards: Attach visual display boards to wall surfaces with egg size adhesive gobs
6 at 24 inches o.c., horizontally and vertically. Attach concealed clips, hangers, and grounds to wall
7 surfaces and to visual display boards with fasteners at not more than 24 inches on center. Secure
8 both top and bottom of boards to walls.

9
10 INSTALLATION OF VISUAL DISPLAY RAILS

11
12 Display Rails: Install rails in locations and at mounting heights indicated on Drawings, or if not
13 indicated, at height indicated below. Attach to wall surface with fasteners at not more than 24
14 inches on center.

15
16 Mounting Height: 60 inches above finished floor to top of rail, unless noted other wise.

17
18 CLEANING AND PROTECTION

19
20 Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning
21 label to visual display surface in each room.

22
23 Repair or replace factory applied finishes to restore damaged or soiled areas.

24
25 Cover and protect visual display surfaces after installation and cleaning.

26
27 Remove protective film covering when directed by owner's representative.

28
29
30
31 END OF SECTION

1 SECTION 101400 - SIGNAGE

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes the following:

- 14
15 Interior panel signs
16 Project sign

17
18 Interior Room Signs:

19
20 Extent of interior room signs is listed below. Contractor to figure in his price to supply and install
21 the below listed typical signs:

22
23 See Room Sign Details on Drawings. Each sign shall be a plastic plaque with room name,
24 room number, occupancy of room, window for removable teachers name slider or
25 combination of these items as scheduled. Every room shall have a sign.

26
27 Each Restroom shall receive a plastic symbol plaque for men and women accordingly as
28 scheduled. Every room shall have a sign.

29
30 Each interior room sign shall have 3/32 raised letters and grade two (2) braille tags to meet
31 ADA requirements.

32
33 Project Sign:

34
35 Contractor to furnish 30" x 40" project sign. Consult with owner's representative for
36 approval of sign layout.

37
38 REGULATORY REQUIREMENTS

39
40 All signs shall comply with the ADA-ABA Accessibility Guidelines: U.S. Architectural &
41 Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility
42 Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

43
44 Provide traffic signs in accordance with requirements of current editions of the following
45 government agency publications:

46
47 "Ohio Manual on Uniform Traffic Control Devices" (OMUTCD) published by Ohio
48 Department of Transportation (ODOT).

1 "Standard Highway Signs" published by the Federal Highway Administration (FHWA), U.S.
2 Department of Transportation.

3
4 SUBMITTALS

5
6 Product Data: For each type of product indicated.

7
8 Shop Drawings: Show fabrication and installation details for signs.

9
10 Show sign mounting heights, locations of supplementary supports to be provided by others,
11 and accessories.

12
13 Provide message list, type-styles, graphic elements, including tactile characters and Braille,
14 and layout for each sign.

15
16 Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of
17 units showing the full range of colors available for the following:

18
19 Acrylic sheet.

20
21 Samples for Verification: For each of the following products and for the full range of color, texture,
22 and sign material indicated, of sizes indicated:

23
24 Sample of actual sign as they will appear installed.

25
26 Sign Schedule: Use same designations indicated on Drawings.

27
28 Qualification Data: For Installer and fabricator.

29
30 Maintenance Data: For signs to include in maintenance manuals.

31
32 Warranty: Special warranty specified in this Section.

33
34 QUALITY ASSURANCE

35
36 Installer Qualifications: An employer of workers trained and approved by manufacturer.

37
38 Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar
39 to those required for this Project and whose products have a record of successful in-service
40 performance.

41
42 Source Limitations for Signs: Obtain each sign type indicated from a single manufacturer.

43
44 Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines,
45 MUTCD, FHWA, ODOT and other authorities having jurisdiction.

46
47 PROJECT CONDITIONS

1 Weather Limitations: Proceed with installation only when existing and forecasted weather
2 conditions permit installation of signs in exterior locations to be performed according to
3 manufacturers' written instructions and warranty requirements.

4
5 Field Measurements: Verify recess openings by field measurements before fabrication and indicate
6 measurements on Shop Drawings.

7
8 COORDINATION

9
10 Coordinate placement of anchorage devices with templates for installing signs.

11
12 WARRANTY

13
14 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace
15 components of signs that fail in materials or workmanship within specified warranty period.

16
17 Failures include, but are not limited to, the following:

- 18
19 Deterioration of metal or polymer finishes .
20 Deterioration of embedded graphic image colors.
21 Deterioration of sign lamination.

22
23 Warranty Period: Five years from date of Substantial Completion.

24
25
26 PART 2 - PRODUCTS

27
28 MATERIALS

29
30 Interior Panel Signs

31
32 Cast Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet). Type UVA (UV absorbing).
33 Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes
34 indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM
35 D 790, a minimum allowable continuous service temperature of 176° F and of the following types:

36
37 Transparent Sheet: Where sheet material is indicated as "clear" provide colorless non-glare
38 sheet in matte finish, with light transmittance of 92%, when tested in accordance with the
39 requirements of ASTM D 1003.

40
41 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 42
43 Advance Corporation; Braille-Tac Division.
44 ASI-Modulex, Inc.
45 Bayuk Graphic Systems, Inc.
46 Columbus Graphics, Inc.
47 Nelson-Harkins Industries.
48 REM Graphics & Signs, LLC
49

1 FABRICATION

2
3 Interior Panel Signs:

4
5 Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a
6 tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the
7 following requirements:

8
9 Total Sign Thickness: .25 inch thick

10
11 Acrylic Face Plate: .1875 inch thick

12
13 Acrylic Backer Plate: .0625 inch thick

14
15 Edge Condition: Square.

16
17 Corner Condition: Rounded to 3/8 inch radius.

18
19 Changeable Text Insert: Fabricate signs to allow insertion of changeable messages for
20 paper inserts printed by Owner.

21
22 Mounting: Unframed.

23
24 Wall mounted with two faced adhesive tape.

25
26 Custom Paint Colors: Match Pantone color matching system.

27
28 Tactile Characters: Provide text and symbols complying with ADA-ABA Accessibility Guidelines and
29 with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed
30 characters with square-cut edges free from burrs and cut marks. Braille dots with domed or
31 rounded shape Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting
32 colors.

33
34 Graphic Content and Style: Provide sign copy to comply with the requirements indicated for sizes,
35 styles, spacing, content, positions, materials, finishes and colors of letters, numbers, symbols and
36 other graphic devices.

37
38 Subsurface Copy: Apply minimum 4-mil- thick vinyl copy to back of face plate to produce precisely
39 formed opaque image. Image shall be free of rough edges.

40
41 Use reverse silk-screen process to print copy; overspray the copy with an opaque
42 background color coating.

43
44 Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings,
45 including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum
46 adherence to acrylic surface and are non-fading for application intended.

47
48 Custom Paint Colors: Match Pantone color matching system.

1 Project Sign:

2
3 Signboard to be 30" X 40" x 3/4" marine plywood. All letters on white background, strip and
4 border black, sizes as noted. All text to be Agaramond medium. Artwork will be provided
5 at a later date to the successful General Contractor for sign text and layout.
6

7 Sign to be mounted on two (2) 8' x 4" x 4" treated finish with 2" x 4" cross brace let into
8 posts, all painted brown. Bolt sign to posts with four (4) 5/8" x 5" carriage bolts with
9 washers.
10

11 ACCESSORIES

12
13 Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for
14 exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead
15 expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into
16 concrete or masonry work.
17

18
19 PART 3 - EXECUTION

20
21 EXAMINATION

22
23 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements
24 for installation tolerances and other conditions affecting performance of work.
25

26 Verify that items, including anchor inserts, are sized and located to accommodate signs.
27

28 Proceed with installation only after unsatisfactory conditions have been corrected.
29

30 INSTALLATION

31
32 Locate signs and accessories where indicated, using mounting methods of types described and
33 complying with manufacturer's written instructions.
34

35 Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and
36 other defects in appearance.
37

38 Interior Panel Signs: Install signs on walls as shown on Drawings. Where not indicated or
39 possible, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign
40 without encountering protruding objects or standing within swing of door.
41

42 Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more
43 stringent requirements apply.
44

45 Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for
46 vinyl-covered or rough surfaces.
47

48 Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal
49 mounting materials.

1
2 CLEANING AND PROTECTION

3
4 After installation, clean soiled sign surfaces according to manufacturer's written instructions.
5 Protect signs from damage until acceptance by Owner.

6
7
8
9 END OF SECTION

1 SECTION 102113 - TOILET COMPARTMENTS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY:

12
13 Extent of toilet partitions is indicated on drawings.

14
15 Types of toilet compartments include:

16
17 Solid Plastic (HDPE)

18
19 Styles of toilet compartments include:

20
21 Floor anchored, overhead braced.

22
23 Toilet accessories, such as toilet paper holders, grab bars, purse shelves, are specified elsewhere
24 in Division 10.

25
26 SUBMITTALS:

27
28 Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and
29 installation, including catalog cuts of anchors, hardware, fastenings, and accessories.

30
31 Shop Drawings: Submit shop drawings for fabrication and erection of toilet partition assemblies
32 not fully described by product drawings, templates, and instructions for installation of anchorage
33 devices built into other work.

34
35 Samples: Submit full range of color samples for each type of unit required. Submit 6" square
36 samples of each color and finish on same substrate to be used in work, for color verification after
37 selections have been made.

38
39 QUALITY ASSURANCE:

40
41 Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

42
43 Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural &
44 Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and
45 Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI
46 A117.1 for toilet compartments designated as accessible.

47
48 PROJECT CONDITIONS

1 Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other
2 construction contiguous with toilet compartments by field measurements before fabrication.
3 However, allow for adjustments within specified tolerances wherever taking field measurements
4 prior to fabrication.

5
6 Coordination: Furnish inserts and anchorages which must be built into other work for installation
7 of toilet partitions and related work; coordinate delivery with other work to avoid delay.

8 9 WARRANTY

10
11 Toilet partitions panels, doors and stiles shall warranted under normal usage against breakage,
12 delamination, and defects in workmanship for a period of 15 years.

13
14 Hardware for toilet partitions shall be warranted under normal usage against breakage and defects
15 in workmanship for a period of 2 years.

16 17 18 PART 2 - PRODUCTS

19 20 MANUFACTURERS:

21
22 Manufacturers: Subject to compliance with requirements, manufacturers offering products include
23 the following:

24
25 Accurate Partitions Div., United States Gypsum Co.
26 Scranton Products
27 Bradley
28 Hadrian
29 Global Partitions, Bobrick

30 31 MATERIALS:

32
33 General: Provide materials which have been selected for surface flatness and smoothness.
34 Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations,
35 telegraphing of core material, or other imperfections on finished units are not acceptable.

36
37 Pilaster Shoes: ASTM A 167, Type 302/304 stainless steel, not less than 3" high, 20 gauge,
38 finished to match hardware.

39
40 Stirrup Brackets: stainless steel or aluminum design for attaching panels to walls and pilasters,
41 provide full length stainless steel or aluminum angle to attached panels to walls.

42
43 Hardware and Accessories: Heavy-duty operating hardware and accessories of stainless steel.

44
45 Overhead-Bracing: Continuous extruded aluminum, anti-grip profile, with clear anodized finish.

46
47 Anchorage and Fasteners: exposed fasteners of stainless steel, chromium-plated steel, or brass
48 finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use
49 hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

1 FABRICATION:

2
3 General: Furnish standard doors, panels, screens, and pilasters fabricated for partition system,
4 unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to
5 receive partition-mounted hardware, accessories, and grab bars, as indicated. All phenolic edges
6 shall be radiused and burnished.

7
8 Door Dimensions: Unless otherwise indicated, furnish minimum 24" wide in-swinging doors for
9 ordinary toilet stalls and minimum 32" wide (clear opening) out-swinging doors at stalls equipped
10 for use by handicapped.

11
12 Overhead-Braced Partitions: Furnish galvanized steel supports and leveling bolts at pilasters, as
13 recommended by manufacturer to suit floor conditions. Make provisions for setting and securing
14 continuous extruded aluminum anti-grip overhead-bracing at top of each pilaster. Furnish stainless
15 steel shoe at each pilaster to conceal supports and leveling mechanism.

16
17 Urinal-Screen Style: Wall hung

18
19 Hardware: shall be 18-8 type 304 stainless steel with satin finish. Furnish hardware for each
20 compartment in partition system, as follows:

21
22 Hinges: Heavy Duty self closing hinge type - 3 per door.

23
24 Latch and Keeper: Minimum 16 gauge surface-mounted latch unit, designed for emergency
25 access, with combination rubber-faced door strike and keeper.

26
27 Coat Hook: Minimum 14 gauge combination hook and rubber-tipped bumper, sized to
28 prevent door hitting mounted accessories.

29
30 Door Pull: Manufacturer's standard unit for in or out-swing doors.

31
32 Wall and Panel Bracket: minimum 16 gauge, provide continuous bracket at urinal screen.

33
34 FINISHES:

35
36 Color As selected by Owner's Representative manufacturers' complete line.

37
38
39 PART 3 - EXECUTION

40
41 INSTALLATION:

42
43 General: Comply with manufacturers' written installation instructions. Install units rigid, straight,
44 level, and plumb. Secure units in position with manufacturers' recommended anchoring devices.

45
46 Maximum Clearances:

47
48 Pilasters and Panels: ½ inch

49
50 Panels and Walls: 1 inch

1 Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than two brackets attached
2 near top and bottom of panel.
3
4 Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
5
6 Align brackets at pilasters with brackets at walls.
7
8 Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with
9 anchors penetrating not less than 1 ¾ inches into structural floor unless otherwise indicated in
10 manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than
11 two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors
12 are parallel with overhead brace when doors are in closed position.
13
14 Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and
15 plumb, rigid, and secured to resist lateral impact.
16
17 ADJUST AND CLEAN:
18
19 Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on in-
20 swinging doors to hold open approximately 30° from closed position when unlatched. Set hinges
21 on out-swinging doors (and entrance swing doors) to return to fully closed position.
22
23 Clean exposed surfaces of partition systems using materials and methods recommended by
24 manufacturer, and provide protection, as necessary, to prevent damage during the remainder of
25 construction period.
26
27
28
29 END OF SECTION

1 SECTION 102813 - MIRROR UNITS

2
3

4 PART 1 - GENERAL

5
6

6 RELATED DOCUMENTS:

7
8

8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11

11 SUMMARY:

12
13

13 Extent of mirror units is indicated on drawings.

14
15

15 Types of mirror units required include the following:

16
17

17 Stainless steel framed fixed mirrors.

18
19

19 Toilet accessories are specified elsewhere in Division 10.

20
21

21 QUALITY ASSURANCE:

22
23

23 General: Provide mirror units produced by single manufacturer for entire project.

24
25

25 SUBMITTALS:

26
27

27 Product Data: Submit manufacturer's technical data, detail drawings, and installation instructions
28 for mirror units.

29
30

30 Schedule: Submit schedule indicating mirror types, quantities, sizes and installation locations for
31 each mirror to be provided for project.

32
33

33 SPECIFIED PRODUCT WARRANTY:

34
35

35 Provide manufacturer's written 15 year warranty against silver spoilage of mirrors, agreeing to
36 replace any mirrors which develop visible defects within warranty period.

37
38

39 PART 2 - PRODUCTS

40
41

41 ACCEPTABLE MANUFACTURERS:

42
43

43 Manufacturer: Subject to compliance with requirements, provide mirror units of one of the following:

44
45

45 American Specialties, Inc. 620 series

46
47

46 Bobrick Washroom Equipment, Inc. B-290 series

47
48

47 Bradley Corp. 780 series

48
49

49 MATERIALS:

1 Mirror Glass: 1/4" thick, Type I, Class 1, Quality q2, conforming to FS DD-G-451, with silvering,
2 copper coating, and protective organic coating complying with FS DD-M-411.

3
4 Stainless Steel Framing: AISI Type 302/304, with polished No. 4 finish.

5
6 Galvanized Steel Sheet: ASTM A 527, G60.

7
8 Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

9
10 FABRICATION:

11
12 General:

13
14 Edge Protection: Fabricate frames for glass mirrors to accommodate wood, felt, plastic, or other
15 glass edge protection material.

16
17 Backing: Provide mirror backing and support system which will permit rigid, tamper-proof glass
18 installation and prevent accumulation of moisture, as follows:

19
20 Galvanized steel backing sheet, not less than 22 gage and full mirror size, with
21 non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.

22
23 Hangers: Provide system of mounting mirror units which will permit rigid, tamper-proof and theft-
24 proof installation, as follows:

25
26 One-piece galvanized steel wall hanger device with spring action locking mechanism to hold
27 mirror unit in position with no exposed screws or bolts.

28
29 Stainless Steel Framed Mirrors:

30
31 Fixed Type: Fabricate frame with channel shapes of not less than 20 gage (.040"), with square
32 corners carefully mitered to hairline joints that are welded and ground smooth. Provide in Type 304
33 satin finish.

34
35 Mark M1 to be 1836 size.

36 Mark M2 to be 3660 size.

37
38
39 PART 3 - EXECUTION

40
41 INSTALLATION:

42
43 Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts or
44 screws. Set units plumb, level, and square at locations indicated, in accordance with
45 manufacturer's instructions for type of substrate involved.

46
47 ADJUST AND CLEAN:

48
49 Verify that adjustable tilting mirrors are properly installed and are operating smoothly.

- 1 Clean exposed surfaces of mirror units in compliance with manufacturer's recommendations.
- 2
- 3
- 4
- 5 END OF SECTION

1 SECTION 104410 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes the following:

14
15 Portable fire extinguishers.

16
17 Fire-protection cabinets for portable fire extinguishers.

18
19 SUBMITTALS

20
21 Product Data: Include construction details, material descriptions, dimensions of individual
22 components and profiles, and finishes for fire-protection specialties.

23
24 Fire Extinguishers: Include rating and classification.

25
26 Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships
27 of box and trim to surrounding construction, door hardware, cabinet type, trim style, and
28 panel style.

29
30 QUALITY ASSURANCE

31
32 Source Limitations: Obtain fire extinguishers and cabinets through one source from a single
33 manufacturer.

34
35 NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for
36 Portable Fire Extinguishers."

37
38 Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing
39 agency acceptable to authorities having jurisdiction.

40
41 Provide extinguishers listed and labeled by FM.

42
43 COORDINATION

44
45 Coordinate size of cabinets to ensure that type and capacity of fire extinguishers indicated are
46 accommodated.

47
48
49 PART 2 - PRODUCTS

1 MANUFACTURERS

2
3 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

4
5 Design based on Larson's Manufacturing Co., Model #2712R.

6
7 Portable Fire Extinguishers:

8
9 J.L. Industries, Inc.

10
11 Kidde: Walter Kidde, The Fire Extinguisher Co.

12
13 Larsen's Manufacturing Company.

14
15 Modern Metal Products; Division of Technico.

16
17 Potter-Roemer; Division of Smith Industries, Inc.

18
19 Watrous; Division of American Specialties, Inc.

20
21 Fire-Protection Cabinets:

22
23 J.L. Industries, Inc. - Model No. 1036G17 or 1036G17FX

24
25 Larsen's Manufacturing Company. Model No. SS-2409-6R or FS-SS-2409-6R

26
27 Modern Metal Products; Division of Technico, Model No. 1026SR3SSFGDA or
28 FSB1026SR3SSFGDA

29
30 Potter-Roemer; Division of Smith Industries, Inc. Model No. 7062-B-RR or
31 FRC7062-B-RR

32
33 MATERIALS

34
35 Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of
36 use and finish indicated, and as follows:

37
38 Sheet: ASTM B 209

39
40 Extruded Shapes: ASTM B 221

41
42 Stainless-Steel Sheet: ASTM A 666/A 666M, Type 302 or Type 304 alloy.

43
44 Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality,
45 stretcher leveled, temper rolled.

46
47 PORTABLE FIRE EXTINGUISHERS

1 General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations
2 indicated.

3
4 Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B: C, 10-lb nominal capacity, in enameled-steel
5 container.

6 7 FIRE-PROTECTION CABINETS

8
9 General: Provide fire protection cabinets where indicated on drawings.

10
11 Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and
12 hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth.
13 Miter and weld perimeter door frames.

14
15 Provide factory-drilled mounting holes.

16
17 Cabinet Metal: Steel sheet

18
19 Cabinet Type: Suitable for the following:

20
21 Fire extinguisher

22
23 Cabinet Mounting: Suitable for the following mounting conditions:

24
25 Fully-recessed: Cabinet box recessed in CMU wall to suit style of trim indicated.

26
27 Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground
28 smooth.

29
30 Exposed Trim: One-piece combination trim and perimeter door frame overlapping
31 surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

32
33 Rolled-Edge Trim: 1 ½" to 2 ½" backbend depth.

34
35 Cabinet Trim Material: Manufacturer's standard, as follows:

36
37 Stainless-steel sheet.

38
39 Door Material: Manufacturer's standard, as follows:

40
41 Stainless-steel sheet.

42
43 Door Glazing: Manufacturer's standard, as follows:

44
45 Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, as follows:

46
47 Class 1 (clear)

48
49 Door Style: Manufacturer's standard design, as follows:

1 Fully glazed panel with frame.
2

3 Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated,
4 and coordinated with cabinet types and trim styles selected.
5

6 Provide minimum ½ inch thick door frames, fabricated with tubular stiles and rails, and
7 hollow-metal design.
8

9 Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for
10 cabinet type, trim style, and door material and style indicated. Provide concealed or
11 continuous-type hinge permitting doors to open 180 degrees.
12

13 ACCESSORIES 14

15 Mounting Brackets: Manufacturer's standard steel, designed to secure extinguishers, of sizes
16 required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.
17

18 Provide brackets for extinguishers not located in cabinets.
19

20 Provide brackets for extinguishers located in cabinets.
21

22 FINISHES, GENERAL 23

24 Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for
25 recommendations for applying and designating finishes.
26

27 Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary
28 protective covering before shipping.
29

30 Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are
31 acceptable if they are within one-half of the range of approved Samples. Noticeable variations in
32 the same piece are not acceptable. Variations in appearance of other components are acceptable
33 if they are within the range of approved Samples and are assembled or installed to minimize
34 contrast.
35

36 STAINLESS-STEEL FINISHES 37

38 General: Remove or blend tool and die marks and stretch lines into finish. Grind and polish
39 surfaces to produce uniform, directionally textured polished finish indicated, free of cross scratches.
40 Run grain with long dimension of each piece.
41

42 Bright, Directional Polish: No. 4 finish.
43

44 When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and
45 leave surfaces chemically clean.
46
47

48 PART 3 - EXECUTION 49

1 EXAMINATION

2

3 Examine walls and partitions for suitable framing depth and blocking where recessed and semi-
4 recessed cabinets are to be installed.

5

6 Examine fire extinguishers for proper charging and tagging.

7

8 Remove and replace damaged, defective, or undercharged units.

9

10 Proceed with installation only after unsatisfactory conditions have been corrected.

11

12 INSTALLATION

13

14 Comply with manufacturer's written instructions for installing fire-protection specialties.

15

16 Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to
17 authorities having jurisdiction.

18

19 Prepare recesses for cabinets as required by type and size of cabinet and trim style.

20

21 Fasten mounting brackets to structure and cabinets, square and plumb.

22

23 Fasten cabinets to structure, square and plumb.

24

25 ADJUSTING, CLEANING, AND PROTECTION

26

27 Adjust cabinet doors that do not swing or operate freely.

28

29 Refinish or replace cabinets and doors damaged during installation.

30

31 Provide final protection and maintain conditions that ensure that cabinets and doors are without
32 damage or deterioration at the time of Substantial Completion.

33

34

35

36 END OF SECTION

1 SECTION 105113 - METAL LOCKERS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This Section includes the following:

14
15 Knocked down, quiet metal lockers.

16
17 SUBMITTALS

18
19 Product Data: Include construction details, material descriptions, dimensions of individual
20 components and profiles, finishes and quantities for each type of metal locker.

21
22 Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

23
24 Show base, sloping tops, filler panels, recess trim and other accessories.

25
26 Numbering: Locker numbering sequence will be provided by the approving authority and noted on
27 approved drawings returned to the Locker Contractor.

28
29 Color Charts: Provide color charts showing manufacturer's available colors for initial selection.
30 Provide samples of paint on metal for final selection.

31
32 Lock Combination Listings and Master Keys: Shall be delivered directly to the Owner's
33 Representative by registered mail or overnight package service when combination locks are
34 specified.

35
36 QUALITY ASSURANCE

37
38 Installer Qualifications: An authorized representative of metal locker manufacturer for installation
39 and maintenance of units required for this Project.

40
41 Source Limitations: Obtain each type of metal locker and accessories through one source from
42 a single manufacturer including necessary installation accessories, fittings and fasteners.

43
44 Product Options: Drawings indicate size, profiles, and dimensional requirements of metal lockers
45 and are based on the specific system indicated.

46
47 Do not modify intended aesthetic effects, as judged solely by Owner's Representative,
48 except with Owner's Representative's approval. If modifications are proposed, submit
49 comprehensive explanatory data to Owner's Representative for review.

1 DELIVERY, STORAGE, AND HANDLING

2
3 Do not deliver metal lockers until spaces to receive them is clean, dry, and ready for metal locker
4 installation.

5
6 PROJECT CONDITIONS

7
8 Field Measurements: Verify the following by field measurements before fabrication and indicate
9 measurements on Shop Drawings:

10
11 Concealed framing, blocking, and reinforcements that support metal lockers before they are
12 enclosed.

13
14 Recessed openings.

15
16 Established Dimensions: Where field measurements cannot be made without delaying the
17 Work, establish recessed opening dimensions and proceed with fabricating metal lockers
18 without field measurements. Coordinate wall and floor construction to ensure that actual
19 recessed opening dimensions correspond to established dimensions.

20
21 COORDINATION

22
23 Coordinate size and location of bases for metal lockers.

24
25 Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units
26 of Work specified in other Sections to ensure that metal lockers can be supported and installed as
27 indicated.

28
29 WARRANTY

30
31 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace
32 components of metal lockers that fail in materials or workmanship, excluding finish, within specified
33 warranty period.

34
35 Failures include, but are not limited to, the following:

36
37 Structural failures.

38
39 Faulty operation of latches and other door hardware.

40
41 Warranty Period for Knocked Down Metal Lockers: Two (2) years from date of Substantial
42 Completion.

43
44 EXTRA MATERIALS

45
46 Furnish extra materials described below, before construction begins, that match products installed
47 and that is packaged with protective covering for storage and identified with labels describing
48 contents.

1 Full size units of the following metal locker hardware items equal to 3 percent of amount
2 installed for each type and finish installed.

3
4 Locks.
5 Hooks.
6

7
8 PART 2 - PRODUCTS

9
10 MANUFACTURERS

11
12 Products: Subject to compliance with requirements, provide one of the following;

13
14 List Industries Superior Lockers.
15 Lyon Workspace Products
16 Penco Products Inc.
17 Republic Storage Systems
18 Tennsco Locker
19

20 MATERIALS

21
22 Cold Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS) Type B, suitable for exposed
23 applications.

24
25 Expanded Metal: ASTM F 1267, Type II (flattened), Class I, 3/4 inch steel mesh, with at least 70
26 percent open area.

27
28 Stainless Steel Sheet: ASTM A 666, Type 304.

29
30 Extruded Aluminum: ASTM B 221, alloy and temper recommended by aluminum producer and
31 manufacturer for type of use and finish indicated.

32
33 Fasteners: Zinc or nickel plated steel, slot-less-type exposed bolt heads, and self locking nuts or
34 lock washers for nuts on moving parts.

35
36 Anchors: Select material, type, size, and finish required for secure anchorage to each substrate.

37
38 Provide nonferrous metal or hot dip galvanized anchors and inserts on inside face of
39 exterior walls for corrosion resistance.

40
41 Provide toothed steel or lead expansion sleeves for drilled in place anchors.
42

43 KNOCKED DOWN, QUIET METAL LOCKERS

44
45 Locker Arrangement: Single tier

46
47 Locker Size: 12" W x 14" D x 60" H; as shown on drawings.

48
49 Locker Quantity: As shown on drawing.

1 Body: Assembled by riveting or bolting body components together. Fabricate from un-perforated,
2 cold rolled steel sheet with thicknesses as follows:
3
4 Tops, Bottoms, and Intermediate Dividers: 0.0209 inch, (24 GA), with single bend at sides.
5
6 Backs and Sides: 0.0209 inch thick, (24 GA) with full height, double flanged connections.
7
8 Shelves: 0.0209 inch thick, (24 GA) with double bend at front and single bend at sides and
9 back.
10
11 Frames: Channel formed; fabricated from 0.0528 inch thick, (16 GA) cold rolled steel sheet; lapped
12 and factory welded at corners; with top and bottom main frames factory welded into vertical main
13 frames. Form continuous, integral door strike full height on vertical main frames.
14
15 Cross Frames between Tiers: Channel formed and fabricated from same material as main
16 frames; welded to vertical frame members.
17
18 Frame Vents: Fabricate face frames with vents.
19
20 Doors: One piece; fabricated from 0.0528 inch thick, (16 GA) cold rolled steel sheet; formed into
21 channel shape with double bend at vertical edges, and with right angle single bend at horizontal
22 edges.
23
24 Doors less than 12 inches wide may be fabricated from 0.0428 inch thick, (18 GA) cold rolled steel
25 sheet.
26
27 Box lockers less than 15 inches wide may be fabricated from 0.0428 inch thick, (18 GA) cold rolled
28 steel sheet.
29
30 Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more
31 than 15 inches wide; welded to inner face of doors.
32
33 Door Style: Vented panel as follows:
34
35 Louvered Vents: Not less than six louver openings at top and bottom for single tier lockers.
36
37 Hinges: Welded to door and attached to door frame with not less than two (2) factory installed
38 rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated
39 to swing 180 degrees.
40
41 Knuckle Hinges: Steel, full loop, 5 or 7 knuckles, tight pin; minimum 2 inches high. Provide
42 not less than three (3) hinges for each door more than 42 inches high.
43
44 Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking
45 device does not protrude beyond face of door; pry resistant.
46
47 Multipoint Latching: Finger lift latch control designed for use with built in combination locks,
48 built in key locks, or padlocks; positive automatic and pre-locking.
49

1 Latch Hooks: Equip doors 48 inches and higher with three (3) latch hooks and
2 doors less than 48 inches high with two (2) latch hooks; fabricated from minimum
3 0.0966 inch thick steel; welded or riveted to full height door strikes; with resilient
4 silencer on each latch hook.
5

6 Latching Mechanism: Manufacturer's standard rattle free latching mechanism and
7 moving components isolated with vinyl or nylon to prevent metal to metal contact,
8 and incorporating a pre-locking device that allows locker door to be locked while
9 door is open and then closed without unlocking or damaging lock or latching
10 mechanism.
11

12 Door Handle and Latch for Box Lockers: Stainless steel strike plate with integral pull; with steel
13 padlock loop that projects through metal locker door.
14

15 Built in Combination Locks: Key controlled, three number dialing combination locks; capable of at
16 least five (5) combination changes made automatically with a control key.
17

18 Bolt Operation: Manually locking deadbolt or automatically locking spring bolt.
19

20 Built in ADA Combination Locks: Key controlled, three number dialing combination locks; capable
21 of at least five (5) combination changes made automatically with a control key.
22

23 Bolt Operation: Manually locking deadbolt or automatically locking spring bolt.
24

25 Provide with two (2) keys, each with ADA key head to comply with ADA 28 CFR, Part 36.
26

27 Equipment: Equip each metal locker with identification plate and the following, unless otherwise
28 indicated:
29

30 Single Tier Units: Shelf, one (1) double prong ceiling hook, and two (2) single prong wall
31 hooks.
32

33 Accessories:
34

35 Continuous Sloping Tops: Fabricated from cold rolled steel sheet, 0.0329 inch thick (20
36 GA).
37

38 Closures: Vertical end type.
39

40 Sloped top corner fillers, mitered.
41

42 Recess Trim: Fabricated from 0.0428 inch thick, (18 GA), cold-rolled steel sheet.
43

44 Filler Panels: Fabricated from cold rolled steel sheet, 0.0329 inch thick (20 GA).
45

46 Finished End Panels: Fabricated from 0.0209 inch thick, cold rolled steel sheet (24 GA).
47

48 Finish: Baked enamel or powder coat.
49

1 Colors: As selected by Owner's Representative from manufacturer's full range.

2
3 FABRICATION

4
5 General: Fabricate metal lockers square, rigid, and without warp; with metal faces flat and free of
6 dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch.

7
8 Form body panels, doors, shelves, and accessories from one piece steel sheet, unless
9 otherwise indicated.

10
11 Provide fasteners, filler plates, supports, clips, and closures as required for a complete
12 installation.

13
14 Unit Principle: Fabricate each metal locker with an individual door and frame; individual top,
15 bottom, and back; and common intermediate uprights separating compartments.

16
17 Knocked Down Construction: Fabricate metal lockers for nominal assembly at Project site using
18 nuts, bolts, screws, or rivets. Factory weld frame members together to form a rigid, one-piece
19 assembly.

20
21 Hooks: Manufacturer's standard ball pointed type, aluminum or steel; zinc plated.

22
23 Identification Plates: Manufacturer's standard etched, embossed, or stamped aluminum plates;
24 with numbers and letters at least 3/8 inch high.

25
26 Continuous Sloping Tops: Fabricated in lengths as long as practicable, without visible fasteners
27 at splice locations; finished to match lockers.

28
29 Sloped top corner fillers, mitered.

30
31 Recess Trim: Fabricated with minimum 2 1/2 inch face width and in lengths as long as practicable;
32 finished to match lockers.

33
34 Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip
35 joint filler angle formed to receive filler panel.

36
37 Finished End Panels: Designed for concealing unused penetrations and fasteners, except for
38 perimeter fasteners, at exposed ends of non-recessed metal lockers; finished to match lockers.

39
40 Provide one piece panels for double row (back to back) locker ends.

41
42 STEEL SHEET FINISHES

43
44 General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for
45 recommendations for applying and designating finishes.

46
47 Factory finish steel surfaces and accessories except stainless steel and chrome plated surfaces.

1 Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants
2 that could impair paint bond. Use manufacturer's standard methods.

3
4 Baked Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply
5 manufacturer's standard thermosetting baked enamel finish. Comply with paint manufacturer's
6 written instructions for application, baking, and minimum dry film thickness.

7
8
9 PART 3 - EXECUTION

10
11 EXAMINATION

12
13 Examine walls, floors, and support bases, with Installer present, for compliance with requirements
14 for installation tolerances and other conditions affecting performance of work.

15
16 For the record, prepare written report, endorsed by Installer, listing conditions detrimental
17 to performance of work.

18
19 Proceed with installation only after unsatisfactory conditions have been corrected.

20
21 INSTALLATION

22
23 General: Install level, plumb, and true; shim as required, using concealed shims.

24
25 Anchor locker runs at ends and at intervals recommended by manufacturer, but not more
26 than 36 inches on center. Install anchors through backup reinforcing plates, channels, or
27 blocking as required to prevent metal distortion, using concealed fasteners.

28
29 Anchor single rows of metal lockers to walls near top and bottom of lockers.

30
31 Anchor back to back metal lockers to floor.

32
33 Knocked Down Metal Lockers: Assemble knocked down metal lockers with standard fasteners,
34 with no exposed fasteners on door faces or face frames.

35
36 Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately
37 together to form tight, hairline joints, with concealed fasteners and splice plates.

38
39 Attach hooks with at least two (2) fasteners.

40
41 Attach door locks on doors using security type fasteners.

42
43 Identification Plates: Identify metal lockers with identification indicated on Drawings.

44
45 Attach plates to each locker door, near top, centered, with at least two (2) aluminum
46 rivets.

47
48 Attach recess trim to recessed metal lockers with concealed clips.
49

1 Attach filler panels with concealed fasteners. Locate fillers panels where indicated on
2 Drawings.

3
4 Attach sloping top units to metal lockers, with closures at exposed ends.

5
6 Attach finished end panels with fasteners only at perimeter to conceal exposed ends of non-
7 recessed metal lockers.

8
9 ADJUSTING, CLEANING, AND PROTECTION

10
11 Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.
12 Verify that integral locking devices operate properly.

13
14 Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit metal locker
15 use during construction.

16
17 Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished
18 appearance. Use only materials and procedures recommended or furnished by metal locker
19 manufacturer.

20
21
22
23 END OF SECTION

1 SECTION 122113 - HORIZONTAL LOUVER BLINDS

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 Section Includes:

14
15 Manual horizontal louver blinds with polymer slats.

16
17 RELATED SECTIONS:

18
19 Division 6 Section "Rough Carpentry" for wood blocking and grounds for mounting
20 horizontal louver blinds and accessories.

21
22 SUBMITTALS

23
24 Product Data: For each type of product.

25
26 Shop Drawings: Show fabrication and installation details for horizontal louver blinds.

27
28 Samples: For each exposed product and for each color and texture specified, 12 inches long.

29
30 Samples for Initial Selection: For each type and color of horizontal louver blind.

31
32 Include similar Samples of accessories involving color selection.

33
34 Samples for Verification: For each type and color of horizontal louver blind indicated.

35
36 Slat: Not less than 12 inches long.

37
38 Tapes: Full width, not less than 6 inches long.

39
40 Horizontal Louver Blind: Full-size unit, not less than 16 inches wide by 24 inches long.

41
42 Valance: Full-size unit, not less than 12 inches wide.

43
44 Window-Treatment Schedule: For horizontal louver blinds. Use same designations indicated on
45 Drawings.

46
47 Informational Submittals:

48
49 Product Certificates: For each type of horizontal louver blind.

1
2 Product Test Reports: For each type of horizontal louver blind, for tests performed by
3 manufacturer and witnessed by a qualified testing agency.

4
5 Closeout Submittals:

6
7 Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

8
9 QUALITY ASSURANCE

10
11 Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate
12 aesthetic effects and set quality standards for fabrication and installation.

13
14 Approval of mockups does not constitute approval of deviations from the Contract
15 Documents contained in mockups unless Architect specifically approves such deviations
16 in writing.

17
18 Subject to compliance with requirements, approved mockups may become part of the
19 completed Work if undisturbed at time of Substantial Completion.

20
21 DELIVERY, STORAGE, AND HANDLING

22
23 Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and
24 location of installation using same designations indicated on Drawings.

25
26 FIELD CONDITIONS

27
28 Environmental Limitations: Do not install horizontal louver blinds until construction and wet and
29 finish work in spaces, including painting, is complete and dry and ambient temperature and
30 humidity conditions are maintained at the levels indicated for Project when occupied for its intended
31 use.

32
33 Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify
34 dimensions of other construction by field measurements before fabrication and indicate
35 measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed
36 units through entire operating range. Notify Architect of installation conditions that vary from
37 Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

38
39
40 PART 2 - PRODUCTS

41
42 MANUFACTURERS

43
44 Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

45
46 HORIZONTAL LOUVER BLINDS, POLYMER SLATS

47
48 Manufacturers: Subject to compliance with requirements, available products that may be
49 incorporated into the Work include the following:

1 Comfortex Window Fashions
2 Hunter Douglas Contract
3 Levolor Contract; a Newell Rubbermaid Company
4 Springs Window Fashions.
5

6 Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify
7 products with appropriate markings of applicable testing agency.
8

9 Slats: Polymers that are lead free, UV stabilized, integrally colored, opaque, and will not crack or
10 yellow; antistatic, dust-repellent treated.
11

12 Formulation: Manufacturer's standard
13

14 Width: 2 inches
15

16 Thickness: 0.125 inch
17

18 Spacing: Manufacturer's standard
19

20 Profile: Manufacturer's standard
21

22 Features:
23

24 Lift-Cord Rout Holes: None
25

26 Headrail: Formed steel or extruded aluminum; long edges returned or rolled. Headrail fully
27 encloses operating mechanisms on three sides and ends.
28

29 Capacity: One blind per headrail unless otherwise indicated.
30

31 Manual Lift Mechanism:
32

33 Lift-Cord Lock: Variable; stops lift cord at user-selected position within full operating
34 range.
35

36 Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord
37 pull.
38

39 Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts
40 ladders.
41

42 Tilt: Full.
43

44 Tilt: Two-directions, positive stop or lockout limited at an angle of 80 degrees from
45 horizontal, both directions.
46

47 Operator: Dual cord
48

1 Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to
2 prevent over rotation of gear.
3
4 Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard
5
6 Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard unless otherwise
7 indicated.
8
9 Bottom Rail: Secures and protects ends of ladders and lift cords.
10
11 Type: Manufacturers standard
12
13 Lift Cord: Manufacturer's standard braided cord.
14
15 Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.
16
17 Type: Braided cord
18
19 Valance: Manufacturer's standard.
20
21 Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
22
23 Type: Overhead
24
25 Intermediate Support: Provide intermediate support brackets to produce support spacing
26 recommended by blind manufacturer for weight and size of blind.
27
28 Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.
29
30 Colors, Textures, Patterns, and Gloss:
31
32 Slats: As selected by Architect from manufacturer's full range.
33
34 Components: Provide rails, cords, ladders, and materials exposed to view matching or
35 coordinating with slat color unless otherwise indicated.
36
37 HORIZONTAL LOUVER BLIND FABRICATION
38
39 Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1
40 including requirements for corded, flexible, looped devices; lead content of components; and
41 warning labels.
42
43 Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74
44 deg F (23 deg C):
45
46 Between Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which
47 blind is installed less ¼ inch per side or ½ inch total, plus or minus ⅛ inch. Length equal
48 to head-to-sill dimension of opening in which blind is installed less ¼ inch, plus or minus 1/8
49 inch.

1 Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

2
3 Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

4
5 Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without
6 damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions
7 and blind placement indicated.

8
9 Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal
10 noncorrosive to brackets and adjoining construction; type designed for securing to supporting
11 substrate; and supporting blinds and accessories under conditions of normal use.

12
13 Color-Coated Finish:

14
15 Metal: For components exposed to view, apply manufacturer's standard baked finish
16 complying with manufacturer's written instructions for surface preparation including
17 pretreatment, application, baking, and minimum dry film thickness.

18
19 Wood: Apply manufacturer's standard factory-applied finish complying with manufacturer's
20 written instructions for surface preparation, application, and minimum dry film thickness.

21
22
23 PART 3 - EXECUTION

24
25 EXAMINATION

26
27 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements
28 for installation tolerances, operational clearances, locations of connections to building electrical
29 system and other conditions affecting performance.

30
31 Proceed with installation only after unsatisfactory conditions have been corrected.

32
33 INSTALLATION

34
35 Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with
36 adjacent units according to manufacturer's written instructions.

37
38 Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not
39 closer than ½ inch from interior faces of glazing frames through full operating ranges of
40 blinds.

41
42 Install mounting and intermediate brackets to prevent deflection of head rails.

43
44 Install with clearances that prevent interference with adjacent blinds, adjacent construction,
45 and operating hardware of glazed openings, other window treatments, and similar building
46 components and furnishings.

47
48 ADJUSTING

1 Adjust horizontal louver blinds to operate free of binding or malfunction through full operating
2 ranges.

3

4 CLEANING AND PROTECTION

5

6 Clean horizontal louver blind surfaces after installation according to manufacturer's written
7 instructions.

8

9 Provide final protection and maintain conditions in a manner acceptable to manufacturer and
10 Installer and that ensures that horizontal louver blinds are without damage or deterioration at time
11 of Substantial Completion.

12

13 Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by
14 Architect before time of Substantial Completion.

15

16 DEMONSTRATION

17

18 Engage a factory-authorized service representative to train Owner's maintenance personnel to
19 adjust, operate, and maintain systems.

20

21

22

23 END OF SECTION

1 SECTION 122413 - ROLLER WINDOW SHADES

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12 This Section includes roller shades.

13
14
15 RELATED SECTIONS:

16
17 Division 06 Section "Rough Carpentry" for wood blocking and grounds for mounting roller
18 shades and accessories.

19
20 SUBMITTALS

21
22 Product Data: For each type of product indicated. Include styles, material descriptions,
23 construction details, dimensions of individual components and profiles, features, finishes, and
24 operating instructions.

25
26 Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details,
27 and dimensions not shown in Product Data. Show installation details, mountings, attachments to
28 other work, operational clearances, and relationship to adjoining work.

29
30 Coordination Drawings: Elevations, drawn to scale, on which the following items are shown and
31 coordinated with each other, based on input from installers of the items involved:

32
33 Shade mounting assembly and attachment.

34
35 Size and location of access to shade operator and adjustable components.

36
37 Minimum Drawing Scale: ¼ inch = 1 foot.

38
39 Samples for Initial Selection: For solid and perforated; colored component of each type of shade
40 indicated.

41
42 Include similar Samples of accessories involving color selection.

43
44 For the following products:

45
46 Shade Material: Not less than 12 inches square, with specified treatments applied. Mark
47 face of material.

1 Valance: Full-size unit, not less than 12 inches long.

2
3 Window Treatment Schedule: For roller shades. Indicate solid and perforated.

4
5 Product Certificates: For each type of roller shade, signed by product manufacturer.

6
7 Qualification Data: For Installer.

8
9 Product Test Reports: For each type of roller shade.

10
11 Maintenance Data: For roller shades to include in maintenance manuals. Include the following:

12
13 Methods for maintaining roller shades and finishes.

14
15 Precautions about cleaning materials and methods that could be detrimental to fabrics,
16 finishes, and performance.

17
18 Operating hardware.

19
20 QUALITY ASSURANCE

21
22 Installer Qualifications: Fabricator of products.

23
24 Source Limitations: Obtain roller shades through one source from a single manufacturer.

25
26 Fire-Test-Response Characteristics: Provide roller shade band materials with the
27 fire-test-response characteristics indicated, as determined by testing identical products per test
28 method indicated below by UL or another testing and inspecting agency acceptable to authorities
29 having jurisdiction:

30
31 Flame-Resistance Ratings: Passes NFPA 701.

32
33 Product Standard: Provide roller shades complying with WCMA A 100.1.

34
35 DELIVERY, STORAGE, AND HANDLING

36
37 Deliver shades in factory packages, marked with manufacturer and product name, and location of
38 installation using same designations indicated on Drawings and in a window treatment schedule.

39
40 PROJECT CONDITIONS

41
42 Environmental Limitations: Do not install roller shades until construction and wet and dirty finish
43 work in spaces, including painting, is complete and ambient temperature and humidity conditions
44 are maintained at the levels indicated for Project when occupied for its intended use.

45
46 Field Measurements: Where roller shades are indicated to fit to other construction, verify
47 dimensions of other construction by field measurements before fabrication and indicate
48 measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware

1 throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication
2 schedule with construction progress to avoid delaying the Work.

3
4
5 PART 2 - PRODUCTS

6
7 ROLLER SHADES

8
9 Available Products: Subject to compliance with requirements, products that may be incorporated
10 into the Work include, but are not limited to, the following:

11
12 Products: Subject to compliance with requirements, provide one of the following:

- 13
14 Am-Source International
15 BTX Window Automation, Inc.
16 Custom Laminations, Inc.
17 Draper Inc.
18 Hunter Douglas, Inc.
19 Levolor; Levolor-Kirsch Window Fashions; a Newell Rubbermaid Company
20 Lutron Shading Solutions by VIMCO
21 MechoShade Systems, Inc.
22 Nysan Shading Systems Ltd.
23 Shade Techniques, Inc.
24 Silent Gliss USA, Inc.
25 SMAutomatic, Inc.
26 Sol-R-Veil
27 Verosol USA, Inc.

28
29 Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall
30 thickness required to support and fit internal components of operating system and the weight and
31 width of shade band material without sagging; designed to be easily removable from support
32 brackets;

33
34 Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled;
35 continuous panel concealing front and bottom of shade roller, brackets, and operating hardware
36 and operators; length as indicated; removable design for access.

37
38 Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end
39 caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

40
41 Corner Section: Factory formed and welded.

42
43 Hold-Down Brackets and Hooks or Pins: Manufacturer's standard for anchoring roller shade
44 bottom in place and keeping shade band material taut.

45
46 Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.

47
48 Bead Chain: Nickel-plated metal.

1 ROLLER SHADE FABRICATION

2
3 Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible
4 sheet or band of material carried by the roller, a means of attaching the material to the roller, a
5 bottom bar, and an operating mechanism that lifts and lowers the shade.

6
7 Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

8
9 Lifting Mechanism: With permanently lubricated moving parts.

10
11 Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured
12 at 74 deg F:

13
14 Shade Units Installed between (Inside) Jamb: Edge of shade not more than 1/4 inch from
15 face of jamb. Length equal to head to sill dimension of opening in which each shade is
16 installed.

17
18 Shade Units Installed Outside Jamb: Width and length as indicated, with terminations
19 between shades of end-to-end installations at center lines of mullion or other defined
20 vertical separations between openings.

21
22 Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting roller,
23 and operating hardware and for hardware position and shade mounting method indicated.

24
25 Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal
26 noncorrosive to shade hardware and adjoining construction; type designed for securing to
27 supporting substrate; and supporting shades and accessories under conditions of normal use.

28
29 Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard
30 baked finish complying with manufacturer's written instructions for surface preparation including
31 pretreatment, application, baking, and minimum dry film thickness.

32
33 Colors of Metal and Plastic Components Exposed to View: White unless otherwise indicated.

34
35
36 PART 3 - EXECUTION

37
38 EXAMINATION

39
40 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements
41 for installation tolerances, operational clearances, and other conditions affecting performance.

42
43 Proceed with installation only after unsatisfactory conditions have been corrected.

44
45 ROLLER SHADE INSTALLATION

46
47 Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's
48 written instructions, and located so shade band is not closer than 2 inches to interior face of glass.
49 Allow clearances for window operation hardware.

1 ADJUSTING

2

3 Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or
4 malfunction throughout entire operational range.

5

6 CLEANING AND PROTECTION

7

8 Clean roller shade surfaces after installation, according to manufacturer's written instructions.

9

10 Provide final protection and maintain conditions, in a manner acceptable to manufacturer and
11 Installer, that ensure that roller shades are without damage or deterioration at time of Substantial
12 Completion.

13

14 Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before
15 time of Substantial Completion.

16

17 DEMONSTRATION

18

19 Engage a factory-authorized service representative to train Owner's maintenance personnel to
20 adjust, operate, and maintain roller shades.

21

22

23

24 END OF SECTION

1 SECTION 123630 - PLASTIC LAMINATE CASEWORK

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and Divisions
9 0 and 1 Specifications Sections, apply to this Section.

10
11 SUMMARY

12
13 This section includes the following:

14
15 Plastic laminate casework
16 Countertops

17
18 Related Sections include the following:

19
20 Division 06 Section "Rough Carpentry" for wood blocking for anchoring casework.

21
22 Division 09 Section "Gypsum Board" for reinforcements in metal-framed gypsum board
23 partitions for anchoring casework.

24
25 Division 09 Section "Resilient Flooring" for resilient base applied to wood casework.

26
27 DEFINITIONS

28
29 Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including
30 bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or
31 behind glass doors.

32
33 **Ends of cabinets installed directly against walls, shall be considered exposed to**
34 **allow for future relocation by Owner.**

35
36 Ends of cabinets indicated to be installed directly against and completely concealed by
37 other cabinets after installation shall not be considered exposed unless noted otherwise on
38 the drawings.

39
40 Semiexposed Surfaces of Casework: Surfaces behind opaque doors or drawers, such as interiors
41 (sides and bottom) of cabinets, shelves, dividers, interiors (sides and bottom) of drawers, and
42 interior faces of doors and drawers. Tops of cases 78 inches or more above floor are defined as
43 semiexposed.

44
45 Concealed Surfaces of casework include sleepers, web frames, dust panels, bottom of drawers,
46 tops of wall and tall cabinets and other surfaces not usually visible after installation.

47
48 SUBMITTALS

1 Product Data: For each type of product indicated.
2
3 Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
4
5 Indicate locations of blocking and reinforcements required for installing casework.
6
7 Indicate locations and types of service fittings, together with associated service supply
8 connection required.
9
10 Indicate locations of and clearances from adjacent walls, doors, windows, other building
11 components, and other equipment.
12
13 Include coordinated dimensions for equipment specified in other Sections.
14
15 Samples for Initial Selection: For factory applied finishes.
16
17 Plastic laminate
18
19 PVC edging
20
21 Hardware finishes
22
23 Hinge
24
25 Samples for Verification: For each type of finish, including countertop material, in manufacturer's
26 standard sizes.
27
28 6 inch square Samples for each type of countertop material.
29
30 One full-size, finished base cabinet complete with hardware, doors, and drawers, but
31 without countertop.
32
33 One full-size, finished wall cabinet complete with hardware, doors, and adjustable shelves.
34
35 One of each service fitting specified, complete with accessories and specified finish.
36
37 Qualification Data: For testing agency.
38
39 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified
40 testing agency, indicating compliance of casework finishes and countertops with requirements
41 specified for chemical and physical resistance.
42
43 QUALITY ASSURANCE
44
45 Testing Agency Qualifications: An independent agency qualified for testing indicated, as
46 documented according to ASTM E 548.
47
48 Source Limitations: Obtain casework and accessories through one source from a single
49 manufacturer.

1 Pre-installation Conference: Conduct conference with **all** Contractors at Project site to coordinate
2 installation.

3

4 PROJECT CONDITIONS

5

6 Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work
7 and utility roughing-in are complete, and an HVAC system is operating and maintaining
8 temperature and relative humidity at occupancy levels during the remainder of the construction
9 period.

10

11 Field Measurements: Coordinate casework construction to ensure that actual building dimensions
12 correspond to designed dimensions. Verify dimensions of construction by field measurements
13 before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to
14 allow for trimming and fitting.

15

16 COORDINATION

17

18 Coordinate layout and installation of blocking and reinforcement in partitions for support of
19 casework. Coordinate layout and installation of utilities located within casework.

20

21 PRODUCT DELIVERY, STORAGE AND HANDLING:

22

23 Protect cabinets and countertops during transit, delivery, storage and handling to prevent damage,
24 soiling and deterioration.

25

26 Store cabinets and countertops at project site in installation and storage areas with similar ambient
27 conditions as final installation. Storage areas must be kept dry, heated with low relative humidity,
28 and away from all other construction activities.

29

30 Inspect and properly adjust all casework and related hardware. Repair damages, remove and
31 dispose of all packing materials, debris, dirt, and dust resulting from casework installation, leaving
32 area broom clean.

33

34 WARRANTY:

35

36 The manufacturer shall warrant the casework to be free from defects in materials and workmanship
37 for a period of two years. The manufacturer shall repair or replace the defective casework.

38

39 The warranty with respect to products of another manufacturer utilized by the Casework
40 Manufacturer, is limited to the warranty extended by that manufacturer to the Casework
41 Manufacturer, but shall not be less than one year.

42

43

44 PART 2 PRODUCTS

45

46 MANUFACTURERS

47

1 Manufacturers requesting approval shall submit samples with Cut-A-Ways showing cabinet
2 construction, joinery, drawer and door construction, hardware, and materials; along with catalogs
3 and specification in order that accurate evaluations can be made. Submitter shall state in writing
4 any deviations from requirements and specifications. The casework shall conform to configuration,
5 arrangement, design, material quality, joinery, panel thickness, and surfacing of that specified and
6 shown on drawings. Samples may be impounded for the duration of contract to insure construction
7 specification compliance. The Owner's Representative will make the final decision on "equal to"
8 products after submission.

9
10 MANUFACTURERS

11
12 Specified Manufacturer:

13
14 Standard Casework: 1200 Series as produced by Stevens Industries, Inc, Teutopolis, Illinois.

15
16 Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of
17 the following:

18
19 Plastic Laminate Faced Casework:

20
21 Cabinets by Design, Duluth, GA
22 Case Systems Inc., Midland, MI
23 LSI Corporation of America, Inc., Minneapolis, MN
24 TMI Systems Design Corp., Dickinson, ND
25 Vivo Brothers, Boardman OH
26 Crowe's Cabinets, Inc. Lowellville, OH

27
28 Plastic Laminates. Products from all of the following manufacturers are to be available for
29 selection. The Owner's Representative to select from **all** of the laminate manufacturers:

30
31 Formica Corporation
32 Panolam Industries International Incorporated; Pionite Decorative Surfaces
33 Wilsonart International

34
35 CABINET MATERIALS

36
37 General:

38
39 Hardwood Plywood: HPVA HP-1, either veneer core or particle core.

40
41 Particleboard: ANSI A208.1, Grade M-2.

42
43 Medium-Density Fiberboard: ANSI A208.2, Grade MD.

44
45 Plastic Laminate: High pressure decorative laminate complying with NEMA LD 3.

46
47 Hardboard: comply with AHA A135.4, Class 1 tempered.

1 Edge banding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm
2 thick at doors and drawer fronts, 1 mm thick elsewhere.

3
4 Colors: As selected by Owner's Representative from manufacturer's full range (minimum
5 selection of 25 colors).

6
7 Exposed Materials:

8
9 Plastic Laminate: Type VGS on vertical cabinet components, VGP on post-formed vertical cabinet
10 components, HGL on horizontal cabinet components and HGP on post-formed horizontal cabinet
11 components.

12
13 Colors, Textures and Patterns: As selected by Owner's Representative from all listed
14 laminate manufacturers full range of standard colors.

15
16 Semiexposed Materials:

17
18 Melamine Faced Particleboard: Particleboard with decorative surface of thermally fused, melamine
19 impregnated web and complying with LMA SAT-1.

20
21 Colors: As selected by Owner's Representative from cabinet manufacturer's full range.
22 Manufacturer's minimum selections shall include white, beige and gray.

23
24 Concealed Materials:

25
26 Solid Wood: Any hardwood or softwood species, with no defects affecting strength or utility.

27
28 Plywood: Hardwood plywood.

29
30 Plastic Laminate: Type BKL.

31
32 Particleboard.

33
34 Medium-density fiberboard.

35
36 Hardboard: AHA A135.4, Class 1 tempered.

37
38 CABINET COMPONENTS

39
40 Construction: Provide plastic laminate faced casework of the following minimum construction:

41
42 Bottoms and Ends of Cabinets and Tops of Wall Cabinets and Tall Cabinets: 3/4 inch thick
43 particleboard, plastic-laminate faced on exposed surfaces, melamine faced on
44 semiexposed surfaces.

45
46 Cabinet Interior Vertical Dividers: 3/4 inch thick particleboard, plastic laminate faced on
47 exposed surfaces, melamine faced on semiexposed surfaces.

48
49 Cabinet Interior Horizontal Dividers: 1/4 inch thick hardboard.

1
2 Backs of Cabinets: 1/4 inch thick hardboard or 1/2 inch thick particleboard, plastic-laminate
3 faced on exposed surfaces, melamine faced on semiexposed surfaces.

4
5 Cabinet Body Edges: 1 mm PVC edging on all exposed and semi-exposed surfaces.

6
7 PVC edging shall have radiused edges and be machine applied with waterproof hot melt
8 adhesive.

9
10 Drawer Fronts: 3/4 inch thick particleboard, plastic laminate faced on both sides with 3 mm
11 thick PVC edging on all 4 edges. PVC edging shall have radiused edges and be machine
12 applied with waterproof hot melt adhesive.

13
14 Drawer Sides and Backs: 1/2 or 5/8 inch thick medium density fiberboard or particleboard,
15 with glued dovetail or multiple-dowel joints.

16
17 Drawer Bottoms: 1/4 or 1/2 inch thick melamine faced particleboard glued and dadoed into
18 front, back, and sides of drawers. Use 1/2 inch thick material for drawers more than 24
19 inches in width.

20
21 Doors: 3/4 inch thick, with particleboard or medium density fiberboard cores and plastic
22 laminate faced on both sides with 3 mm thick PVC edging on all 4 edges. PVC edging shall
23 have radiused edges and be machine applied with waterproof hot melt adhesive.

24
25 Frame Rails: 3/4" thick x 3 3/4 inch wide particleboard, laminate for balanced construction.

26
27 Sub-Base: Two (2) toekick support rails constructed of 3/4 inch thick x 3 3/4 inch high
28 particleboard.

29
30 Mounting Rails: 3/4 inch thick x 3 3/4 inch wide particleboard.

31
32 Adjustable and Fixed Shelves: Plastic laminate sheet complying with NEMA LD 3, shop
33 bonded with waterproof adhesive to both sides of 1inch particleboard, made with binder
34 containing no urea formaldehyde. Sand surfaces to which plastic laminate is to be bonded.
35 Exposed shelves on open units shall have 3mm PVC edging on front edge and 1 mm PVC
36 edging on other three edges. Semi-exposed shelves concealed behind doors shall have 1
37 mm PVC edging on all four edges.

38
39 Leg Shoes: Vinyl or rubber, black, open bottom type.

40
41 Filler Strips and Closure Panels: Provide as needed to close spaces between cabinets and
42 walls, ceilings, and indicated equipment. Fabricate from same material and with same
43 finish as cabinet fronts.

44
45
46 CABINET CONSTRUCTION

47
48 Cabinet parts shall be accurately machined and bored for premium grade quality joinery
49 construction utilizing automatic machinery to ensure consistent sizing of modular components.

1 Interior tops, interior bottoms and internal cabinets components, such as fixed horizontals and rails,
2 shall be joined using 8 mm diameter industrial grade hardwood dowels. These parts are glued and
3 clamped under pressure during assembly to secure joints and ensure cabinet squareness.

4
5 Cabinet ends shall be bored to receive 8 mm industrial grade hardwood. Cabinet ends shall be
6 prepared to receive adjustable shelf hardware to 32 mm (approximately 1 1/4 inch) centers. Door
7 hinges and drawer slides shall be machine drilled to maintain vertical and horizontal alignment of
8 components. Inset grooving with chamfer shall be machined 3/4 inch from edge to accept the
9 back. Base and tall units shall have one-piece end panels continuous to floor for added load
10 capabilities.

11
12 Tops and bottoms shall be joined to cabinet ends using a minimum of six (6) dowels at each joint
13 for 24 inch deep cabinets and minimum of four (4) dowels at each joint for 12 inch deep cabinets.
14 Top of base cabinets will be full depth. Inset grooving with camfer shall be machined 3/4 inch from
15 rear edge to accept the back.

16
17 Vertical dividers shall be bored to receive adjustable shelf hardware at 32 mm (approximately 1 1/4
18 inch) centers. Dividers shall be joined to tops and bottoms with 8 mm diameters hardwood dowels.

19
20 Frame rails shall be joined to ends with 8 mm diameter hardwood dowels.

21
22 Two (2) toekick supports shall be inset from cabinet front and back edges and doweled into cabinet
23 ends with 8 mm hardwood dowels.

24
25 Mounting rails shall be fully concealed behind backs. Rails shall be 3/4 inch thick and fastened to
26 cabinet ends with 8mm hardwood dowels. Wall and tall cabinets shall incorporate two mounting
27 rails. Wall cabinets shall have rails positioned at top and bottom. Tall cabinets shall have rails
28 positioned at top and intermediate locations. Base units shall have one rail positioned in the upper
29 back area.

30
31 Back panels shall be inset 3/4 inch from rear edge of cabinet. Back shall be glued and
32 continuously trapped in top, bottom and ends of cabinets.

33
34 Drawer corner joints shall be interlocking dowel pin design. Hardwood dowel pins 8 mm diameter
35 shall be inserted into drawer fronts and backs to fit into machined hole patterns in drawer sides.

36
37 Bottoms shall be trapped into grooves on all four sides, glued and mechanically fastened.

38
39 CABINET HARDWARE

40
41 General: Provide casework manufacturer's commercial-quality, heavy-duty hardware complying
42 with requirements indicated for each type.

43
44 Hinges: Institutional barrel style with 4 MM exposed barrel and shall provide a height and overlay
45 adjustment. Hinge to be Aximat series by Hafele or Selektta Pro 2000 series by Hettich. Hinge to
46 have 270 degree opening and internal secure closing detent feature. Hinge attachment to sides
47 of cabinet shall use 5 mm threaded fasteners for additional strength. Hinge finish to be nickle or
48 black plated. Doors less than 48 inch in height shall have two (2) hinges each door; doors 48

1 inches to 63 inches in height shall have three (3) hinges each door; all doors greater than 63 inches
2 in height shall have four (4) hinges each door.

3
4 Doors less than 48 inches in height shall have two (2) hinges each door; doors 48 inches to 63
5 inches in height shall have three (3) hinges each door; all doors greater than 63 inches in height
6 shall have four (4) hinges each door.

7
8 Pulls: Metal bent wire, fastened from back with two screws. Hinge finish to be as selected by
9 Owner's Representative from manufacturer's selection of matte nickel, brushed nickel, grey
10 chrome, or epoxy coated satin black or pearl. For sliding doors, provide chrome-plated
11 stainless-steel recessed flush pulls. Provide two (2) pulls for drawers more than 24 inches in width.

12
13 Door Catches: Heavy duty, spring loaded, large diameter (11/16 inch diameter) roller type catch
14 or dual, self-aligning, permanent magnet catch. Provide two (2) catches on doors more than 48
15 inches in height.

16
17 Drawer Slides: Powder coated, cold rolled, heavy duty steel, side mounted, drawer slides,
18 designed to prevent rebound when drawers are closed; with heavy duty, ball bearing, nylon tired
19 rollers; and complying with BHMA A156.9, and rated for 100 lbf. Slides shall have automatic
20 positive stops to prevent accidental drawer removal, but allow quick removal without tools.

21
22 File Drawer Slides: full extension, zinc plated or powder-coated cold rolled, heavy duty steel, side
23 mounted drawer slides, designed to prevent rebound when drawers are closed; with heavy duty
24 ball bearing rollers or ball bearing, nylon tired rollers and complying with BHMA A156.9, and rated
25 for 150 lbf. Slides shall have a positive stop, and a lift out disconnect.

26
27 Label Holders: Chrome plated, sized to receive standard label cards approximately 1 by 2 inches,
28 attached with screws or rivets. Provide when listed as a standard component of the selected
29 cabinet model by the specified manufacturer or where indicated on drawings.

30
31 Locks: shall be cylinder type with 5-pin (minimum) tumbler, brass with chrome-plated finish;
32 complying with BHMA A156.11, Type E07281 or E07261. Each cabinet lock shall be keyed
33 differently unless otherwise noted. Locks shall be master keyed by room and grand mastered for
34 the entire project.

35
36 Each lock shall be provided with milled brass key. Provide two (2) keys per lock and two
37 (2) master keys per room and four (4) grand master keys per project.

38
39 Provide locks when listed as a standard component of the selected cabinet model by the
40 specified manufacturer or where indicated on drawings.

41
42 Hanger rods: heavy chrome plated tubing. Rod shall be securely affixed to cabinet shelves.

43
44 Tote Trays: high impact polystyrene with smooth edges. Each tray to include an identification card
45 holder and shall be suspended from rails securely attached to cabinet vertical.

46
47 Adjustable shelves shelf support clips: injection molded clear polycarboniate. Support clips shall
48 incorporate integral molded lock tabs to retain shelf from inadvertently tipping or being lifted out.
49 Support clip shall have 5 mm diameter double pin engagement into precision bored hole pattern

1 in cabinet vertical members. Clips shall have a molded ridge which provide pressure against edge
2 of shelving to maintain positive pin engagement. Clip shall be designed in such a manner to
3 provide means for permanent retention to shelf. Static test load must exceed 200 lb per clip.

4
5 Countertop Supports: 1/8 inch thick by 2 inch wide bar stock with black enamel paint, size as
6 required by countertop dimensions.

7
8 Friction roller catch is a zinc plated steel catch with a spring cushioned, polyethylene roller, and a
9 metal strike plate. The catch and steel strike plate mount with screws. Catch screw holes are
10 slotted for adjustability. Provide two (2) catches on doors more than 48 inches in height.

11
12 Elbow catch is a steel, spring loaded catch that releases with finger pressure. The catch and steel
13 strike plate are mounted with screws. Strike plate screw holes are slotted for adjustability and pin
14 hole is provided to help anchor its position.

15 16 COUNTERTOPS

17
18 Countertops, General: Provide units with smooth surfaces in uniform plane free of defects. Make
19 exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1
20 inch.

21
22 Plastic Laminate Countertops:

23
24 Countertops: Plastic laminate sheet, complying with NEMA LD 3, shop bonded with
25 waterproof adhesive to both sides of 3/4 inch thick core. Sand surfaces to which plastic
26 laminate is to be bonded.

27
28 Plastic Laminate Type for Formed Countertops: HGP.

29
30 Plastic Laminate Type for Backing: BKL.

31
32 Countertop Core: Particleboard complying with ANSI A208.1, Grade M-2.

33
34 Colors, Textures, and Patterns: As selected by Owner's Representative from all listed
35 laminate manufacturers full ranges.

36
37 Finish front edges of countertops, faces and top edges of back splashes and end splashes,
38 and ends of countertops and splashes with same plastic laminate as top.

39
40 Construct top and backsplash from one piece of plastic laminate with 180° rolled front edge
41 and 90° rolled back splash with coved intersection. Provide separate end splashes of same
42 material as top, fitted to top. Finish exposed ends with same plastic laminate as top rigid
43 3mm PVC edging.

44 45 ACCESSORIES

46
47 Adjustable Wall Shelf Supports: Surface type steel standards and steel shelf brackets, with epoxy
48 powder-coated finish, complying with BHMA A156.9, Types B04102 and B04112.

1 PART 3 - EXECUTION

2
3 EXAMINATION:

4
5 Install casework and countertops with factory trained installers authorized by manufacturer. The
6 installer must examine the job site for compliance with requirements for installation tolerances,
7 location of framing and reinforcements, and other conditions affecting performance of casework.

8 After review of the conditions under which the work in this section is to be performed, notify the
9 Owner's Representative in writing of any unsatisfactory conditions. Do not proceed with work until
10 unsatisfactory conditions have been corrected in a manner acceptable to the installer and Owner's
11 Representative.

12
13 Casework and related materials to be conditioned to average prevailing humidity condition in
14 installation areas prior to start of work.

15
16 INSTALLATION OF CABINETS

17
18 Install with no variations in flushness of adjoining surfaces. Install casework to be level, plumb, and
19 true to a tolerance of 1/8 inch in 10 feet; shim as required, using concealed shims. Where
20 casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners
21 concealed where practical.

22
23 Base Cabinets: Adjust top rails and sub-tops within 1/16 inch of a single plane. Fasten cabinets
24 to masonry walls, partition framing, wood blocking, or reinforcements in partitions with fasteners
25 spaced not more than 24 inches on center. Fasten adjacent cabinets together with joints flush,
26 tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.

27
28 Where base cabinets are installed away from walls, fasten to floor at toe space at not more
29 than 24 inches on center and at sides of cabinets with not less than two (2) fasteners per
30 side.

31
32 Wall Cabinets: Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to masonry,
33 partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near
34 top, at not less than 24 inches. Align similar adjoining doors to a tolerance of 1/16 inch.

35
36 Provide scribe moldings for closures at junctures of casework with walls matching materials and
37 finish to adjacent laboratory casework.

38
39 Install cabinets without distortion so doors and drawers fit the openings. Uniformly and precisely
40 complete installation of hardware and accessories as indicated. Adjust casework and hardware
41 so doors and drawers are aligned, and are uniformly spaced and operate smoothly without warp
42 or bind and contact points meet accurately. Lubricate operating hardware as recommended by
43 manufacturer.

44
45 INSTALLATION OF COUNTERTOPS

46
47 Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports
48 placed to prevent deflection. Locate joints only where shown on Shop Drawing. **Note that no**

1 **plastic laminate countertop butt splice joints shall be within 4'-0" of a sink edge.** Countertop
2 butt splice joints are to be sealed in the field to prevent water penetration or delamination.

3
4 Field Jointing: Use concealed clamping devices for field joints in plastic-laminate countertops.
5 Locate clamping devices withing 6 inches of front and back edges and at intervals not exceeding
6 24 inches. Tighten according to manufacture's written instructions to exert a uniform heavy
7 pressure at joints.

8
9 Fastening: Secure countertops, to cabinets with Z-type fasteners or equivalent, using two or more
10 fasteners at each cabinet front, end and back.

11
12 Provide scribe moldings for closures at junctures of countertop, curb, and splash, with walls as
13 required. Match materials and finish to adjacent countertop material.

14
15 Remove surface scratches, and clean entire surface.

16
17 INSTALLATION OF ACCESSORIES

18
19 Install accessories according to Shop Drawings and manufacturer's written instructions.

20
21 Securely fasten adjustable shelving supports, and pegboards to masonry wall, partition framing,
22 wood blocking, or reinforcements in partitions.

23
24 Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install
25 shelving level and straight, closely fitted to other work where indicated.

26
27 PROTECTING AND CLEANING

28
29 At completion of basic installation inspect casework for damaged or soiled areas; remove, refinish,
30 and touch up as necessary. Adjust casework and hardware so that doors and drawers operate
31 smoothly without warp or bind. Lubricate operating hardware as recommended by the
32 manufacturer. Remove and replace, defective work as directed upon completion of installation.
33 Wipe clean cabinet interiors.

34
35 **COVER INSTALLED COUNTERTOPS WITH 6 MIL POLYETHYLENE FILM AS PROTECTION**
36 **AGAINST SOILING.**

37
38 Immediately Prior to Owner Occupancy, return to the job site to remove the protection film and wipe
39 down the casework and polish the countertops.

40
41
42
43 END OF SECTION

SECTION 22 01 00 – PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED CONTRACT DOCUMENTS

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates and Addenda are a part of this Specification. Contractors and Subcontractors shall examine these provisions as they may affect work under this Division.
- B. Contractor shall examine Division 1 Contract Documents for general project requirements.
- C. Contractor shall also examine the Contract Documents of all Divisions which may affect work under this Division. Contractor shall be responsible for Plumbing work required.

1.02 DESCRIPTION OF WORK

- A. This project involves work in an existing operating facility and will require close communication with Owner in regards to access and work hours. Coordinate all work schedules prior to bidding with Owner and Construction Manager.
- B. Plumbing, Architectural, Electrical, HVAC, Structural, Civil, Technology and all other Drawings as well as the Specifications for all the Divisions shall be defined as the Contract Documents. Contractor shall review entire set of Contract Documents prior to bidding.
- C. Drawings and Specifications are to be considered as supplementing each other. Work specified but not shown, or shown but not specified, shall be performed or furnished as though mentioned in both the Specifications and the Drawings.
- D. Prior to submitting bid, Contractor shall examine all Drawings and Specifications to develop a complete understanding of the project scope. Contractor shall ask for clarifications during the pre-bid phase of the project. Failure to do so will not relieve the Contractor of their responsibility to perform all required work.
- E. Where the project scope involves renovations and additions, it is strongly recommended that Contractors visit the site of the work and become familiar with the conditions affecting the installation. Submission of a Bid shall presuppose knowledge of such conditions and no additional compensation shall be allowed where extra labor or materials are required because of the lack of knowledge of these conditions.
- F. Bid shall include any special phasing requirements related to the construction work as described in the Contract Documents. Coordinate with Division 1.

- G. Extra costs which might result from deviations from the Drawings, so as to avoid interferences, shall be considered a "Job Condition", and no additional compensation shall be considered applicable. In the event that such interferences occur in course of the work, due to an error, omission, or oversight by the Contractor, no additional compensation shall be allowed. Interferences that may occur during the course of construction shall be brought to the immediate attention of the Architect and Engineer, and the Architect and Engineer's decision, confirmed in writing, shall be final.
- H. The following general terms as used within the context of the Plumbing Contract Documents shall be defined as follows:
1. "Contract Documents" - The complete set of Drawings and Specifications for all Divisions included in the project.
 2. "Drawings" - Drawings furnished as part of the Contract Documents.
 3. "Contractor" - Plumbing Contractor and the Plumbing Contractor's Subcontractors.
 4. "Responsible" - To perform work required.
 5. "Furnish" - To supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations.
 6. "Install" - Work which includes the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
 7. "Provide" - To furnish and install, complete and ready for the intended use.
 8. "Equal" - To meet or exceed the standards of the specified products or listed manufacturers.
 9. "Mechanical" - Plumbing, HVAC and Fire Protection Divisions as applicable.

1.03 WORK INCLUDES

- A. Include all labor, material, equipment, services, permits, fees, coordination, supervision and administration necessary for the proper completion of all Plumbing work shown. Items omitted, but necessary, to make the Plumbing systems complete and workable shall be understood to form part of the work.
- B. Material for work required to complete installation such as earthwork, concrete, masonry, mortar, reinforcing steel, patching and painting shall be provided as specified in other applicable Divisions covering such work.
- C. Provide material and labor which is neither drawn nor specified but which is obviously a component part of and necessary to complete work and which is customarily a part of work of similar character.

- D. Include all testing, test reports, system programming, start-up reports and warranties for each system as outlined elsewhere in these Specifications. Refer to "Operating and Maintenance Manuals" for additional requirements.

1.04 PERMITS AND FEES

- A. Secure and pay for permits and inspections required for the Plumbing work. Turn over certificates of approval to the Owner or Construction Manager promptly when received, and before payment is made for the work.
- B. Give proper authorities notice as required by law relative to the work in their charge. Comply with the regulations regarding temporary enclosures, obstructions or excavations and pay all legal fees involved.
- C. Make payments to all Public Utilities for work performed by them in providing service connections, including tap-in fees.

1.05 QUALITY ASSURANCE

- A. Work shall be installed in accordance with provisions of all applicable codes, as interpreted by the local Authority Having Jurisdiction (AHJ), as well as any further modifications or regulations published by local or State Authorities.
- B. Reference to the codes and standards listed shall constitute the minimum acceptable requirements. Nothing in the Specifications shall be construed to permit deviation from the requirements of the governing code. Where requirements of the Drawings and Specifications exceed those of the code listed, follow the Drawings and Specifications.
- C. The following building codes with amendments shall be followed:
 - 1.2011 Ohio Building, Mechanical, Plumbing and Fire Codes
 - 2.2009 International Fuel Gas Code
- D. Lead-free Compliance
 - 1. In compliance with "The Reduction of Lead in Drinking Water Act" signed into federal law on January 4, 2011 and in effect as of January 4, 2014, all applicable products and materials installed shall meet the standard of ANSI/NSF 372 pertaining to any wetted surfaces of pipes, pipe fittings, plumbing fittings, and plumbing fixtures having a weighted-average lead content of no more than 0.25% (0.20% for solders and flux) when used in applications intended to convey or dispense water for human consumption through drinking or cooking.
 - 2. Model numbers specified herein may or may not reflect manufacturer's updated compliant versions; however distinguishing product identification is required of the manufacturer per the ANSI/NSF 372 standard. It is the intent of this specification to specify only compliant

versions of any model or product whether a revised number is available, or not at the time of this printing.

3. It is the responsibility of the installing contractor to secure only compliant materials, equipment, components, etc. for installation. Formerly made versions or models of equipment containing non-compliant components are not acceptable.

E. Applicable portions of the following codes, standards, societies and agencies shall be followed. Where a specific edition is listed, it shall be used. Where not listed, the edition recognized by the Authority Having Jurisdiction shall be used. Listing of a specific portion of a code, standard, society or agency does not preclude the Contractor from following all other applicable portions of the code, standard, society or agency.

1. American National Standards Institute (ANSI)
2. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
3. American Society of Mechanical Engineers (ASME)
4. American Society of Sanitary Engineers (ASSE)
5. American Society of Testing and Material (ASTM)
6. American Water Works Association (AWWA)
7. American Welding Society (AWS)
8. Americans with Disabilities Act (ADA) - Americans with Disabilities Act Accessibility Guidelines (ADAAG)
9. Cast Iron Soil Pipe Institute (CISPI)
10. Federal Occupational Safety and Health Act (OSHA)
11. National Electric Code (NEC)
12. National Fire Protection Association (NFPA)
13. NSF International
14. Ohio Facilities Construction Commission (OFCC)
15. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
16. Underwriters Laboratories, Inc., Standards for Safety (UL)

1.06 ELECTRONIC MEDIA

- A. Electronic drawing files are available to the Contractor, from the Engineer for coordination purposes as defined in Division 0 and Division 1.
- B. Contractor shall deliver closeout documents on a portable memory device. Portable memory device shall refer to CD, DVD, Flash Drive, external hard drive or any other portable media used for storing electronic files.

1.07 SUBMITTALS

- A. Prior to commencing work, submit product data and/or shop drawings for Plumbing equipment, materials and systems as described herein and as required in each individual Division 22 Specification section. Provide all Submittals far enough in advance of scheduled dates for installation to provide sufficient time for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery.
- B. Conform to submittal requirements outlined in Division 1 Specifications. Provide Submittals in an electronic format. The file format shall be portable data file (.pdf).
- C. Prepare Submittals with adequate details and dimensions as necessary to clearly show construction. Clearly identify each item on the submittal with designation as indicated on Drawings including location and use. Include with Submittals Manufacturers published descriptive literature, specifications, performance data (normal operating characteristics, curves, ratings, etc.), wiring diagrams and installation instructions. Indicate for each item the operating characteristics, design conditions, features, and optional items that are intended for application on this project. Where contents of Submittal literature includes data not pertinent to the Submittal, clearly indicate (highlight) which portion of content is being submitted for review.
- D. If for any reason, the Submittal shows variations from the requirements of the Contract Documents, the Contractor shall make mention of such variation in the letter of transmittal. The Contractor shall note in red on the Submittal any change in design or dimension on the items submitted including changes made by the Manufacturer which may differ from catalog information.
- E. Where additional installation drawings, wiring diagrams or other drawings are specified elsewhere as part of the project requirements, they shall be submitted at the same time as the Submittals. Partial Submittals are not acceptable.
- F. Contractor shall review each Submittal prior to submission, and check for compliance with the Contract Documents. Corrections shall be noted. Mark with approval stamp prior to submission. Submittals that do not bear the Contractor's approval stamp will be returned without action.
- G. The Submittals will be reviewed only for General compliance and not for

dimensions, quantities, etc. The Submittals that are returned shall be used for procurement. The responsibility of correct procurement remains solely with the Contractor. The Submittal review shall not relieve the Contractor of responsibility for errors or omissions and deviations from the Contract Document requirements. Submittals which are not required under this Division shall be returned to the Contractor.

- H. After review of submittals by the Engineer, the Contractor shall revise and resubmit if required to establish compliance with the Contract Document requirements. Resubmittal shall include a document with a written response to each of the Engineer's previous comments.
- I. The Contractor shall notify the Engineer when all product data and/or shop drawings for Plumbing equipment, materials and systems have been submitted for review.
- J. The Contractor agrees that Submittals, processed by the Engineer, are not change orders; that the purpose of submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design intent of the project. This understanding is demonstrated by indicating which equipment and material is required, and by what methods of fabrication and installation will be utilized.
- K. The Contractor further agrees that if deviations, discrepancies or conflicts between the Submittals and the Contract Documents are discovered, either prior to or after Submittals are processed by the Engineer, the Drawings and Specifications shall control and shall be followed.
- L. Final reviewed submittals shall be included in the Operating and Maintenance Manuals. Where Submittals are returned "REVIEWED, EXCEPTIONS AS NOTED", the final Submittals shall be updated to include the exceptions. Upon ordering equipment, order sufficient number of sets of product data literature for the Operating and Maintenance Manuals.
- M. Submit product data for the following. Refer to specific Specification sections for additional requirements.

1. Basic Materials and Methods

- a. Piping, Fittings, and Unions
- b. Valves
- c. Strainers
- d. Dielectric Connections
- e. Inserts, Hangers, and Supports
- f. Access Doors

- g. Natural Gas Piping Specialties
- h. Paint
- i. Nameplates, Markers, and Tags

2. Firestopping

3. Vibration Isolators

4. Testing, Adjusting, and Balancing

5. Insulation

6. Exterior Water Distribution Systems

7. Plumbing Fixtures

8. Any other specified system or equipment not listed

N. Submit shop drawings for the following. Where project floor plans are required, refer to Electronic Media section for requirements for obtaining electronic drawing files. Refer to specific Specification sections for additional requirements.

1. Prefabricated Plumbing Assemblies: submit fabrication diagrams complete with all components, hardware, fastening, shipping reinforcement, and field connection points.

1.08 CONSTRUCTION DOCUMENTATION

A. Coordination Drawings

1. Refer to Division 1 for additional requirements.

2. Preparation of the Coordination Drawings shall be the responsibility of the HVAC Contractor.

3. Coordination Drawings shall include but not be limited to: locations of equipment and devices, ductwork, piping, and conduit routing and required service clearances for all trades. Show the relationship of all components as related to installation and future access for maintenance and removal. Where access doors are required, indicate locations and type. Show locations of all ductwork, piping and conduit penetrations through wall and floors. Show existing items affecting new installation in remodeled areas.

4. Supply HVAC Contractor information necessary for the development of Coordination Drawings. Information shall include but not be limited to: locations and sizes of Plumbing equipment and devices; piping routing and sizes; and required service clearances affecting the work of other

trades. How this information is supplied shall be discussed and decided between all trades. Coordination meetings between all trades are strongly recommended.

5. Before supplying information to the HVAC Contractor, coordinate locations of all floor, wall, and roof penetrations including sleeve requirements with General Trades. Coordinate locations and types of all access doors with the Architect and General Trades.
6. Before supplying information to the HVAC Contractor, provide to the Structural Engineer electronic drawing files indicating the size and location of all penetrations through slabs. The Contractor shall make all adjustments as required by the Structural Engineer.
7. Contractor shall approve Coordination Drawings prior to submittal to Architect for review and must indicate acceptance of illustrated conditions by attaching their endorsement to each Drawing.
8. Proceed with installation only after review of Coordination Drawings by Architect and approval from other trades affected. Architect does not approve Coordination Drawings.
9. The Coordination Drawings shall be updated to include any deviations made during construction as required to create Record Drawings.

B. Recirculation Hot Water System Testing, Adjusting and Balancing Report

1. Submit Testing, Adjusting and Balancing Report to Engineer upon completion.
2. Refer to Section 22 03 00 for additional information.
3. Final copy shall be included in Operating and Maintenance Manuals

C. Wall hung fixture carrier installation sign-off approval

1. Submit documentation to Engineer upon completion prior to chase wall construction.
2. Refer to Section 22 40 00 for additional information.
3. Final copies shall be included in the Operating and Maintenance Manuals.

D. Pressure Tests and Disinfection

1. Submit pipe system pressure testing and disinfection documentation to Engineer upon completion.
2. Refer to Section 22 03 00 for additional information.
3. Final copies shall be included in the Operating and Maintenance Manuals.

1.09 GUARANTEE AND WARRANTIES

- A. Warrant that equipment and all work is installed in accordance with good workmanship practice. All equipment shall be installed in accordance with the Manufacturer's recommendations and shall meet the requirements specified. Any equipment failing to perform or function as specified shall be replaced with complying equipment without cost to the Owner. Warranty shall commence upon acceptance of substantial completion of construction by the Owner. Sign-off of individual equipment start-up procedures shall not activate the warranty commencement.
- B. Guarantee against defects in workmanship and materials; repair or replace any defective work, material or equipment within one year from date of formal written warranty commencement. Longer product warranties provided by individual equipment manufacturers shall supersede this one year guarantee; however, the Contractor shall maintain the one year workmanship and materials guarantee for installation of such equipment. Coordinate guarantee and warranty requirements with Division 1 Specifications.

1.010 CLOSEOUT DOCUMENTS

A. Record Drawings:

1. Record Drawings shall consist of updated Coordination Drawings as defined elsewhere in the Specifications. Refer to Division 1 for quantities, special formatting, and additional requirements.
2. Updated Coordination Drawings shall be reproduced electronically from the original Coordination Drawings in an approved format. Drawings shall include any deviations or changes made during construction. Drawings shall only include Division 22 work. Work of other divisions shall be removed. At the end of the project, the electronic drawing files shall be transferred onto a portable memory device. Both hard copy drawings and the portable memory device shall be provided as Record Drawings.
3. Record Drawings shall reflect as-built conditions and show changes in:
 - a. Size, type, capacity, etc. of any material, device or piece of equipment
 - b. Location of any device or piece of equipment
 - c. Location of any outlet or source in building service system.
 - d. Routing of any piping, conduit, sewers or other building services.
4. Record Drawings shall indicate the location of all underground, under floor and concealed piping including the location of all utility service entries.
5. Record Drawings shall indicate the location of each respective penetration

made through any fire rated assembly. Include the corresponding UL system number, from the current UL Fire Resistant Directory that was used to firestop the penetration.

6. Record Drawings shall indicate the location of all tagged valves including the tag designations.
7. After the project is completed, the Record Drawings shall be delivered to the Architect for inclusion into the Operating and Maintenance Manuals, as a permanent record of the installation as constructed.

B. Operating and Maintenance Manual (OMM)

1. Furnish complete bound sets of Operating and Maintenance Manuals. Refer to Division 1 Specifications for quantities and for additional requirements.
2. Bind the required material into a hard-backed binder(s) where they can be accommodated into 8-1/2" x 11" size.
3. OMM shall be assembled as follows, unless otherwise directed in Division 1 Specifications. Include a title tab for each section and an index at the beginning of each individual section.
 - a. First Page --- Title of Project, Owner, Address, Date of Submittal, Name of Contractor and Name of Engineer, including contact information, phone numbers and email addresses.
 - b. Second Page --- Index
 - c. First Section --- Written description of system contents including where actually located in building, how each part functions individually, and how system works as a whole. Included step by step procedures for startup and shut down for each system and piece of equipment. Conclude with a list of items requiring service and either state the service needed or refer to the Manufacturer's data in the binder that describes the proper service.
 - d. Second Section --- A copy of each approved Submittal.
 - e. Third Section --- A copy of each equipment Manufacturer's operating and maintenance instructions and where applicable, a copy of the equipment startup report. Maintenance instructions shall include name of service agency, spare and replacements parts lists, lubrication instructions, and replacement belt information (size, type and length). For packaged equipment with manufacturer supplied controls, provide information listing any programming that is not a factory default.
 - f. Fourth Section --- A copy of the testing, adjusting and balancing

report.

- g. Fifth Section --- A copy of all test results performed by the Contractor. Test results shall include pipe pressure tests and disinfection. Wall hung fixture carrier sign-off approvals
- h. Sixth Section --- A copy of all valve directories.
- i. Seventh Section --- A copy of all guarantees and warranties.
- j. Eighth Section --- Owner training sign-in sheets [and a copy of all digitally recorded training sessions].
- k. Ninth Section --- Record Drawings.
- l. Tenth Section --- A list of attic stock furnished for the project.
- m. Eleventh Section --- Final Punch List with Contractor's responses.

4. Once submittals are completed, provide an OMM index to the Engineer for review. Once index is approved, submit an electronic copy of the OMM to the Engineer for acceptance. If any sections are incomplete, include section title tab and a page describing what is missing. After acceptance, submit the required quantity of final hard copies to the Architect for delivery to the Owner. If data is missing from final copies, a page shall be inserted into the front of the OMM listing what is missing and a date when the data will be available for insertion into the OMM.

5. After acceptance, information contained within the OMM shall be transferred onto a portable memory device and delivered with the OMM. Data shall be in .pdf format and shall utilize interactive index tabs. In addition, a portable memory device shall be delivered to the Engineer.

1.011 OWNER TRAINING

- A. Before final payment, demonstrate to the Owner's satisfaction the proper operation of each of the systems provided as part of the Contract Documents.
- B. Provide to Owner after all equipment, systems and controls are in operation and at an agreeable time, instructions for the purpose of training Owner's maintenance personnel in the operation and maintenance of all Plumbing equipment, systems and controls.
- C. Provide a "sign-in" sheet at each training session. A copy of each "sign-in" sheet shall be included in the Operating and Maintenance Manual.
- D. The Contractor shall video record training sessions for systems if required in other Specification sections. Turn one copy of each on DVD over to the Owner upon completion as part of Operating and Maintenance Manual. Coordinate preferred type of recording media with the Owner.

- E. Refer to individual Division 22 sections for minimum time periods for training.
- F. Deliver to the Owner all special tools and appurtenances for proper operation and maintenance of the equipment provided and request receipt for same. Attach to the Contractor's request for final payment.

1.012 SITE REPORTS AND PUNCHLISTS

- A. The Engineer may visit the site periodically during construction and provide written Construction Observation Reports to the Contractor identifying areas where installation does not meet the intent of the Contract Documents. The Contractor shall provide a written response to these reports within 5 business days, indicating the reason the installation is out of compliance with the Contract Documents. After review, the Engineer may or may not require the Contractor to correct the installation.
- B. Final Punch List
 - 1. The Engineer will visit the site to perform a scheduled Final Punch List to identify areas where the installation is incomplete or does not meet the intent of the Contract Documents.
 - 2. If the Engineer is requested to perform the Final Punch List prior to the Contractor being 100% complete with their scope of work, the Contractor shall furnish a Contractor's Completion List, indicating all incomplete work. This list shall be furnished to the Engineer a minimum of 24 hours prior to the scheduled Final Punch List.
 - 3. The Contractor shall respond to each punch list item along with a date, indicating that the item has been completed or corrected.
 - 4. The Engineer is not responsible for visiting the site to verify that punch list items are completed or corrected.
 - 5. A copy of the Final Punch List with the Contractor's responses shall be included on the Operating and Maintenance Manual.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. All equipment and materials used on this project shall be new and UL Listed for the intended application. Where possible, the same brand or manufacturer shall be used for each type of material or equipment.
- B. Equipment and materials for the construction shall be the responsibility of the Contractor and shall be protected by the Contractor until formally accepted by the Owner.
- C. All Manufacturers of Plumbing equipment shall verify to the satisfaction of the Contractor and Engineer that their equipment will function properly under

the conditions of use, as shown on the Drawings and as specified herein. dimensions, weights, operating characteristics and all other related appurtenances shall be verified before submittal of shop drawings.

- D. Domestic steel shall be used for steel products as required by the Ohio Revised Code, Chapter 153.

2.02 MATERIAL SUBSTITUTIONS

- A. Bids shall be based upon the specified products, suppliers or listed alternatives. The Drawings and Specifications are based on the products specified by type, model, size and suppliers if indicated and thus establish minimum qualities which substitutes must meet to qualify for review.
- B. Should the Contractor propose to furnish materials, equipment and/or suppliers other than those specified, submit a written request for substitutions to the Architect or Engineer in accordance with Division 1 requirements. The request shall be an alternate to the original Bid and shall be accompanied with complete descriptive (manufacturer, brand name, catalog number, supplier name and references, etc.) and technical data for all items. Indicate any additions or deductions to the base Bid price.
- C. Where listed alternatives, substitutions or equipment manufacturers (other than the basis of design) alter the design or space requirements indicated on the Drawings, the Contractor shall be responsible for the revised design and construction including cost of all associated trades involved.
- D. Acceptance or rejection of the proposed substitutions shall be subject to approval of the Architect or Engineer. If requested, the Contractor shall submit inspection samples of both the specified and the proposed substitute items for review.
- E. In all cases where substitutions are permitted, the Contractor shall bear any and all extra cost of evaluating the equality of the material and equipment to be installed.
- F. Where only one Manufacturer or supplier is named in the Contract Documents, the system or equipment shall be provided as specified.
- G. Verbal requests or approvals of substitutions shall not be binding on the Architect, Engineer or Owner.

PART 3 - EXECUTION

3.01 SAFETY

- A. The Contractor shall follow all safety requirements as defined herein, as described in Division 1 and as defined by Owner safety protocols.
- B. Work shall be performed on de-energized equipment in accordance with NFPA

70E.

- C. Should hazardous materials be encountered, Contractor shall adhere to procedures, methods and regulations of the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) and immediately notify Owner.

3.02 COORDINATION

- A. Consult the Contract Documents and Submittals pertaining to the work for other trades. Review the field layouts for all trades and make adjustments accordingly in laying out the Plumbing work.
- B. Examine the work of all other trades when it comes in contact with, or is covered by, work in this Division. Do not attach to, cover up, or finish against any defective work, or install work in a manner which will prevent proper installation of the work of other trades. Plumbing Contractor shall be responsible for the costs of adjustments required.
- C. Take all field measurements necessary and assume responsibility for the accuracy.
- D. Install work that is to be concealed within the building construction in sufficient time to secure proper location without delay to the work of other trades.
- E. Assume responsibility for location of chases, other openings through masonry and concrete construction. When work cannot be installed concurrent with building construction, arrange for rough-in boxes, sleeves, inserts and other items, as necessary for installation thereof at a later date.
- F. If any work is installed so that the architectural design cannot be adhered to, Contractor is responsible for making such changes as Architect may require. Before installing work, report any interferences between work of this Division and work of other Divisions to Architect as soon as discovered. Architect will determine which work must be relocated, or make adjustments to maintain clearances, maximum headroom and to avoid conflict with other work.
- G. Become familiar with the construction where work attaches. Review Structural Drawings for coordination of openings. Cut no structural members or slabs without Architect's written approval.
- H. Exercise caution when working in areas where concealed systems or materials may exist. Any costs for repair of damage incurred shall be the responsibility of Contractor causing the damage.

3.03 PROTECTION

- A. All finished surfaces shall be protected from damage and spills during construction.

1. Protect finished floors with a heavy duty flexible fiber reinforced floor protection board – Ram Board or equal.
 2. When setting up pipe cutting and threading machines, protect area against staining and abrasion.
 3. Protect finished surfaces from chips and cutting oil by use of a chip receiving pan and oil proof cover.
 4. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.
 5. Protect finished surfaces from paint droppings, insulation adhesive, etc. by use of drop cloths.
- B. Cost of correcting any such condition will be charged against the respective Contractor.

3.04 PRODUCT HANDLING

- A. Pay all costs for transportation of materials, equipment to job site.
- B. Provide all scaffolding, tackle, hoists, rigging necessary for placing Plumbing materials and equipment in their proper place. Scaffolding, hoisting equipment: comply with applicable Federal, State, and Local regulations. Remove temporary work when no longer required.
- C. Arrange for packaging of equipment, which must be hoisted, so that there will be no damage or distortion caused by hoisting operation. Protect all piping, ductwork, and equipment from any damage during hoisting operation.
- D. Store equipment, fixtures, controllers, insulation, etc., in dry location and protect from dirt and moisture until building is ready to receive them.
- E. Coordinate location of stored items with other trades. Where necessary, store materials and equipment on movable carts so they may be moved when interfering with the work of other trades.

3.05 CUTTING AND PATCHING

- A. All cutting and patching in construction as necessary for installation of this work shall be the responsibility of this Division and performed by the Tradesmen related to that specific Division of work. Subcontract this work to the appropriate Trade Division.
- B. Do not cut any structural member, including but not limited to steel framing and structural floors, without specific permission from the Architect and Structural Engineer.
- C. Do not cut openings in roof or floor construction without specific permission from the Architect and Structural Engineer. Existing roof warranty must be

maintained.

- D. Where locations of penetrations are inaccurate or where building components are improperly cut by inadequate methods, the Contractor in error shall be responsible for complete repair.
- E. The Contractor shall assume responsibility for removing and replacing existing ceiling tiles as required for installation of all work. Areas include that as outlined by the project scope and areas outside the scope where the Contractor is required to make connections to existing systems and install new work. Damaged tiles shall be replaced.

3.06 DAMAGE AND EMERGENCY REPAIRS

- A. Assume responsibility for any damage to new or existing building components caused by work provide as part of the Contract Documents, including leaks in piping systems being installed or reworked. Repair all damage without extra cost to Owner.
- B. Owner reserves the right to make emergency repairs as required to keep equipment in operation, without voiding Contractor's guarantee or relieving him of responsibility during warranty period.
- C. Restore roads, grounds, paving, insulation, piping building components, etc. to their original condition whenever this work causes damage.

3.07 CLEANING

- A. At all times keep premises and building in neat and orderly condition, follow explicitly any instructions in regard to storing of materials, protective measures and disposing of debris.
- B. After all tests and adjustments have been completed, clean all equipment leaving everything in working order at the completion of this work. Thoroughly clean all piping, fixtures and equipment of dirt, dust, grease, oil, debris and paint, after all other trades have completed their work.
- C. All debris created by the execution of this work shall be removed as directed by the Architect or Owner.
- D. Upon completion of work remove all tools, equipment and surplus materials.

3.08 PAINTING

- A. Finish painting is included under Division 9 - Finishes, except where specifically called for in Section 22 03 00.
- B. Materials and equipment installed under this Division shall be left free from dirt, grease and foreign matter, ready for painting.
- C. No equipment or piping shall be painted before being tested.

- D. Damaged surfaces of prefinished materials and equipment shall be touch-up painted to match existing finish.

3.09 SERVICE SHUTDOWNS

- A. This project involves remodeling of existing areas in an operating facility. Plan work including alterations and connections to existing facilities, to permit carrying on normal building functions. When necessary to temporarily interrupt a service, shutdowns shall be scheduled through the Owner and shall be done at a time as directed by the Owner. No additional compensation shall be allowed for these shutdown periods even though premium time work may be required unless specifically defined in Division 1.
- B. Provide temporary service to equipment or systems that cannot be shut down, and as determined by Owner, or as described in the Contract Documents. Remove temporary services when permanent work is completed

3.010 INDOOR AIR QUALITY

- A. All occupied areas of building shall remain free from odors, fumes, dust and smoke generated from installation of material and equipment.
- B. Arrange with building Owner to schedule isolation of areas where paints, adhesives, solvents, etc., will be used. Areas shall remain isolated until all materials have cured sufficiently as to stop out-gassing of fumes or odors and area has been ventilated to remove all detectable traces of odors and fumes.
- C. Provide temporary partitions and air seals to prevent the migration of airborne contaminants from unoccupied areas to occupied areas.
- D. Provide temporary ventilation and/or filtration systems of sufficient size and quantity to ensure complete removal of all odors, fumes, and airborne contaminants generated. Maintain 25 feet clearance from all temporary exhaust outlets to all active building outdoor air intakes.
- E. If the building HVAC system is used and adjustments are made for ventilation purposes, rebalance systems to maintain occupied areas pressurization and air change requirements.
- F. Arrange with Owner to override the HVAC system control of night setback functions to assist with ventilation of building.
- G. Comply with SMACNA guideline "IAQ Guidelines for Occupied Buildings Under Construction" Second Edition - 2007.

END OF SECTION

SECTION 22 02 00 – PLUMBING DEMOLITION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 22 01 00 – Plumbing General Provisions
- B. Section 22 03 00 – Plumbing Basic Materials and Methods

1.02 WORK INCLUDES

- A. Plumbing equipment, piping and systems indicated on the Demolition Drawings are shown to indicate the extent of demolition only and not intended to be a record drawing of the existing conditions. The Drawings and Specifications establish the minimum standards for workmanship and materials.
 - 1. If additional interpretation is required regarding the scope of demolition, contact the Engineer prior to bid.
- B. Include all labor, materials, equipment, services, and permits necessary for completion of the demolition work.
- C. Provide protection for all adjacent areas before, during, and after execution of the demolition work.
- D. Comply with all the rules and regulations of local and state Authorities Having Jurisdiction, including applicable OSHA safety requirements.
- E. Visit the site and become familiar with conditions affecting the demolition work. No additional compensation shall be approved on claims that arise from a lack of knowledge of the existing conditions.
- F. Normal building functions shall be maintained during the demolition work. Coordinate the day and time of any temporary building system interruptions with the Owner. Additional compensation shall not be approved for premium time effort.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide materials and equipment for completion of the demolition work as described within the Specifications and on the Drawings.
- B. Materials and equipment shall be new and UL labeled for the application.

PART 3 - EXECUTION

3.01 GENERAL DEMOLITION WORK

- A. Disconnect and remove existing Plumbing Work made necessary because of Project alterations as indicated or implied on the Contract Documents of all trades. Relocate equipment and/or devices where indicated. Existing Plumbing equipment, piping and systems not affected by these changes shall remain and shall be protected whether shown on the Drawings or not.
- B. Plumbing equipment, piping and systems shall be de-energized prior to disconnection and removal.
- C. Demolition Work under this Contract shall be accomplished by the Contractor in complete accordance with the Construction Procedure and Progress Schedule specified under Division 1. Proposal shall include any special phasing requirements related to demolition work as described in the Division 1 Specifications.
- D. Remove existing equipment indicated including piping connections. Existing equipment shown as being reused or relocated shall be carefully removed, stored on the premises, and refurbished before reinstallation.
- E. Equipment to be salvaged by the Owner shall be carefully removed and stored on site by the Contractor for delivery to the Owner. All other materials, equipment and debris shall become the property of the Contractor and shall be removed from the site.
- F. Remove all previously abandoned equipment and piping encountered above existing ceilings.
- G. Where required, re-support existing to remain piping above ceilings being removed.
- H. Remove piping as described on the Drawings. Cap or plug as indicated or as required by Code. Identify in the field where piping connections are to be reused.
- I. Provide drainage, capping, and re-filling as necessary to isolate portions of systems to enable full or partial demolition.
- J. Provide valves as necessary whether indicated or not to isolate portions of systems to enable full or partial demolition and to make ready for re-connection of the new work.
- K. In case of existing valves failures, replace valves in kind or as specified for new service to enable positive shut-off and keep with project schedule as much as possible. Report any such cases immediately upon discovery to the Architect or Engineer.
- L. For portions of existing piping systems to be re-used, visually inspect for signs of leaks. Report any such cases immediately upon discovery to the Architect or Engineer. Provide jetting of mains and camera documentation of condition to ensure its integrity. Should any compromised pipe be

discovered, notify Architect and Engineer immediately.

- M. For portions of under-slab drainage piping not intended for re-use, the following shall be required:
1. No dead ends shall be created.
 2. No open end pipe shall be left behind and buried.
 3. Portions of existing piping not indicated to be re-used can become abandoned to minimize floor removal, however abandoned piping shall be capped or plugged at both or all ends.
 4. Any portion of existing piping impeding the installation of new piping shall be removed and bedding re-established.
 5. Branch laterals no longer used shall be capped at the branch connection to the main at the wye, or as close as possible, to avoid removal and replacement of portions of mains.
 6. Any under-slab venting acceptable under a previous code shall be permitted to remain in effect provided it is a necessary vent for an existing portion of drainage intended to remain.
 7. Addition of a cleanout shall not substitute for provisions herein to eliminate being a dead end.
- N. Maintain necessary venting for any fixture(s) to remain as a result of partial demolition or project phasing. If necessary, provide temporary venting to ensure proper fixture operation.
- O. Maintain necessary recirculating hot water for any fixture(s) to remain as a result of partial demolition or project phasing. If necessary, provide temporary circuits and valves to ensure proper fixture operation.
- P. Cutting, patching, finishing, etc., for removed or relocated Plumbing equipment, piping and systems shall be included as part of the Plumbing Work. All holes and damage caused by the demolition work shall be properly patched with suitable materials to match existing construction. Patching shall be performed by the qualified trade.
- Q. Where equipment, piping and systems are removed from fire or smoke rated construction, penetrations shall be patched to match existing ratings with suitable materials matching existing construction. Patching shall be performed by the qualified trade.
- R. Remove and reinstall existing ceiling tiles in areas outside the scope of demolition work as required to complete the demolition work outlined within these Specifications or indicated on the Demolition Drawings. Damaged tiles shall be replaced to match existing.

END OF SECTION

SECTION 22 03 00 – PLUMBING BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 WORK INCLUDES

- Pipe
- Fittings
- Piping Joining Systems
- Valves
- Strainers
- Unions
- Water Hammer Arrestors
- Floor, Ceiling and Wall Plates
- Sleeves
- Inserts, Hangers and Supports
- Roof Flashings
- Access Doors
- Natural Gas Piping Specialties
- Nameplates, Markers and Tags
- General Installation Requirements
- Access to Equipment and Devices
- General Piping
- Sanitary and Storm Drainage Systems
- Domestic Water Supply System
- Recirculating Hot Water System
- Natural Gas System
- Cleaning and Disinfecting
- Startups
- Tests and Adjustments
- Painting
- System and Equipment Identification
- Excavation and Backfill

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 22 01 00 – Plumbing General Provisions
- B. Section 22 04 00 – Plumbing Firestopping
- C. Section 22 07 00 – Plumbing Insulation
- D. Section 22 40 00 – Plumbing Fixtures

1.03 SUBMITTALS

- A. Refer to Section 22 01 00.

1.04 CONSTRUCTION DOCUMENTATION

- A. Refer to Section 22 01 00.
- B. Submit recirculation hot water testing, adjusting and balancing report upon completion of report. Include final copies in the Operating and Maintenance Manuals.
- C. Submit wall hung carrier installation sign-off approval documentation upon completion of sign-off. Include final copies in the Operating and Maintenance Manuals.
- D. Submit pipe pressure test and disinfection documentation upon completion of testing and disinfecting. Include final copies in the Operating and Maintenance Manuals.

PART 2 - PRODUCTS

2.01 PIPED SYSTEMS

- A. Application schedule of required pipe materials and joining:

PIPE AND JOINING APPLICATION SCHEDULE			
PIPED SYSTEM	PIPE SIZE RANGE	PIPE SPECIFIED TYPE (s)	JOINING SPECIFIED METHOD(s)
Domestic Water Inside Building	2" and smaller	Cu-L	Soldered, or Pressed fitting system
Domestic Water Inside Building	2-1/2" to 4"	Cu-L	Brazed, Pressed fitting system
Trap Primer Feed Piping Beneath Slab Floors	1/2"	PEX-AL-PEX	"Without joints"
Natural Gas Inside Building	2" and smaller	BS sch40	Threaded
Natural Gas Inside Building	2-1/2" and larger	BS sch40	Welded
Building Drain, Waste and Vent Underground	2" to 15"	CI-SW	Push Joint
Building Drain, Waste and Vent Above ground	1-1/2" to 15"	CI-NH	No-Hub coupling, or MG fitting
Building Drain, Waste and Vent Underground, NOT Serving Kitchens or Boiler Rooms	2" to 15"	PVC-DWV	Solvent Weld

2.02 PIPE AND FITTING SPECIFICATIONS

- A. BS sch40: Schedule 40 black steel (ASTM A53). Fittings for black steel pipe - 150 PSIG, steam working pressure malleable iron screwed fittings on sizes through 2 inches and standard factory formed welding fittings on sizes over 2 inches.
- B. CI-NH: No hub cast iron pipe and fittings (ASTM A888, CISPI-301), as manufactured by Charlotte, Tyler, or AB + I.
- C. CI-SW: Service weight cast iron, bell and spigot, soil pipe, and fittings (ANSI R 112.5), (ASTM A74), with Tyler "Ty-Seal" or equal, neoprene pipe gaskets (ASTM C564)
- D. Cu-L: Type "L" hard drawn seamless copper tube (ASTM B88). Fittings for copper pipe - wrought copper solder joint type (ASME B16.22). Where silver brazing alloy is used to join pipe and fittings, fittings to be suitable for brazing (ASME B16.50).
- E. PEX-AL-PEX: Multi-layer polyethylene cross-linked tubing with aluminum sheathing and polyethylene external layer shall conform to (ASTM F 1281) and fittings (ASTM F1282), (CSA 137.5) and (NSF 14 and 61) (NSF®us-pw). Tube shall have a Standard Dimensional Ratio designation (SDR 9), with a 100 psi at 180°F / 160 psi at 73°F pressure, temperature rating, a "PEX5006" chlorine resistance rating, and extended UV rating.
- F. PVC-DWV: Schedule 40 PVC solid core DWV pipe and fittings per ASTM D2665.

2.03 PIPE JOINING SYSTEMS

- A. Copper Press System: Where listed for acceptable joining method in above application schedule, the following press system may be used.
 - 1. Press Fittings: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM.
 - 2. Installation must be in accordance to manufacturer's instructions and specifications.
 - 3. Manufacturer: Viega Pro-Press or Engineer approved equal.

2.04 VALVES

- A. Provide all valves of the same manufacturer where possible. Manufacturers: Apollo, Milwaukee, NIBCO, Hammond, or Watts. All valves to be of domestic manufacture.
- B. Provide valves with joining ends to match that of the specified piped system(s).
- C. Utilize adapter fittings only when listed valve manufacturer does not offer

suitable ends for joining to the specified piped system's joining.

1. Pressed piping systems may have valves of the same manufacturer of the pressed piping joining system.
- D. Valves in water piping 2 inches and smaller: two-piece ball valves with cast bronze body, Teflon seats, full port, blow-out proof stem, adjustable packing gland, chrome plated solid bronze ball, soldered or threaded ends, minimum 150 WSP, 600 WOG. Milwaukee BA-125.
- E. Valves in water piping 2-1/2 inches and larger: butterfly type, Class B cast iron body, stainless steel stem, aluminum bronze disc, and EPDM liner; 175 WOG. Lug type with lug drilled and tapped, extended neck. Operators: on-off throttling lever handles on sizes 2-1/2 inches to 6 inches, totally enclosed worm gear or Acme screw operators with hand wheel on sizes 8 inches to 20 inches. Equip valves used for balancing with memory stop. Milwaukee CL123 Series.
- F. Horizontal check valves 2 inches and smaller: swing type design, Class 125, 200 WOG, with bronze body and cap with threaded or soldered ends. Conform to ASTM B62. Milwaukee 509 or 1509.
- G. Vertical check valves 2 inches and smaller: 250 WOG. Center guided, silent, non-slam type. Bronze body, spring, and disc holder, threaded ends. Metraflex 700.
- H. Shutoff valves for Natural Gas Piping: 2 inches and smaller, U.L. listed ball valve, 175 PSI working pressure, cast bronze body, viton seals, full port, threaded ends, stainless steel trim, AGA certified and UL listed for flammable liquids and LP gas. Milwaukee Valve BB2-100, Nibco T-585-70-UL or T-580-70-UL.
- I. Shutoff valves for Natural Gas Piping: 2-1/2 inches and larger, ASME/ANSI compliant API approved ball valve. Class 150 carbon steel fire safe split body, stainless steel vented full port ball valve with blow out proof stem, stainless steel trim, flanged ends. Milwaukee F20CS150F, or NIBCO F-515CSF66FS.
- J. Valve Chain Operator: Provides for remote operation of valves. Sprocket rim attaches to valve wheel. Furnish with chain and chain guide. Sprocket rim constructed of cast iron. Chain guide constructed of malleable iron. Chain constructed of steel. Handwheel to match valve. Provide chain operators for valves located more than 10 feet above floor or as indicated.
- K. Other valves or valve requirements are specified in the Sections applicable to the various systems.
- L. Automatic flow regulating valve installed in domestic hot water system's re-circulating circuit piping: NSF / ANSI 61-G certified 2-32 PSID, 400 PSIG cold working pressure, 180 °F rated maximum operating temperature, 300

stainless steel construction with nickel plated union, factory set flow control cartridge set to specified flow-rate to within 5% accuracy minimum. Complete installation with shut-off ball valves, inline 20 mesh strainer, and downstream check valve to enable cleaning of strainer and cartridge replacement without cutting or draining of pipe. Manufactured by Flow Design Inc. Model ICSS, or equivalent by Nexus or Griswold.

2.05 STRAINERS

- A. 2 inches and smaller, 'Y' type pipe line strainer, brass or bronze body, threaded ends, 304 stainless steel screen with 20 mesh openings, 400 PSIG at 210 degree F. Complete with solid retainer cap and gasket. WATTS Series 777 or equivalent by CLA-VAL, Conbraco, Febco, or Wilkins.
- B. 2-1/2 inches and larger 'Y' pattern pipeline strainer, NSF and FDA approved epoxy coated iron body, 125 pound flanged ends, bolted cover, 200 PSIG water, oil, gas operating pressure, and of # 304 stainless steel screen. Complete with blow down connection with closure plug. WATTS Series 77F-DI-FDA-125 or equivalent by CLA-VAL, Conbraco, Febco, or Wilkins.

2.06 UNIONS

- A. Unions in steel piping 2 inches and smaller, malleable iron, ground joint brass to iron seat suitable for 175 PSI working pressures.
- B. Unions in copper piping 2 inches and smaller, cast brass solder fittings with machined and lapped seats suitable for 175 PSI working pressures.
- C. Unions on all piping 2-1/2 inches and larger: Use flanged connections. Gaskets used with flanged fittings: 1/16 inch thick, ring type, compressed graphite sheet.

2.07 DIELECTRIC CONNECTIONS

- A. Provide at connections between copper and ferrous metal piping materials in domestic cold water systems ASTM F441, Schedule 80, CPVC threaded pipe nipples, 4 inches minimum length. Provide for dielectric connections in pipe sizes 2 inches and smaller.
- B. Provide at connections between copper and ferrous piping in domestic hot water systems Victaulic Clearflow dielectric waterway Style 47. Fitting consists of zinc plated casing with a chemically inert NSF/FDA listed dielectric thermoplastic lining.

2.08 WATER HAMMER ARRESTORS

- A. Bellows type, with stainless steel casing and bellows, tested and certified in accordance with PDI Standard WH-201. Provide a pressure reducing valve on the inlet to the device where system pressures are above 80psi. Manufacturer: Jay R. Smith. Other acceptable manufacturers are: Josam,

Wade, and Zurn.

2.09 FLOOR, CEILING, AND WALL PLATES

- A. Fit all pipe passing exposed through walls, floors, or ceilings in finished rooms with steel or brass escutcheons. Where surface is to receive a paint finish make escutcheons prime painted; otherwise make escutcheons nickel or chrome plated. Where piping is insulated, fit escutcheons outside insulation.

2.010 SLEEVES

- A. Where pipes pass through masonry or concrete walls, set machine cut steel pipe sleeves 1 inch larger than outside diameter of pipe, with ends of sleeves flush with wall faces. Sleeves in partitions other than masonry or concrete where firestopping is required: 28 gage galvanized steel sheet.
- B. Where pipes pass through floors, set Schedule 40 galvanized steel pipe sleeves 1 inch larger than the outside diameter of the pipe. Top of sleeve to be 4 inches above finished floor in machine rooms and wet floor locations.
- C. Where pipes are insulated, provide sleeves large enough to allow insulation to pass through sleeve. Center pipes in sleeves.
- D. Set sleeves true to line, grade; position and plumb or level and so maintain throughout construction period.
- E. Where concrete or masonry walls are core drilled for pipe passage steel sleeves are not required.
- F. Provide fire stopping between pipe and sleeve or opening as required to maintain the integrity of the fire rating of all walls and floors.
- G. Where pipes pass through exterior walls below grade, set Schedule 40 steel pipe or manufactured castings or sleeves 1-1/2 inch larger than the outside diameter of the pipe. Make the pipe to wall penetration closure with "Link-Seal" as manufactured by the Thunderline Corp. or Metraseal.

2.011 INSERTS, HANGERS, AND SUPPORTS

- A. Manufacturer: Basis of design shall be Anvil. Other acceptable manufacturers include Mason, Holdrite, or Erico/Caddy.
- B. Provide all inserts, hangers, anchors, guides, sway bracing, restraints, and supports to properly support and retain piping, conduits and equipment; to control expansion, contraction, anchorage, drainage and prevent sway and vibration.
- C. Provide inserts for support of work in concrete construction.
- D. Provide forged steel beam clamps when attaching to steel construction.

- E. Provide supplementary angles, channels, and plates where supports are required between building structural members, span the space and attach to building structural members by welding, bolting or anchors.
- F. Provide hangers, rollers, threaded rods, turnbuckles, saddles, insulation protectors, anchors, and all other miscellaneous specialties for the attachment of hangers and supports to structure.
 - 1. For up to 3/4 inch diameter rod: Anvil Figure 92, 93, or 94 beam clamps.
 - 2. For 7/8 inch and 1 inch diameter rod: Anvil Figure 134 beam clamp with Anvil Figure 290 eye nut.
 - 3. Pressed steel beam clamps are not permitted.
- G. Provide rods, angles, rails, struts, brace plates, and platforms required for suspension or support of piping, conduit and equipment.
- H. Support individual piping from hangers as follows:
 - 1. Uninsulated piping 2 inches and smaller - Anvil Figure #69 adjustable swivel ring.
 - 2. Uninsulated piping 2-1/2 inches and larger - Anvil Figure 260, Carbon Steel adjustable wrought clevis type.
 - 3. Insulated piping 2 inches and smaller - 18 gage galvanized steel shield (Anvil Figure 167) over insulation in 180 degree segments, minimum 12 inches long with Anvil Figure 260 adjustable clevis type hanger. Or option of using Insulation Saddle System by ANVIL, Figure. #260ISS. ASTM A36 Carbon Steel Clevis Hanger with V-Block Hi Impact Glass reinforced Polypropylene Saddle with low thermal conductivity of .77 (BTU-Sq.Ft. - Hr-Deg F), Flammability Rating Dual Listed ASTM E84 and V-0 UL 94, and Carbon Steel Spacer.
 - 4. Insulated piping 2-1/2 inches and larger (except cold piping) - Anvil Figure 260 adjustable clevis type hanger with pipe covering protection saddle or Anvil Figure 160 Series (depending on insulation thickness). Or option of using Insulation Saddle System by ANVIL, Figure. #260ISS. ASTM A36 Carbon Steel Clevis Hanger with V-Block Hi Impact Glass reinforced Polypropylene Saddle with low thermal conductivity of .77 (BTU-Sq.Ft. - Hr-Deg F), Flammability Rating Dual Listed ASTM E84 and V-0 UL 94, and Carbon Steel Spacer.
 - 5. Rollers - Where thermal movement causes a hanger rod to deviate more than five degrees from the vertical or where longitudinal expansion may cause a movement of more than 1/2 inch in the piping, use and install roller hangers or chairs, Anvil Figure 181, 171, or 175.
- I. Hanger Spacing (Steel Pipe)

<u>PIPE SIZE</u>	<u>MAXIMUM SPACING</u>	<u>MINIMUM ROD DIAMETER</u>
Up to 1"	6'	3/8"
1-1/4"	8'	3/8"
1-1/2", 2"	10'	3/8"
2-1/2", 3"	12'	1/2"
4", 5"	12'	5/8"
6"	12'	3/4"

- J. Provide additional lock nut on each threaded support rod.
- K. Provide additional hanger support within two feet of each elbow and at valves, strainers and other equipment in pipe lines.
- L. Support copper pipe at intervals of not over 10 feet for 1-1/2 inch and larger, and not over 5 feet for 1-1/4 inch and smaller. Provide additional supports where necessary to maintain proper alignment.
- M. Support sanitary drain and vent and storm drain piping at every hub or coupling within 18 inches of hub or coupling. Installations requiring multiple joints within a 4 foot developed length shall be supported at every other or alternating hubs or couplings. Supports shall not exceed 10 feet between hangers. Vertical components shall be secured at each base stack. Provide additional supports where necessary to maintain proper alignment and grade.
- N. Trapeze hangers may be used for multiple runs of piping. Construct of a channel with adjustable hanger rods. Determine hanger spacing by the smallest pipe supported. Install all piping free for independent movement on the trapeze hanger. Provide insulation protection saddles as specified for individual pipe support.
- O. Do not suspend a pipe from another pipe or ductwork. Do not support ceiling framing or lighting from piping. Do not support any item from metal roof deck.
- P. Provide support saddles where pipes are insulated. All insulation shall be continuous through all hangers.
- Q. Where fireproofing is removed or damaged to allow attachment to building structural members, repair to maintain integrity of fireproofing.
- R. Secondary Pipe Positioning and Supports:
1. Field devised methods of plumbing pipe support, such as with the use of scrap framing materials, are not allowed. Support and positioning of all secondary piping shall be done by means of engineered methods that comply with IAPMO PS 42-96.
 2. Pipe Clamps in Plenum-Rated Environments: All non-metallic clamps must meet ASTM E-84 25/50.

3. Suspended Equipment: Suspended water heaters of 30 gallons or less, suspended from the structure above, shall be installed with an engineered and manufactured product such as the Suspended Water Heater Platform with integral drain body.
4. Hubless Cast Iron Soil Pipe Restraints: CISPI 310-11 compliant engineered restraints comprised of 16 GA, CRS, Galvanized straps and/or heavy duty black steel or galvanized pipe clamps with stainless steel bands, and galvanized steel hardware.
5. Manufacturer: Hubbard Holdrite or equivalent by Erico/Caddy, or Sioux Chief.

S. Rooftop Piping Supports

1. Field devised methods of pipe supports, such as with the use of scrap framing materials or wood, are not allowed. Support and positioning of all rooftop piping shall be done by means of pipe curbs or engineered methods.
2. Pipe curbs: Units shall be 18 gauge galvanized steel, insulated, continuous welded seams, wood nailer, counterflashing; of type and style as indicated.
 - a. The height of roof curbs and supports shall be a minimum of 12 inches above the finished roof surface; total curb height shall accommodate the roof insulation thickness. Refer to Architectural Drawings for details.
 - b. Manufacturer: Custom Curb, Roof Products & System Corp, Pate, or Thycurb.
3. Engineered supports: Smooth UV-stabilized, EPDM support shall allow for installation without requiring roof penetrations, flashing or damage to the roofing material.
 - a. Support Bases and Pipe Rollers shall be made of an engineered thermoplastic with appropriate additives for UV protection. All structural steel components shall be hot-dipped galvanized. Height-adjustable supports must be used where necessary. The support shall have a continuous bottom surface to provide even load distribution and minimize point loading of the roof membrane. The support base will have a radiused edge to enhance compatibility with roof membranes.
 - b. Manufacturer: Erico/Caddy, Dymotek or equivalent to Miro Industries.

2.012 ROOF FLASHINGS

- A. Roof flashings for plumbing equipment are part of the membrane roofing system and provided under another Division of the Specification.

2.013 ACCESS DOORS

- A. Furnish access doors and frames for installation in building walls, partitions and ceilings, where necessary for access to concealed valves and other equipment requiring service or inspection. The Plumbing Contractor shall not be responsible for installation of such access doors. However, the cost of installation shall be included in the bid.
- B. Exact location, type, size and number of access doors shall be determined by the installer of the Plumbing systems to suit requirements. Group valves and other equipment to be accessible from a single door. Where practical, group Plumbing components with other Division components to be accessible from a single door. Coordinate with all Divisions.
- C. The respective Contractor, as designated by the Architect or Construction Manager, shall install the required access doors and frames in designated locations after such locations are approved by the Architect.
- D. Access doors are not required in removable type ceilings. Installer of Plumbing systems shall coordinate locations and requirements for removable ceiling sections with Architect, including a means of identifying removable sections.
- E. Access doors shall be sufficiently large enough for access but in all cases the minimum door size shall be 14 inches x 14 inches.
- F. Refer to Section 08 31 13 Access Doors and Frames for additional information.
- G. Access doors located in nonfire-rated walls, partitions and ceilings shall be equal in fabrication to the following Milcor styles and equipped with invisible spring hinges and standard screw driver cam-latches. All frames and anchors shall be compatible with the specific wall, partition or ceiling where it is to be installed.
 - 1. Access doors in drywall shall be 14-gauge steel with a 16-gauge steel frame surrounded by a 22-gauge galvanized steel drywall bead for a concealed frame finish. Milcor Style DW.
 - 2. Access doors in masonry or tile walls shall be 14-gauge steel with a 14-gauge steel exposed frame. Milcor Style M.
 - 3. Access doors in plaster shall be 14-gauge steel with a 16-gauge steel frame surrounded by a 22-gauge galvanized steel perimeter casing bead for a concealed frame finish. Milcor Style K.
- H. Access doors located in fire-rated walls, partitions and ceilings shall be UL listed and labeled 1-1/2 hour, Class B or to match construction rating, equal

in fabrication to Milcor Style UFR. Door shall be 20-gauge steel with a 16-gauge frame and include a continuous hinge, coil spring and cylinder lock with two keys. Door shall be insulated with 2" mineral fiber insulation sandwiched between inner and outer panels.

- I. Access doors shall be completely primed, including the frame assembly, before leaving the factory. Finish painting shall be by another Division.
- J. Access doors shall be as manufactured by Milcor, Nystrom or MIFAB.

2.014 ELECTRICAL CONNECTIONS

- A. Refer to those portions of the Contract Documents which establish electrical characteristics and furnish equipment to operate on that service.
- B. Starters shall be provided under Division 26 Work, unless otherwise noted. Starters to be provided with proper NEMA enclosures, surface or flush application as required. Where equipment has magnetic starters furnished as an integral part of the equipment, disconnect switches shall be provided under Division 26 Work.
- C. Provide coordinated wiring diagrams for motor equipment of plumbing system conforming to operation specified. Provide line diagrams, power diagrams, terminal connections. Submit all such drawings as shop drawings.

2.015 VIBRATION CONTROL

- A. Refer to Section 22 05 48 "Plumbing Vibration Isolation".

2.016 NATURAL GAS PIPING SPECIALTIES

- A. Gas Pressure Regulator:
 - 1. Spring loaded, general purpose, self-operating service regulator which includes an internal relief type diaphragm assembly and vent valve. Diaphragm case can be rotated 360 degrees in rotation to body. Conforms to ASA Code B31.8, for temperatures from -20 degrees F to 160 degrees F. Spring case vent with removable screen. Internal relief for exhaust of excessive outlet pressure out of spring case. Cast iron body, aluminum diaphragm and spring case, nitrile rubber o-rings disk and diaphragm, composition gaskets.
 - 2. Manufacturer: Fisher Controls HSR (3/4" to 1") or CS400/CS800 (1 1/4" to 2") or acceptable equivalent by Maxitrol, or Sensus.

2.017 NAMEPLATES, MARKERS AND TAGS

- A. Equipment Nameplates
 - 1. Equipment nameplates shall be laminated phenolic with a black surface and white core. Use 1/16 inch thick material for plates up to 2 inch by 4

inch. For larger sizes use 1/8 inch thick material.

2. Lettering shall be condensed Gothic. The space between lines shall be equal to the width of the letters. Use ¼ inch minimum height letters which occupy four to the inch.
3. Nameplates shall be attached to equipment with brass screws or rivets; no adhesive attachments will be permitted.
4. Acceptable Manufacturers: Seton Nameplate Company, Marking Services Inc.

B. Valve Tags

1. Tags shall be 2" diameter, 1/16" thick, multilayered acrylic with engraved letters.
2. Lettering shall be ¾" high for type service and ½" for number. Tag shall indicate service and valve number. Letter and number designations shall be coordinated with the Owner.
3. Each service shall be a different color in conformance with the "Scheme for the Identifications of Piping Systems" (ANSI A13.1).
4. Tag shall be attached with chain similar to Seton No. 16 stainless steel jack chain. Use of beaded chain or wire is not acceptable.
5. Acceptable Manufacturers: Seton Nameplate Company, Marking Services Inc.

C. Pipe Markers

1. Each marker background shall be appropriately color coded with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identifications of Piping Systems" (ANSI A13.1).
2. Flow direction arrows shall be included on each marker.
3. Snap-around markers shall be used for overall diameters up to 6" and strap-around markers shall be used above 6" overall diameters.
4. Underground pipe markers shall be detectable tape, color coded and labeled same as indoors.
5. Acceptable Manufacturers: Seton Nameplate Company, Marking Services Inc.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Location of piping, equipment, etc., on the drawings are diagrammatic; indicated positions shall be followed as closely as possible, exact locations shall be subject to building construction and interferences with other work. In general, conceal piping located outside of equipment rooms. Difficulties preventing the installation of any part of work as indicated, shall be called to the attention of the Architect. Architect will determine locations and changes. Contractor shall install the work accordingly. Architect reserves right to make minor changes in location of any part of the work up to the time of roughing-in without additional cost.
- B. Attempts have been made to identify existing equipment locations and piping routing and sizes with use of existing drawings and field observations. Contractor shall field verify all existing information, report any discrepancies to the Architect or Engineer and note on the Record Drawings.
- C. At locations in project involving alterations, assume responsibility for removal, rerouting, protection and replacement of existing facilities as necessary to install new work. Work to be executed by craft which customarily or by jurisdictional award performs such service. Refer to 22 02 00 for additional information.
- D. Coordinate all work with the phasing of the Project. Certain services must remain active to serve occupied areas during construction. Coordinate all phasing requirements with the Owner.
- E. Install all materials and equipment in a neat and workmanlike manner by competent specialist for each subtrade. The installation of any materials and equipment not meeting these standards may require removal and reinstallation at no additional cost to the Owner.
- F. Locate piping and other services, in pipe spaces, to ensure maximum accessibility. Where necessary to cross pipe spaces, crossing must be made near the floor or 6 feet or more above floor.
- G. Install, connect equipment, services, materials according to best engineering practice and in conformity with manufacturer's printed instructions. Provide complete auxiliary piping, water seals, valves, electric connections, controls, etc., as recommended by respective equipment manufacturer or required for proper operation.
- H. Take all measurements and determine all elevations at the building.

3.02 ACCESS TO EQUIPMENT AND DEVICES

- A. All valves, equipment, and other devices requiring examination, adjustment, service, and maintenance shall be accessible. If located above drywall ceiling or behind finished walls, provide an access door. Coordinate all access door locations with the Architect and General Trades.
- B. To ensure accessibility during and after construction, when a device is

- installed, its location shall be marked with securely attached temporary signage. Signage shall indicate the amount of clearance required for the specific device. Signage shall remain in place until the ceiling or access door is installed or until substantial completion.
- C. Clearance shall include not only code required clearance but also clearance for Owner's staff to access the device. This access shall be from the floor or from the floor level using normal maintenance ladders and apparatus to meet all OSHA requirements. Consideration shall be given to accessing a device through an access door.
 - D. Where a device is installed above finished ceilings, signage shall be hung below the device at the finished ceiling level. Where a device is exposed, in open ceiling areas, signage shall be hung at approximately 8' above the floor level.
 - E. Plumbing Contractor shall monitor these access locations until substantial completion and notify Architect, Owner and Engineer when the access area is encroached upon so that corrective action may be taken immediately.
 - F. Corrective action shall be the responsibility of the trade encroaching the access area unless identified that the equipment in question is installed incorrectly or not where indicated on the signed-off coordination drawings.

3.03 GENERAL PIPING

- A. Drawings (floor plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.
- B. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- C. Provide shutoff valves at all branch connections to main, at all fixture groupings, each piece of apparatus, and in mains to sectionalize the systems and elsewhere as indicated.
- D. Install gate valves with stems at 45 degrees or greater above the horizontal position.
- E. Install ball and butterfly valves with the stems at the horizontal position and the handle pointing in the direction of flow.
- F. Install all valves and equipment with unions or flanges or grooved couplings to facilitate removal.
- G. Provide hose end drain valves with cap at all low points, trapped sections and on equipment side of all branch valves to permit draining of all or part of

liquid piping systems.

- H. Pipe equipment drip bases to nearest drain.
- I. Locate covered piping a sufficient distance from walls, other pipe, ductwork, or other obstacles, to permit application of the full thickness of insulation specified; if necessary, use extra fittings and pipe.
- J. Use Dielectric Connectors where pipe materials change from ferrous to copper.
- K. Make piping connections to equipment and fixtures indicated.
- L. Install all piping, including shut-off valves and strainers, to pumps, and equipment line size with reduction in size being made only at inlet to pump or equipment. Install outlet piping from pump or equipment, full size of outlet connection. Increase to line size and install piping, check valves, strainers and shut-off valves line size.
- M. Plug open ends of pipe or equipment at all times during installation to keep dirt and foreign material out of system.
- N. Arrange and install all pipes, valves, cleanouts, access openings and equipment so as to be accessible for service. Locate equipment to maintain clearances for tube pulling, periodic servicing.
- O. Unless otherwise specified, make branch connections in welded steel piping less than 2/3 of main size with weldolets, butt, or threaded type. Make branch connections 2/3 of main size and larger with weld tees, laterals, or crosses. Shaped nipples are not acceptable.
- P. Make reductions in piping lines with reducing coupling.
- Q. Support piping so as not to place a strain on valves or equipment.
- R. Install Copper Press System according to manufacturer's recommendations.
 - 1. Pipe shall be fully inserted into the fitting and pipe marked at the shoulder of the fittings.
 - 2. The fitting alignment shall be checked against the mark on the pipe to assure the pipe is fully engaged (inserted) into the fitting.
 - 3. Joint shall be pressed using the tool provided by the manufacturer.

3.04 JOINTS

- A. Joint methods shall be as previously specified in this section for the respective piped systems.
- B. All pipes must be reamed and cleaned before assembly. Apply pipe compound to male end of threaded joints. Make all welded joints as previously

specified.

- C. Assemble soldered copper pipe by cleaning, fluxing, and soldering per ASTM B32 with lead free solder and fluxes, except where a silver brazing alloy is specified.
- D. Assemble brazed copper pipe with silver brazing alloy having a melting point above 1000 degrees F.
- E. Make joints in above ground no-hub cast iron pipe systems for storm drain and soil, waste, vent and drain piping with engineered couplings comprised of rubber/elastomeric ribbed or grooved gasket, stainless steel shield band, and multiple stainless steel clamping as follows.
 - 1. Joints located in systems with less than 50 feet of elevation above.
 - a. For sizes through 2 inches, provide standard duty, CISPI 310 compliant as manufactured by Tyler, Anaco, Ideal, Clamp-All Corporation, or Husky.
 - b. For sizes 2-1/2 inches and larger, provide heavy duty 80 inch pound torque hubless soil pipe couplings. Provide Clamp-All Corporation Model 80, Husky Series 4000, Ideal HD, or Mission HW coupling conforming to FM1680 class one and ASTM C1540.
- F. Make solvent welded joints in PVC and CPVC piping with compatible solvents and/or cleaning chemical specified by manufacturer of the particular brand piping being installed. Contractor shall be responsible for safeguarding against incompatible solvents and cleaners
- G. Make push-on joints in underground PVC piping with elastomeric gaskets meeting ASTM F477.
- H. Make joints in underground cast iron soil, waste, vent and drain piping with hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

3.05 EXPANSION

- A. Install all piping throughout the project with adequate allowance for expansion to prevent damage to building, equipment, and piping. Provide anchors, loops, expansion compensators, or expansion joints for complete control of movement.
 - 1. Make changes in directions with fittings.
 - 2. Make branch connections to mains for domestic hot water risers with at least two (2) 90 degree elbows.
 - 3. Bullhead connections in any piping service are prohibited.

4. Supplement all loops, joints, compensators, etc. with adequate guides located as close to loops and joints as possible to preserve alignment and pitch. Provide control rods to prevent overextension or compression.
5. Securely attach pipe guides to the building structure.
6. Provide securely supported pipe anchors as required to control expansion, contraction in piping.
7. Locate the first pipe guide 4 pipe diameters from the expansion joint or expansion compensator. Locate the second pipe guide 14 pipe diameters from the expansion joint or expansion compensator. Install pipe guides according to manufacturer's recommendations.

3.06 SANITARY AND STORM DRAINAGE SYSTEMS

- A. Run all drainage and vent piping as direct as possible. Install drains, soil, waste, and storm piping in an actual location to meet the various building conditions. Do any work necessary to conceal piping or clear piping and ductwork of other trades.
- B. Slope branch soil, waste and storm pipes at an incline of at least 1/4 inch per foot of run, and main house drain and storm drain at 1/8 inch per foot unless noted otherwise. Make changes in direction of drainage piping by means of "Y" branches and 1/4, 1/8 or 1/16 bends except that sanitary 'T's and crosses may be used on vertical stacks. Make no unnecessary bends or offsets, where changes in direction are unavoidable make with bends of not more than 45 degrees.
- C. Provide cleanouts at base of all stacks and downspouts, at changes of direction and as indicated. Where more than one change of direction occurs in a run, only one cleanout is required for each 40 feet of developed length of drainage piping. Extend cleanouts on underground lines flush with finished floor or grade. Provide cleanouts not over 50 feet on center along straight runs. Install cleanouts same size of pipe up to 4 inch in diameter. Provide pipe over 4 inch in diameter with a 4 inch cleanout. All cleanouts shall be accessible.
- D. Lay all storm and sanitary sewers with full length of each section resting on a solid bed. Lay pipe starting at upgrade with spigot end of pipe pointing in directions of flow.
- E. Encase in concrete all sewers 14'-0" or more below grade.
- F. Provide engineered no-hub joint restraints for hubless cast iron piping greater than 4 inch in size in accordance with the CISPI installation at changes in direction and at changes in pipe size of two or more in accordance with the CISPI installation handbook.
- G. Terminate vent pipes at least 12 inch above roof utilizing black pipe. Maintain

a minimum distance of 10 feet (25 feet for health care facilities) from any type of outdoor air intake.

3.07 DOMESTIC WATER SUPPLY SYSTEM

- A. Install water system as indicated with hot and cold water being supplied and connected to all fixtures and equipment.
- B. Connect to the existing site water piping within building, as indicated on drawings.
- C. Pitch all water piping to drainage points, provide hose end drain valves at such points.
- D. Provide trap primer and domestic water piping to trap primer for all floor drains.
- E. Provide water hammer arrestors on all cold and hot water lines at each group of fixtures and at isolated individual fixtures having flush valves, hose sprays, and electronic quick closing activation. Install and size per manufacturers requirements and in an accessible location – provide access door as needed.
- F. Provide water hammer arrestors in water lines before all quick closing valves such as at dishwashers, and washing machines. Install and size per manufacturers requirements and in an accessible location – provide access door as needed.
- G. Provide unions at all equipment valves, strainers, etc., to facilitate removal for repair or replacement without disturbing adjacent piping.

3.08 RECIRCULATING HOT WATER SYSTEM

- A. Provide services of a certified AABC or NEBB test agency to test and balance the recirculating system. Conduct all tests according to with Associated Air Balance Council, National Standards for Field Measurements and Instrumentation, or at the contractor's option, he may himself perform tests and balance system in accordance with the following requirements:
 - 1. Balance recirculating system pump and all circuits to obtain scheduled flow rates.
 - 2. List design data for pump, obtain by measurement and tabulate pump motor voltage, pump motor operating current, pump head and flow. Submit manufacturer's pump curves, indicating operating point of pump.
- B. Connect the terminal point of the hot water mains as indicated on plans to recirculating hot water mains. Vent the recirculating mains through manual air vents and fixtures so no air binding will occur in them. Each branch return is to be valved to permit balancing of the system.

- C. At all hot water circuits provide an automatic flow regulating valve assembly, a downstream check valve, and a downstream shut-off valve to facilitate strainer cleaning and cartridge replacement for the automatic flow regulating valve without system draining or cutting of pipe. Clean out all strainers prior to final system balancing and project close out.
- D. Ensure that all mop basins piped from the hot water system have check valves in both hot and cold water piped to them
- E. Provide a manual air vents at the highest points of the system as needed and label locations on the as-built drawings.
- F. Connect the recirculating water return to the existing recirculating water main in the building.

3.09 NATURAL GAS PIPING SYSTEM

- A. Install new gas service from house main in gas meter room.
- B. Connect to all building equipment requiring gas. Install line size dirt leg (of three inch nipple minimum), shutoff valve, and union prior to reducing pipe size to equipment connection size.
- C. Gas piping underground inside building, install in a sealed schedule 40 steel conduit vented to building exterior. Do not install valves or unions on natural gas piping in return air plenums.
- D. Provide pressure reducing or pressure regulating valves with vent piping sized per manufacturer's recommendations and route piping to the outside. Terminate piping away from outside air intakes.
- E. Where pressure regulating valves are provided with external pilot, install piping between pilot and regulator.

3.010 CLEANING AND DISINFECTING

- A. Flush and disinfect all newly installed and or repaired potable water piping systems prior to utilization as required by the plumbing code.
- B. Chlorination procedures shall conform that prescribed by the local health department or water purveyor having jurisdiction. In absence of such, procedures described in AWWA Specification C651 or AWWA C652, or that listed in the plumbing code itself shall be acceptable.
- C. All flushing and chlorination shall be fully documented and submitted by the plumbing contractor. Include documentation and sample test reports in the Operating and Maintenance Manual.
- D. After initial period of operation clean all strainers, and dirt legs.

3.011 STARTUPS

- A. Coordinate schedule for start-up of various equipment and systems. Notify Owner at least three business days prior to start-up of each item.
- B. Provide written reports that equipment and systems have been properly installed and are functioning correctly. Where start-up is by a factory authorized representative, report shall be on manufacturer's forms intended for the purpose. Reports shall be included in the Operating and Maintenance Manual.
- C. Equipment and systems not installed properly or operating correctly shall be corrected or replaced and its proper operation shall again be verified. This Contractor shall be responsible for the costs of any and all re-inspections.

3.012 TESTS AND ADJUSTMENTS

- A. Obtain all inspections required by law, ordinances, rules, regulations of authorities having jurisdiction, furnish certificates of such inspections. Pay all fees, and provide all equipment, power and labor necessary for inspections and tests.
- B. During testing period maintain on the project an engineer thoroughly familiar with all phases for as long a period as required to thoroughly adjust all systems and demonstrate that they are functioning properly.
- C. Perform all tests, including but not limited to those specified, make necessary adjustments to obtain specified equipment and system characteristics.
- D. Do not consider work under this Specification complete until required inspections have been obtained, tests performed, necessary adjustments made and satisfactory evidence of compliance has been submitted. Architect reserves right to make spot checks to determine accuracy and completeness of final adjustments.
- E. Piping Pressure Tests:

- 1. All piping shall be given the following pressure test without pressure drop. Equipment which would be damaged by the required test pressure shall be isolated from the system during test.

SERVICE	MEDIUM	(PSI)	HRS.
Underground Water	Water	125	*
Domestic Water	Water	125	6
Gas	Air	**	**

* AWWA Procedures

** International Fuel Gas Code (NFPA 54) test procedures

*** Refer to Section 22 60 00 for test procedures

Sanitary and storm sewers per State Plumbing Code or Local Authority

- 2. Correct minor leaks in welded joints by chipping out weld and re-welding.

Correct leaks in screwed joints by replacing thread or fitting or both. Caulking of threaded joints is not permitted. Repair leaks in copper tubing by sweating out joints, thoroughly cleaning both tube and fitting, and resoldering.

3. Perform all tests before piping is concealed or covered.
4. Be responsible for completely draining the systems after hydrostatic tests are performed. Any damage from freezing prior to acceptance of the completed installation shall be repaired at no additional cost to the Owner.
5. All tests shall be scheduled and documented. Include copy of the piping system pressure test reports in the Operating and Maintenance Manual.

3.013 SYSTEM AND EQUIPMENT IDENTIFICATION

A. Valve Identification

1. Identify all valves with tags attached with chain. Local valves need not be tagged. All valves shall be designated by distinguishing numbers and letters carefully coordinated with a valve directory. All letter and number designations shall be coordinated with the Owner.
2. Designations and locations shall be accurately recorded on the Record Drawings.
3. At completion of project, provide a framed valve directory, under Plexiglass, giving number of valve, service, building location by column coordinates, floor location, manufacturer's figure number, size, and equipment controlled. For service, use designation shown in legend on drawings. Mount where directed by Owner.
4. Identify each new pipe, in Equipment Rooms, above accessible ceilings and in accessible shafts.
5. Markers shall be located:
 - a. Adjacent to each valve.
 - b. At each branch.
 - c. At each cap for future.
 - d. At each riser takeoff.
 - e. At each pipe passage through wall (each side).
 - f. At each pipe passage 20' - 0" intervals maximum.
 - g. At each piece of equipment.

- h. At all access doors.
 - i. A minimum of one (1) marker shall be provided at each room.
6. Provide detectable tape on underground piping exterior to the building.

3.014 EXCAVATION AND BACKFILL

- A. Do all excavation and backfilling necessary for installation of work.
- B. Prior to opening an excavation, determine whether underground installations; i.e., sewer, telephone, water, fuel, electric lines, etc., will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated location of such an installation, determine the exact location and when it is uncovered, provide proper supports for the existing installation. Contact and advise Utility companies of proposed work **PRIOR TO THE START OF ACTUAL EXCAVATION**. Contact Ohio Utilities Protection Service 48 hours prior to starting work. Telephone 1-800-362-2764.
- C. Dig trenches to exact grade and depth with only sufficient dirt removed at holes to provide working space. Dig bell holes to insure pipe resting for its entire length upon bottom of trench. Refill trenches dug below required depth to proper depth with sand. Dig trenches not more than 18 inches wider than external diameter of pipe and sides practically perpendicular. Shore or sheet pile trenches if necessary to prevent caving.
Do not endanger work of other contractors or existing structures. Contractor will be held solely responsible for damage.
- D. In event that rock is encountered during excavation, notify Architect at once. In event that shale is encountered or any condition such that it is not possible to provide a flat even grade in bottom of trench, lay pipe line in a bed of sand of sufficient depth to properly support pipe.
- E. After installation and testing of piping has been completed and approved for backfill, refill all excavation inside of building and under paved areas outside of building with number 57 backfill per ASTM D-448 [or ODOT No. 304] or the previously excavated material if this excavated material is determined by the Architect to be suitable for reuse. Backfill and tamp in 6 inch layers. Refill trenches outside of building and not under paved areas with selected dirt as specified under Division 31 "Earth Work" to 6 inches above finished grade to provide for settlement.
- F. Where sand is used for backfill provide compacted clay bulkheads to prevent groundwater in sand from draining to building.
- G. Remove, dispose of any material not used for backfill.
- H. Take special care to protect trees and shrubbery adjacent to trenches. If roots of live trees are encountered in excavation, protect as directed.

- I. Provide, operate, pumping equipment as necessary to keep trenches, other excavations, free of water. Do not install piping in trenches until trenches have been pumped and bottom dried out sufficiently to receive piping.
- J. When excavation is necessary in an existing lawn, resod to match existing lawn, as approved.
- K. Where trenches cross roads, walks, or public thoroughfares, provide suitable barricades and bridges adequately protected by signs or red flags during day and lights at night.
- L. Repave all streets or sidewalks disturbed to satisfaction of Architect and authorities having jurisdiction.

END OF SECTION

SECTION 22 07 00 – PLUMBING INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDES

- A. All labor, equipment, accessories, materials and services required to furnish and install all insulation, fittings and finishes for piping and related mechanical equipment in the plumbing systems.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 22 01 00 – Plumbing General Provisions
- B. Section 22 03 00 – Plumbing Basic Materials and Methods
- C. Section 22 04 00 – Plumbing Firestopping

1.03 SUBMITTALS

- A. Refer to Section 22 01 00.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide all insulation material (insulation, jackets, fitting covers, adhesives, cements, mastics, sealers coatings and finishes) with a composite Fire and Smoke Hazard rating as tested under procedure ASTM E-84, NFPA 255 or UL 723, not exceeding, as follows:
 - 1. Flame Spread 25
 - 2. Smoke Developed 50

2.02 INSULATION PRODUCTS

- A. Provide the following insulation products as manufactured by Owens-Corning. Insulation products as manufactured by Armstrong, Johns Manville, Certain Teed, or Knauf are acceptable. Adhesives shall be Foster Products or equal.
- B. OWENS-CORNING FIBERGLASS: ASJ/SSL-II ONE PIECE PIPE INSULATION (refer to thickness schedule.)

<u>Service</u>	<u>Thickness Schedule Type</u>
Domestic cold water	A
Horizontal storm conductors	A
Horizontal and vertical storm conductors (overflow)	A
Domestic hot water	C
Recirculating hot water	B
Horizontal sanitary piping carrying A/C condensate drainage within 30 feet of floor drain	A

C. OWENS-CORNING FIBERGLASS 705: ALL SERVICE JACKET (ASJ) EQUIPMENT INSULATION (Density 6 pounds per cubic foot)

Service

Roof drain sumps (1 inch thick)

2.03 SCHEDULE OF FIBERGLASS PIPE INSULATION THICKNESS

A. MINIMUM PIPE INSULATION THICKNESS (inches.)

Thickness Schedule Type	PIPE SIZES (INCHES)					MAX 'K' FACTOR	MEAN TEMP RATING °F
	To $\frac{3}{4}$	1 to $1\frac{1}{4}$	$1\frac{1}{2}$ to 3	4 to 6	8 and above		
A	$\frac{1}{2}$	$\frac{1}{2}$	1	1	1	0.25	75
B	1	1	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	0.25	100
C	1	1	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	0.28	100

PART 3 - EXECUTION

3.01 GENERAL

- A. Install insulation products according to manufacturer's printed instructions and this specification.
- B. Install all insulation over clean dry surfaces. Insulation must be dry and in good condition. Wet or damaged insulation will not be acceptable.
- C. Install insulation subsequent to installation of heat tracing, painting, and pressure tests.
- D. Install insulation materials with smooth even surfaces.
- E. Repair existing pipe and equipment insulation where removed to make new connections, or where damaged by new construction. Use same insulation as specified for new service.

- F. Where existing asbestos insulation is discovered or suspected notify the building Owner immediately so it can be removed under a separate "Asbestos Removal Contract" direct with the Owner.

3.02 INSTALLATION - PIPING INSULATION

- A. On exposed piping, locate insulation and cover seams in least visible locations.
- B. Install insulation continuous through all wall, floor and ceiling openings, sleeves and pipe hanger locations.
- C. Install fiberglass pipe insulation with joints butted firmly together. Seal jacket laps with butt strips, having factory applied adhesives. Insulate valves and fittings using mitered sections of insulation cement, or premolded fitting insulation. Cover valves and fittings with the same type of insulation as used on the piping.
- D. Cover valve bonnets, unions and strainers with insulation. Taper all insulation ends, seal and cover with glass cloth regardless of service. Where vapor barrier jackets are used on cold surfaces apply insulation with vapor seal integrity maintained throughout the entire system.
- E. Extend all pipe insulation through floor and countertops. Wherever subject to moisture or cleaning equipment provide 0.016 inch thick aluminum jacket of sufficient length for protection.
- F. Cover exposed pipe insulation located in mechanical rooms with PVC jacket.
- G. Exterior canopy storm and overflow piping insulation can be omitted if not run through any heated space.

3.03 INSTALLATION - EQUIPMENT INSULATION

- A. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose
- B. Install insulation materials with smooth and even surfaces. Rework poorly fitted joint. Do not use joint sealer or mastic as filler for joint gaps and excessive voids resulting from poor workmanship. Apply using staggered joint method for both single and multi-layer installation, applying each layer of insulation separately.
- C. Coat insulated surfaces without vapor barrier with a layer of insulating cement, troweled to a smooth and continuous surface. Fill in seams, broken edges, and depressions. Cover over wire mesh and joints with cement sufficiently thick to remove surface irregularities.
- D. Maintain the integrity of factory-applied vapor barrier jacketing on all insulation, protecting it against puncture, tears or other damage.

- E. For field-applied all-service vapor barrier jacketing, neatly fit and tightly secure. Lap seams 2 inches minimum. Seal all joints with adhesive. Tape with 3 inch matching pressure-sensitive tape or 3 inch glass fabric and mastic.
- F. Removable insulation: Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance, such as vessel covers, fasteners, flanges, frames and accessories.
- G. Areas left uninsulated: Items such as handholes, clean-outs, ASME stamp, and manufacturer's nameplates, shall be left uninsulated unless omitting insulation would cause a condensation problem. When such is the case, appropriate tagging shall be provided to identify the presence of these items. Provide neatly beveled edges at interruptions of insulation.
- H. Miter rigid fiberglass equipment insulation to fit shape of equipment and secure in place with steel bands on 12 to 18 inches on center. Seal all joints with matching pressure sensitive joint sealing tape.

3.04 FIELD QUALITY ASSURANCE

- A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be accomplished while work is in progress to assure compliance with requirements to cover and protect insulation materials during installation.

3.05 PROTECTION

- A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.
- B. The insulation installer shall advise the General and the Plumbing Contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

END OF SECTION

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 WORK INCLUDES

Water Closets
Water Closet Seats
Urinals
Flush Valves
Fixture Carriers
Sinks
Faucets
Fixture Supplies, Drain Assemblies, and Traps
Electric Water Coolers

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 22 01 00 - Plumbing General Provisions
- B. Section 22 03 00 - Plumbing Basic Materials and Methods
- C. Section 22 07 00 - Plumbing Insulation

1.03 SUBMITTALS

- A. Refer to Section 22 01 00.

PART 2 - PRODUCTS

2.01 GENERAL

A. General

1. Refer to the Plumbing Fixture Schedules on the Drawings for the model number and manufacturer's names given for each plumbing fixture, fitting, and accessory. The scheduled fixtures indicate the basis of design and configuration. The remainder of this section shall further cover general requirements for typical fixture types and their installations
2. All fixtures and their components furnished by this contractor shall be ANSI, ASME, and NSF compliant.
3. Include all plumbing fixtures complete, cleaned, and ready for use including, but not limited to supply stop-valves, check-stops, fixture supplies, traps, escutcheons, vacuum breakers, miscellaneous supports, low voltage wiring and any required accessories.
4. Refer to Architectural elevations for intended placement of fixtures and their components provided under this division and components provided

by other divisions that affect the installation and use of the fixture. Install all components within required ADA dimensions mandated by the applicable State observed code referenced ANSI 117.A along with manufacturer's rough-in dimensions necessary to its function. In the event of a conflict with said requirements of fixtures and components verse the Architectural elevations, notify the construction managing party, or design team prior to rough-in for clarification and resolution. The locations of piping and or drops shown on the plumbing drawings are diagrammatic, not precise, nor defining of actual rough-in or fixture placement.

B. Fixture Finishes

1. Provide fixtures constructed of vitreous china white in color unless noted otherwise, and with all visible surfaces glazed.
2. Furnish enameled cast iron fixtures constructed of cast iron with non-staining, acid resistant, porcelain enameled coat thoroughly fused on the surfaces.
3. Furnish stainless steel sinks with satin finish, unless noted otherwise.
4. Provide exposed faucets, traps, connecting piping, stops, flush valves and other fixture trim with chromium plated finish and brass construction unless noted otherwise.
5. Provide all fastenings of chromium plated brass, Type 302 stainless steel or matching color and finish of fixture.

C. ADA Protective Covers

1. ANSI A177-1-1980 Vinyl or compliant insulation kit. Closed cell PVC molded anti-microbial components for wastes and supplies of lavatories complete with weep holes and vandal resistant fastening.
2. Manufacturer: Plumberex, or equivalent kits by McGuire or Truebro.

D. Sealant: For use between plumbing fixture and wall: General Electric Sanitary Silicone 1702.

2.02 ACCEPTABLE MANUFACTURERS

A. Vitreous China and Enameled Steel Fixtures: Water Closets, Urinals

1. American Standard
2. Kohler
3. Zurn

B. Water Closet Seats

1. Bemis
2. Beneke
3. Church
4. Olsonite
5. Sperzel

C. Flush Valves

1. Sloan
2. Zurn
3. Delany

D. Fixture Carriers

1. Jay R. Smith
2. Josam
3. Wade
4. Watts Drainage
5. Zurn
6. MIFAB

E. Stainless Steel Sinks

1. Just
2. Elkay
3. American Standard
4. Moen Commercial

F. Faucets

1. Chicago Faucet
2. T & S Brass
3. Zurn

G. Fixture Supplies, Drain Assemblies, and Traps

1. Chicago
2. EBC
3. Watts (commercial only)
4. Brass Craft
5. Dearborn Brass
6. McQuire manufacturing
7. T & S Brass
8. Just
9. Elkay
10. Kohler
11. Zurn

H. Electric Water Coolers and Drinking Fountains

1. Acorn
2. Elkay
3. Halsey Taylor
4. Haws
5. Oasis

2.03 WATER CLOSETS

- A. Fixtures: Vitreous china or stainless steel siphon jet action, elongated or round bowl, in configurations of wall hung – wall outlet, floor mounted – floor outlet, or floor mounted – wall outlet. ADA compliant fixtures shall have a seat height of 17” to 19” above finished floor.
 1. Flush valve type closets with 1-1/2” top or rear spud, and 1.28 gallons per flush or less.
- B. Seats: Color matching heavy duty commercial grade, open front, integral bumpers, self-sustaining check hinges with 300 stainless steel posts, and stay tight torque shearing fasteners. For all healthcare and educational facilities, provide seats with impervious anti-microbial agent and liftable hinge system for cleaning. Provide matching lids only when scheduled
- C. Flush Valves: Exposed, chrome plated, metal oscillating, non-hold-open

handle, or auto sensing activation, 1 inch IPS screw driver angle stop with protective cap, adjustable tailpiece, vacuum breaker flush connection and spud coupling for 1-1/2 inch top or rear spud, wall and spud flanges, and gallon per flush as scheduled.

- D. Carriers: Wall hung water closets shall be supported by ASME A112.6.1M compliant. Single or double inlet, horizontal or vertical arrangement as needed for plan layout. Carriers shall be cast iron, adjustable type, foot support, through wall finishing frame, chromium plated finished trim, and the required accessories of the type appropriate for the pipe materials specified.
 - 1. All wall hung water closets installations shall be capable to withstand a minimum of 500 lbs. Provide vitreous china fixtures compliant to ASME A112.19.2.2M 500 lb. load test and install with using a heavy duty 500 lb rated carrier. Standard 300lb. rated carriers are not acceptable.

2.04 URINALS

- A. Fixtures: Vitreous china or stainless steel. Washout or blowout flushing action, or waterless. Configurations of wall hung – 2” wall outlet or floor mounted – 3” floor outlet. ADA compliant wall hung fixtures shall have a lip height or 14” to 17” above finished floor as required by the manufacturer’s installation instructions. Location of ADA urinals shall be as indicated on the architectural drawings.
 - 1. Flush valve type urinals with ¾” or 1-1/4” top or rear spud, and gallon per flush as scheduled.
 - 2. Waterless type urinals to be complete with trap seal. For replaceable type trap seals; install one cartridge, and furnish one spare.
- B. Flush Valves: Exposed, chrome plated metal oscillating non-hold-open handle or auto-sensing activation, 1 inch I.P.S. inlet, screw driver check angle stop with protective cap, adjustable tail piece, vacuum breaker flush connection and spud coupling for top or rear spud, wall and spud flanges.
- C. Carriers: Wall hung fixtures for frame wall construction shall be supported by ASME A112.6.1M compliant concealed adjustable carrier with steel uprights and block feet for securing to the floor. Masonry wall supports to be similar less steel uprights.
 - 1. Fixture carriers shall be capable to withstand the 200 lb load test as per the ASME standard.

2.05 SINKS

- A. Fixtures: 18 gauge min. type 304 stainless steel with sound deadening undercoating and radius corners, in configurations of wall-hung, floor mounted, countertop drop-in, or under mount.

- B. Faucets: Commercial grade lead free brass construction with chrome plated finish. Deck or wall-mounted, auto-sensing or manual operation with fixed or swivel spout. Furnish complete with all suitable mounting hardware and components. All faucets shall have a vandal resistant removable laminar flow outlet, aerator, or spray-head at the outlet or the spout.
 - 1. Manual operated faucets shall have vandal resistant removable handles and replaceable cartridges or ceramic discs.
 - 2. Auto-sensing faucets shall have all necessary electronic components for activation. Auto-sensing faucets without user adjustable temperature control shall be furnished with an ASSE 1070 thermostatic mixing valve (blending valves are not acceptable).
- C. Supplies: Chrome plated field bent tubing supplies with loose key or handle quarter-turn ball valve stops, reducers, and escutcheons at wall or casework backing.
- D. Sink drains: Stainless steel with chrome plated flat grid strainer(s) (7) hole minimum. Sinks to have 1-1/2" tailpiece(s).
- E. Traps: Provide 17 gauge chrome plated brass tubular waste piping with adjustable "P" trap with cleanout. Provide escutcheon at wall or casework backing. Non threaded slip type gasket trap adapters shall not be acceptable.

2.06 ELECTRIC WATER COOLERS

- A. Fixtures: Single or dual user with either manual or auto-sensing activation. Construction shall be lead free ASME, NSF, and UL compliant and utilizing 134a refrigerant. Configuration shall be recessed, surface mounted or free standing. Fixture shall have stainless steel top(s) and edge surfaces with shielded one-piece chrome plated bubbler(s). Inner framing shall be heavy gauge galvanized steel with required installation brackets or tabs for framed or masonry walls. Wall panels and enclosure cabinets shall be removable for servicing with vandal resistant fasteners. Wall panels shall be stainless steel or otherwise selected by architect. Power supply shall be flexible power cord with grounded three prong plug.
- B. Carriers: Wall hung fixtures for frame wall construction shall be supported by ASME A112.6.1M compliant concealed adjustable carrier with steel uprights and block feet for securing to the floor. Masonry wall supports to be similar with Manufacturer's steel wall plate.
 - 1. Fixture carriers shall be capable to withstand the 200 lb for a single unit and 300 lb for dual bi-level unit load test as per the ASME standard.
- C. Supply: Provide stop valve.
- D. Drain: Provide 17 gauge brass "P" trap, and 17 gauge waste to wall. Non threaded slip type gasket trap adapters shall not be acceptable.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Refer to Architectural Drawings for indication of mounting heights for plumbing fixtures.
- B. Install all fixtures square with wall, inline, level, and plumb. Install faucet lever and wrist blade type handles also parallel with the wall and completely symmetrical. Install specified convertible faucet spouts in the rigid fashion for lavatories and hand washing sinks, install them in the swing fashion for all large sinks in lounges and utility cleaning rooms and at double compartment sinks.
- C. Fixture Carriers: Install and anchor in according to the manufacturers' published instructions.
- D. Fixture carriers: To comply with the ASME A112.6.1M standard, the installing contractor shall install and anchor all fixtures explicitly per the manufacturer's instructions including all specified hardware. Compliance to size, material, and quantity of fasteners as prescribed by the manufacturer shall be the responsibility of the installing contractor. Provide and submit documentation and sign-off approval of the installation from the construction manager prior to concealing behind walls. Failure of any fixture without submitted documentation shall be the responsibility of the plumbing contractor including all wall repairs.
- E. Secure plumbing fixture P-traps, lavatory wall supplies and flush valve supply to wall to prevent any movement.
- F. Water Closets: For handicapped accessible fixtures, mount flush valve handle on the access side of the fixture.
- G. Install all exposed plumbing trim, supplies, and waste, including traps.
- H. Install shut off valves for each hot and cold water connection to fixtures and equipment if not provided with stops. Use angle or straight type fixture stops adapted for each particular location. Locate fixture stops immediately adjacent to the fixture. Provide threaded adapters when used in conjunction with copper piping.
- I. Provide vacuum breakers as a part of the fixture trim wherever there is a possibility of back-siphoning.
- J. Seal space between plumbing fixtures and wall or floor with silicone sealant to provide watertight installation.
- K. Clean all fixtures removing stains. Remove labels. Adjust flush valves and other fixture water supplies to provide proper water flow.

- L. Protect plumbing fixtures after installation until construction is completed and accepted by Owner. Remove protection, including paper covering on china and enameled ware, when ready for use.
- M. For solid surface countertops requiring basins, faucets, and equipment to be installed, the plumbing contractor shall provide templates, locations, and dimensions of all required cut-outs and drilled holes. The cutting and drilling of solid surface material countertops shall be performed by the general contractor that is responsible for installing such. For laminate type countertops, the plumbing contractor shall be responsible for all cut-out and drilling required.
- N. All fixture low voltage wiring shall be by this Contractor. Wiring shall be run in conduit per Division 26 requirements.

END OF SECTION

SECTION 23 01 00 – HVAC GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED CONTRACT DOCUMENTS

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates and Addenda are a part of this Specification. Contractors and Subcontractors shall examine these provisions as they may affect work under this Division.
- B. Contractor shall examine Division 1 Contract Documents for general project requirements.
- C. Contractor shall also examine the Contract Documents of all Divisions which may affect work under this Division. Contractor shall be responsible for HVAC work required.

1.2 DESCRIPTION OF WORK

- A. This project involves work in an existing operating facility and will require close communication with Owner in regards to access and work hours. Coordinate all work schedules prior to bidding with Owner and Construction Manager.
- B. HVAC, Architectural, Electrical, Plumbing, Structural, Civil, Technology and all other Drawings as well as the Specifications for all the Divisions shall be defined as the Contract Documents. Contractor shall review entire set of Contract Documents prior to bidding.
- C. Drawings and Specifications are to be considered as supplementing each other. Work specified but not shown, or shown but not specified, shall be performed or furnished as though mentioned in both the Specifications and the Drawings.
- D. Prior to submitting bid, Contractor shall examine all Drawings and Specifications to develop a complete understanding of the project scope. Contractor shall ask for clarifications during the pre-bid phase of the project. Failure to do so will not relieve the Contractor of their responsibility to perform all required work.
- E. Where the project scope involves renovations and additions, it is strongly recommended that Contractors visit the site of the work and become familiar with the conditions affecting the installation. Submission of a Bid shall presuppose knowledge of such conditions and no additional compensation shall be allowed where extra labor or materials are required because of the lack of knowledge of these conditions.
- F. Bid shall include any special phasing requirements related to the construction work as described in the Contract Documents. Coordinate with Division 1.
- G. Extra costs which might result from deviations from the Drawings, so as to avoid interferences, shall be considered a "Job Condition", and no additional

compensation shall be considered applicable. In the event that such interferences occur in course of the work, due to an error, omission, or oversight by the Contractor, no additional compensation shall be allowed. Interferences that may occur during the course of construction shall be brought to the immediate attention of the Architect and Engineer, and the Architect and Engineer's decision, confirmed in writing, shall be final.

- H. The following general terms as used within the context of the HVAC Contract Documents shall be defined as follows:
1. "Contract Documents" - The complete set of Drawings and Specifications for all Divisions included in the project.
 2. "Drawings" - Drawings furnished as part of the Contract Documents.
 3. "Contractor" - HVAC Contractor and the HVAC Contractor's Subcontractors.
 4. "Responsible" - To perform work required.
 5. "Furnish" - To supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations.
 6. "Install" - Work which includes the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
 7. "Provide" - To furnish and install, complete and ready for the intended use.
 8. "Equal" - To meet or exceed the standards of the specified products or listed manufacturers.
 9. "Mechanical" - HVAC, Plumbing and Fire Protection Divisions as applicable.

1.3 WORK INCLUDES

- A. Include all labor, material, equipment, services, permits, fees, coordination, supervision and administration necessary for the proper completion of all HVAC work shown. Items omitted, but necessary, to make the HVAC systems complete and workable shall be understood to form part of the work.
- B. Material for work required to complete installation such as earthwork, concrete, masonry, mortar, reinforcing steel, patching and painting shall be provided as specified in other applicable Divisions covering such work.
- C. Provide material and labor which is neither drawn nor specified but which is obviously a component part of and necessary to complete work and which is customarily a part of work of similar character.
- D. Include all testing, test reports, system programming, start-up reports and warranties for each system as outlined elsewhere in these Specifications. Refer to "Operating and Maintenance Manuals" for additional requirements.

1.4 PERMITS AND FEES

- A. Secure and pay for permits and inspections required for the HVAC work. Turn over certificates of approval to the Owner or Construction Manager promptly when received, and before payment is made for the work.
- B. Give proper authorities notice as required by law relative to the work in their charge. Comply with the regulations regarding temporary enclosures, obstructions or excavations and pay all legal fees involved.

1.5 QUALITY ASSURANCE

- A. Work shall be installed in accordance with provisions of all applicable codes, as interpreted by the local Authority Having Jurisdiction (AHJ), as well as any further modifications or regulations published by local or State Authorities.
- B. Reference to the codes and standards listed shall constitute the minimum acceptable requirements. Nothing in the Specifications shall be construed to permit deviation from the requirements of the governing code. Where requirements of the Drawings and Specifications exceed those of the code listed, follow the Drawings and Specifications.
- C. The following building codes with amendments shall be followed:
 - 1. 2011 Ohio Building, Mechanical, Plumbing and Fire Codes
 - 2. 2009 International Fuel Gas Code
- D. Applicable portions of the following codes, standards, societies and agencies shall be followed. Where a specific edition is listed, it shall be used. Where not listed, the edition recognized by the Authority Having Jurisdiction shall be used. Listing of a specific portion of a code, standard, society or agency does not preclude the Contractor from following all other applicable portions of the code, standard, society or agency.
 - 1. American National Standards Institute (ANSI)
 - 2. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
 - 3. American Society of Mechanical Engineers (ASME)
 - 4. American Society of Testing and Material (ASTM)
 - 5. American Welding Society (AWS)
 - 6. Americans with Disabilities Act (ADA) - Americans with Disabilities Act Accessibility Guidelines (ADAAG)
 - 7. Federal Occupational Safety and Health Act (OSHA)

8. National Electric Code (NEC)
 9. National Fire Protection Association (NFPA)
 10. Ohio Facilities Construction Commission (OFCC)
 11. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 12. Underwriters Laboratories, Inc., Standards for Safety (UL)
- E. All Contractor personnel who perform installation, maintenance or repair work who might have the opportunity to release CFC's, HCFC's, or HFC's into the atmosphere shall have a UNIVERSAL certification as required by Environmental Protection Agency, Section 608 Regulatory Requirements: Stationary Refrigeration and Air Conditioning.
- 1.6 ELECTRONIC MEDIA
- A. Electronic drawing files are available to the Contractor, from the Engineer for coordination purposes as defined in Division 0 and Division 1.
 - B. Contractor shall deliver closeout documents on a portable memory device. Portable memory device shall refer to CD, DVD, Flash Drive, external hard drive or any other portable media used for storing electronic files.
- 1.7 SUBMITTALS
- A. Prior to commencing work, submit product data and/or shop drawings for HVAC equipment, materials and systems as described herein and as required in each individual Division 23 Specification section. Provide all Submittals far enough in advance of scheduled dates for installation to provide sufficient time for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery.
 - B. Conform to submittal requirements outlined in Division 1 Specifications. Provide Submittals in an electronic format. The file format shall be portable data file (.pdf).
 - C. Prepare Submittals with adequate details and dimensions as necessary to clearly show construction. Clearly identify each item on the Submittal with designation as indicated on Drawings including location and use. Include with Submittals Manufacturer's published descriptive literature, specifications, performance data (normal operating characteristics, curves, ratings, etc.), wiring diagrams and installation instructions. Indicate for each item the operating characteristics, design conditions, features, and optional items that are intended for application on this project. Where contents of Submittal literature includes data not pertinent to the Submittal, clearly indicate (highlight) which portion of content is being submitted for review.

- D. If for any reason, the Submittal shows variations from the requirements of the Contract Documents, the Contractor shall make mention of such variation in the letter of transmittal. The Contractor shall note in red on the Submittal any change in design or dimension on the items submitted including changes made by the Manufacturer which may differ from catalog information.
- E. Where additional installation drawings, wiring diagrams or other drawings are specified elsewhere as part of the project requirements, they shall be submitted at the same time as the Submittals. Partial Submittals are not acceptable.
- F. Contractor shall review each Submittal prior to submission, and check for compliance with the Contract Documents. Corrections shall be noted. Mark with approval stamp prior to submission. Submittals that do not bear the Contractor's approval stamp will be returned without action.
- G. The Submittals will be reviewed only for General compliance and not for dimensions, quantities, etc. The Submittals that are returned shall be used for procurement. The responsibility of correct procurement remains solely with the Contractor. The Submittal review shall not relieve the Contractor of responsibility for errors or omissions and deviations from the Contract Document requirements. Submittals which are not required under this Division shall be returned to the Contractor.
- H. After review of submittals by the Engineer, the Contractor shall revise and resubmit if required to establish compliance with the Contract Document requirements. Resubmittal shall include a document with a written response to each of the Engineer's previous comments.
- I. The Contractor shall notify the Engineer when all product data and/or shop drawings for HVAC equipment, materials and systems have been submitted for review.
- J. The Contractor agrees that Submittals, processed by the Engineer, are not change orders; that the purpose of submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design intent of the project. This understanding is demonstrated by indicating which equipment and material is required, and by what methods of fabrication and installation will be utilized.
- K. The Contractor further agrees that if deviations, discrepancies or conflicts between the Submittals and the Contract Documents are discovered, either prior to or after Submittals are processed by the Engineer, the Drawings and Specifications shall control and shall be followed.
- L. Final reviewed submittals shall be included in the Operating and Maintenance Manuals. Where Submittals are returned "REVIEWED, EXCEPTIONS AS NOTED", the final Submittals shall be updated to include the exceptions. Upon ordering equipment, order sufficient number of sets of product data literature for the Operating and Maintenance Manuals.

M. Submit product data for the following. Refer to specific Specification sections for additional requirements.

1. Basic Materials and Methods
 - a. Piping, Fittings, and Unions
 - b. Valves
 - c. Strainers
 - d. Dielectric Connections
 - e. Combination Balancing/Shut-off Valves
 - f. Inserts, Hangers, and Supports
 - g. Roof Curbs and Supports
 - h. Access Doors
 - i. Nameplates, Markers, and Tags
2. Firestopping
3. Variable Frequency Drives
4. Vibration Isolators
5. Testing, Adjusting, and Balancing
6. Insulation
7. Temperature Control System Components
8. HVAC Air Distribution Equipment
9. Packaged Outdoor HVAC Equipment
10. Decentralized HVAC Equipment
11. Any other specified system or equipment not listed

N. Submit shop drawings for the following. Where project floor plans are required, refer to Electronic Media section for requirements for obtaining electronic drawing files. Refer to specific Specification sections for additional requirements.

1. Temperature Control System Drawings and Sequences of Operations
2. Ductwork Fabrication Drawings

1.8 CONSTRUCTION DOCUMENTATION

A. Coordination Drawings

1. Refer to Division 1 for additional requirements.
2. Preparation of Coordination Drawings shall be the responsibility of the HVAC Contractor.
3. Refer to Electronic Media section for requirements for obtaining electronic drawing files of the project floor plans.
4. Prepare Coordination Drawings at minimum scale of 1/4" = 1'-0". Submit electronic drawing files to Architect for review. Drawings shall be submitted on a potable memory device.
5. Coordination Drawings shall include but not be limited to, locations of equipment and devices, ductwork, piping, and conduit routing and required service clearances for all trades. Show the relationship of all components as related to installation and future access for maintenance and removal. Where access doors are required, indicate locations and type. Show locations of all ductwork, piping and conduit penetrations through wall and floors. Show existing items affecting new installation in remodeled areas.
6. Secure from other trades, information necessary for the development of Coordination Drawings. Items shall include but not be limited to: framing and suspension of ceilings; locations and sizes of equipment and devices; conduit, piping, and ductwork routing and sizes; and required service clearances. How this information is supplied shall be discussed and decided between all trades. Coordination meetings between all trades are strongly recommended.
7. Before preparing Coordination Drawings, coordinate locations of all floor, wall, and roof penetrations including sleeve requirements with General Trades. Coordinate locations and types of all access doors with the Architect and General Trades.
8. Before preparing Coordination Drawings, provide to the Structural Engineer electronic drawing files indicating the size and location of all penetrations through slabs. The Contractor shall make all adjustments as required by the Structural Engineer.
9. Secure approval of Coordination Drawings from other trades affected, prior to submittal to Architect for review. Each trade must indicate acceptance of illustrated conditions by attaching their endorsement to each Drawing.
10. Proceed with installation only after review of Coordination Drawings by Architect and approval from other trades affected. Architect does not approve Coordination Drawings.

11. The Coordination Drawings shall be updated to include any deviations made during construction as required to create Record Drawings.

B. Testing, Adjusting and Balancing Report

1. Submit Testing, Adjusting and Balancing Report to Engineer upon completion.
2. Refer to Section 23 03 00 for additional information.
3. Final copy shall be included in Operating and Maintenance Manuals.

C. Pipe Cleaning and Pressure Tests

1. Submit pipe system cleaning and pressure testing documentation to Engineer upon completion of testing.
2. Refer to Section 23 03 00 for additional information.
3. Final copies shall be included in the Operating and Maintenance Manuals.

D. Ductwork Pressure Tests

1. Submit ductwork pressure testing documentation to Engineer upon completion of testing.
2. Refer to Section 23 30 00 for additional information.
3. Final copies shall be included in Operating and Maintenance Manuals.

1.9 GUARANTEE AND WARRANTIES

- A. Warrant that equipment and all work is installed in accordance with good workmanship practice. All equipment shall be installed in accordance with the Manufacturer's recommendations and shall meet the requirements specified. Any equipment failing to perform or function as specified shall be replaced with complying equipment without cost to the Owner. Warranty shall commence upon acceptance of substantial completion of construction by the Owner. Sign-off of individual equipment start-up procedures shall not activate the warranty commencement.
- B. The Contractor shall review the construction schedule requirements defined in Division 1. Where necessary to accommodate the schedule and where equipment and systems are installed that are used by the project until the date of substantial completion, the Contractor shall provide an extended warranty as part of the Bid to cover the equipment warranty until the date of substantial completion.
- C. Guarantee against defects in workmanship and materials; repair or replace any defective work, material or equipment within one year from date of formal written warranty commencement. Longer product warranties provided by

individual equipment manufacturers shall supersede this one year guarantee; however, the Contractor shall maintain the one year workmanship and materials guarantee for installation of such equipment. Coordinate guarantee and warranty requirements with Division 1 Specifications.

D. Guarantee air conditioning equipment refrigeration compressors for five years.

1.10 CLOSEOUT DOCUMENTS

A. Record Drawings:

1. Record Drawings shall consist of updated Coordination Drawings as defined elsewhere in the Specifications. Refer to Division 1 for quantities, special formatting, and additional requirements.
2. Updated Coordination Drawings shall be reproduced electronically from the original Coordination Drawings in an approved format. Drawings shall include any deviations or changes made during construction. Drawings shall only include Division 23 work. Work of other divisions shall be removed. At the end of the project, the electronic drawing files shall be transferred onto a portable memory device. Both hard copy drawings and the portable memory device shall be provided as Record Drawings.
3. Record Drawings shall reflect as-built conditions and show changes in:
 - a. Size, type, capacity, etc. of any material, device or piece of equipment
 - b. Location of any device or piece of equipment
 - c. Location of any outlet or source in building service system.
 - d. Routing of any piping, conduit, ducts or other building services.
4. Record Drawings shall indicate the location of all underground, under floor and concealed piping.
5. Record Drawings shall indicate the location of each respective penetration made through any fire rated assembly. Include the corresponding UL system number, from the current UL Fire Resistant Directory that was used to firestop the penetration.
6. Record Drawings shall indicate the location of all tagged valves and traps including the tag designations.
7. After the project is completed, the Record Drawings shall be delivered to the Architect for inclusion into the Operating and Maintenance Manuals, as a permanent record of the installation as constructed.

B. Operating and Maintenance Manual (OMM)

1. Furnish complete bound sets of Operating and Maintenance Manuals. Refer

to Division 1 Specifications for quantities and for additional requirements.

2. Bind the required material into a hard-backed binder(s) where they can be accommodated into 8-1/2" x 11" size.
3. OMM shall be assembled as follows, unless otherwise directed in Division 1 Specifications. Include a title tab for each section and an index at the beginning of each individual section.
 - a. First Page --- Title of Project, Owner, Address, Date of Submittal, Name of Contractor and Name of Engineer, including contact information, phone numbers and email addresses.
 - b. Second Page --- Index
 - c. First Section --- Written description of system contents including where actually located in building, how each part functions individually, and how system works as a whole. Included step by step procedures for startup and shut down for each system and piece of equipment. Conclude with a list of items requiring service and either state the service needed or refer to the Manufacturer's data in the binder that describes the proper service.
 - d. Second Section --- A copy of each approved Submittal.
 - e. Third Section --- A copy of each equipment Manufacturer's operating and maintenance instructions and where applicable, a copy of the equipment startup report. Maintenance instructions shall include name of service agency, spare and replacements parts lists, lubrication instructions, and replacement belt information (size, type and length). For packaged equipment with manufacturer supplied controls, provide information listing any programming that is not a factory default.
 - f. Fourth Section --- Temperature Control System component information, drawings and sequences of operation.
 - g. Fifth Section --- A copy of the testing, adjusting and balancing report.
 - h. Sixth Section --- A copy of all test results performed by the Contractor. Test results shall include pipe cleaning and pressure tests, and ductwork pressure tests.
 - i. Seventh Section --- A copy of all valve directories.
 - j. Eighth Section --- A copy of all guarantees and warranties.
 - k. Ninth Section --- Owner training sign-in sheets.
 - l. Tenth Section --- Record Drawings.
 - m. Eleventh Section --- A list of attic stock furnished for the project.

- n. Twelfth Section --- Final Punch List with Contractor's responses.
- 4. Once submittals are completed, provide an OMM index to the Engineer for review. Once index is approved, submit an electronic copy of the OMM to the Engineer for acceptance. If any sections are incomplete, include section title tab and a page describing what is missing. After acceptance, submit the required quantity of final hard copies to the Architect for delivery to the Owner. If data is missing from final copies, a page shall be inserted into the front of the OMM listing what is missing and a date when the data will be available for insertion into the OMM.
- 5. After acceptance, information contained within the OMM shall be transferred onto a portable memory device and delivered with the OMM. Data shall be in .pdf format and shall utilize interactive index tabs. In addition, a portable memory device shall be delivered to the Engineer.

1.11 OWNER TRAINING

- A. Before final payment, demonstrate to the Owner's satisfaction the proper operation of each of the systems provided as part of the Contract Documents.
- B. Provide to Owner after all equipment, systems and controls are in operation and at an agreeable time, instructions for the purpose of training Owner's maintenance personnel in the operation and maintenance of all HVAC equipment, systems and controls.
- C. Provide a "sign-in" sheet at each training session. A copy of each "sign-in" sheet shall be included in the Operating and Maintenance Manual.
- D. Refer to individual Division 23 sections for minimum time periods for training.
- E. Deliver to the Owner all special tools and appurtenances for proper operation and maintenance of the equipment provided and request receipt for same. Attach to the Contractor's request for final payment.

1.12 SITE REPORTS AND PUNCLISTS

- A. The Engineer may visit the site periodically during construction and provide written Construction Observation Reports to the Contractor identifying areas where installation does not meet the intent of the Contract Documents. The Contractor shall provide a written response to these reports within 5 business days, indicating the reason the installation is out of compliance with the Contract Documents. After review, the Engineer may or may not require the Contractor to correct the installation.
- B. Final Punch List
 - 1. The Engineer will visit the site to perform a scheduled Final Punch List to identify areas where the installation is incomplete or does not meet the intent of the Contract Documents.

2. If the Engineer is requested to perform the Final Punch List prior to the Contractor being 100% complete with their scope of work, the Contractor shall furnish a Contractor's Completion List, indicating all incomplete work. This list shall be furnished to the Engineer a minimum of 24 hours prior to the scheduled Final Punch List.
3. The Contractor shall respond to each punch list item along with a date, indicating that the item has been completed or corrected.
4. The Engineer is not responsible for visiting the site to verify that punch list items are completed or corrected.
5. A copy of the Final Punch List with the Contractor's responses shall be included on the Operating and Maintenance Manual.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. All equipment and materials used on this project shall be new and UL Listed for the intended application. Where possible, the same brand or manufacturer shall be used for each type of material or equipment.
- B. Equipment and materials for the construction shall be the responsibility of the Contractor and shall be protected by the Contractor until formally accepted by the Owner.
- C. All Manufacturers of HVAC equipment shall verify to the satisfaction of the Contractor and Engineer that their equipment will function properly under the conditions of use, as shown on the Drawings and as specified herein. dimensions, weights, operating characteristics and all other related appurtenances shall be verified before submittal of shop drawings.
- D. Domestic steel shall be used for steel products as required by the Ohio Revised Code, Chapter 153.

2.2 MATERIAL SUBSTITUTIONS

- A. Bids shall be based upon the specified products, suppliers or listed alternatives. The Drawings and Specifications are based on the products specified by type, model, size and suppliers if indicated and thus establish minimum qualities which substitutes must meet to qualify for review.
- B. Should the Contractor propose to furnish materials, equipment and/or suppliers other than those specified, submit a written request for substitutions to the Architect or Engineer in accordance with Division 1 requirements. The request shall be an alternate to the original Bid and shall be accompanied with complete descriptive (manufacturer, brand name, catalog number, supplier name and references, etc.) and technical data for all items. Indicate any additions or deductions to the base Bid price.

- C. Where listed alternatives, substitutions or equipment manufacturers (other than the basis of design) alter the design or space requirements indicated on the Drawings, the Contractor shall be responsible for the revised design and construction including cost of all associated trades involved.
- D. Acceptance or rejection of the proposed substitutions shall be subject to approval of the Architect or Engineer. If requested, the Contractor shall submit inspection samples of both the specified and the proposed substitute items for review.
- E. In all cases where substitutions are permitted, the Contractor shall bear any and all extra cost of evaluating the equality of the material and equipment to be installed.
- F. Where only one Manufacturer or supplier is named in the Contract Documents, the system or equipment shall be provided as specified.
- G. Verbal requests or approvals of substitutions shall not be binding on the Architect, Engineer or Owner.

PART 3 - EXECUTION

3.1 SAFETY

- A. The Contractor shall follow all safety requirements as defined herein, as described in Division 1 and as defined by Owner safety protocols.
- B. Work shall be performed on de-energized equipment in accordance with NFPA 70E.
- C. Should hazardous materials be encountered, Contractor shall adhere to procedures, methods and regulations of the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) and immediately notify Owner.

3.2 COORDINATION

- A. Consult the Contract Documents and Submittals pertaining to the work for other trades. Review the field layouts for all trades and make adjustments accordingly in laying out the HVAC work.
- B. Examine the work of all other trades when it comes in contact with, or is covered by, work in this Division. Do not attach to, cover up, or finish against any defective work, or install work in a manner which will prevent proper installation of the work of other trades. HVAC Contractor shall be responsible for the costs of adjustments required.
- C. Take all field measurements necessary and assume responsibility for the accuracy.
- D. Install work that is to be concealed within the building construction in sufficient

time to secure proper location without delay to the work of other trades.

- E. Assume responsibility for location of chases, other openings through masonry and concrete construction. When work cannot be installed concurrent with building construction, arrange for rough-in boxes, sleeves, inserts and other items, as necessary for installation thereof at a later date.
- F. If any work is installed so that the architectural design cannot be adhered to, Contractor is responsible for making such changes as Architect may require. Before installing work, report any interferences between work of this Division and work of other Divisions to Architect as soon as discovered. Architect will determine which work must be relocated, or make adjustments to maintain clearances, maximum headroom and to avoid conflict with other work.
- G. Become familiar with the construction where work attaches. Review Structural Drawings for coordination of openings. Cut no structural members or slabs without Architect's written approval.
- H. Exercise caution when working in areas where concealed systems or materials may exist. Any costs for repair of damage incurred shall be the responsibility of Contractor causing the damage.

3.3 PROTECTION

- A. All finished surfaces shall be protected from damage and spills during construction.
- B. Protect finished floors with a heavy duty flexible fiber reinforced floor protection board – Ram Board or equal.
- C. When setting up pipe cutting and threading machines, protect area against staining and abrasion.
- D. Protect finished surfaces from chips and cutting oil by use of a chip receiving pan and oil proof cover.
- E. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.
- F. Protect finished surfaces from paint droppings, insulation adhesive, etc. by use of drop cloths.
- G. Cost of correcting any such condition will be charged against the respective Contractor.

3.4 PRODUCT HANDLING

- A. Pay all costs for transportation of materials, equipment to job site.
- B. Provide all scaffolding, tackle, hoists, rigging necessary for placing HVAC materials and equipment in their proper place. Scaffolding, hoisting equipment:

comply with applicable Federal, State, and Local regulations. Remove temporary work when no longer required.

- C. Arrange for packaging of equipment, which must be hoisted, so that there will be no damage or distortion caused by hoisting operation. Protect all piping, ductwork, and equipment from any damage during hoisting operation.
- D. Store equipment, controllers, insulation, ductwork, etc., in a dry location and protect from dirt and moisture until building is ready to receive them.
- E. Coordinate location of stored items with other trades. Where necessary, store materials and equipment on movable carts so they may be moved when interfering with the work of other trades.

3.5 CUTTING AND PATCHING

- A. All cutting and patching in construction as necessary for installation of this work shall be the responsibility of this Division and performed by the Tradesmen related to that specific Division of work. Subcontract this work to the appropriate Trade Division.
- B. Do not cut any structural member, including but not limited to steel framing and structural floors, without specific permission from the Architect and Structural Engineer.
- C. Do not cut openings in roof or floor construction without specific permission from the Architect and Structural Engineer. Existing roof warranty must be maintained.
- D. Where locations of penetrations are inaccurate or where building components are improperly cut by inadequate methods, the Contractor in error shall be responsible for complete repair.
- E. The Contractor shall assume responsibility for removing and replacing existing ceiling tiles as required for installation of all work. Areas include that as outlined by the project scope and areas outside the scope where the Contractor is required to make connections to existing systems and install new work. Damaged tiles shall be replaced.

3.6 DAMAGE AND EMERGENCY REPAIRS

- A. Assume responsibility for any damage to new or existing building components caused by work provided as part of the Contract Documents, including leaks in piping systems being installed or reworked. Repair all damage without extra cost to Owner.
- B. Owner reserves the right to make emergency repairs as required to keep equipment in operation, without voiding Contractor's guarantee or relieving him of responsibility during warranty period.

- C. Restore roads, grounds, paving, insulation, piping, ductwork building components, etc., to their original condition whenever this work causes damage.

3.7 CLEANING

- A. At all times keep premises and building in neat and orderly condition, follow explicitly any instructions in regard to storing of materials, protective measures and disposing of debris.
- B. After all tests and adjustments have been completed, clean all equipment leaving everything in working order at the completion of this work. Thoroughly clean all piping, ductwork, and equipment of dirt, dust, grease, oil, debris and paint, after all other trades have completed their work.
- C. All debris created by the execution of this work shall be removed as directed by the Architect or Owner.
- D. Upon completion of work remove all tools, equipment and surplus materials.

3.8 PAINTING

- A. Finish painting is included under Division 9 - Finishes, except where specifically called for in Section 23 03 00.
- B. Materials and equipment installed under this Division shall be left free from dirt, grease and foreign matter, ready for painting.
- C. No equipment, piping or ductwork shall be painted before being tested.
- D. Damaged surfaces of prefinished materials and equipment shall be touch-up painted to match existing finish.
- E. Under no circumstance shall any open cabling be painted.

3.9 SERVICE SHUTDOWNS

- A. This project involves remodeling of existing areas in an operating facility. Plan work including alterations and connections to existing facilities, to permit carrying on normal building functions. When necessary to temporarily interrupt a service, shutdowns shall be scheduled through the Owner and shall be done at a time as directed by the Owner. No additional compensation shall be allowed for these shutdown periods even though premium time work may be required unless specifically defined in Division 1.
- B. Provide temporary service to equipment or systems that cannot be shut down, and as determined by Owner, or as described in the Contract Documents. Remove temporary services when permanent work is completed

3.10 INDOOR AIR QUALITY

- A. All occupied areas of building shall remain free from odors, fumes, dust and

smoke generated from installation of material and equipment.

- B. Arrange with building Owner to schedule isolation of areas where paints, adhesives, solvents, etc., will be used. Areas shall remain isolated until all materials have cured sufficiently as to stop out-gassing of fumes or odors and area has been ventilated to remove all detectable traces of odors and fumes.
- C. Provide temporary partitions and air seals to prevent the migration of airborne contaminants from unoccupied areas to occupied areas.
- D. Provide temporary ventilation and/or filtration systems of sufficient size and quantity to ensure complete removal of all odors, fumes, and airborne contaminants generated. Maintain 25 feet clearance from all temporary exhaust outlets to all active building outdoor air intakes.
- E. If the building HVAC system is used and adjustments are made for ventilation purposes, rebalance systems to maintain occupied areas pressurization and air change requirements.
- F. Arrange with Owner to override the HVAC system control of night setback functions to assist with ventilation of building.
- G. Comply with SMACNA guideline "IAQ Guidelines for Occupied Buildings Under Construction" Second Edition - 2007.

END OF SECTION

SECTION 23 02 00 – HVAC DEMOLITION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 01 00 – HVAC General Provisions
- B. Section 23 03 00 – HVAC Basic Materials and Methods
- C. Section 23 04 00 – HVAC Firestopping

1.02 WORK INCLUDES

- A. HVAC equipment, piping, ductwork, and systems indicated on the Demolition Drawings are shown to indicate the extent of demolition only and are not intended to be a record drawing of the existing conditions. The Drawings and Specifications establish the minimum standards for workmanship and materials.
 - 1. If additional interpretation is required regarding the scope of demolition, contact the Engineer prior to bid.
- B. Include all labor, materials, equipment, services, and permits necessary for completion of the demolition work.
- C. Provide protection for all adjacent areas before, during, and after execution of the demolition work.
- D. Comply with all the rules and regulations of local and state Authorities Having Jurisdiction, including applicable OSHA safety requirements.
- E. Visit the site and become familiar with conditions affecting the demolition work. No additional compensation shall be approved on claims that arise from a lack of knowledge of the existing conditions.
- F. Normal building functions shall be maintained during the demolition work. Coordinate the day and time of any temporary building system interruptions with the Owner. Additional compensation shall not be approved for premium time effort.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide materials and equipment for completion of the demolition work as described within the Specifications and on the Drawings.
- B. Materials and equipment shall be new and UL labeled for the application.

PART 3 - EXECUTION

3.01 GENERAL DEMOLITION WORK

- A. Disconnect and remove existing HVAC Work made necessary because of Project alterations as indicated or implied on the Contract Documents of all trades. Relocate equipment and/or devices where indicated. Existing HVAC equipment, piping, ductwork and systems not affected by these changes shall remain and shall be protected whether shown on the Drawings or not.
- B. HVAC equipment, piping, ductwork and systems shall be de-energized prior to disconnection and removal.
- C. Demolition Work under this Contract shall be accomplished by the Contractor in complete accordance with the Construction Procedure and Progress Schedule specified under Division 1. Proposal shall include any special phasing requirements related to demolition work as described in the Division 1 Specifications.
- D. Remove existing equipment indicated including piping and ductwork connections. Existing equipment shown as being reused or relocated shall be carefully removed, stored on the premises, and refurbished before reinstallation.
- E. Equipment to be salvaged by the Owner shall be carefully removed and stored on site by the Contractor for delivery to the Owner. All other materials, equipment and debris shall become the property of the Contractor and shall be removed from the site.
- F. Remove all previously abandoned equipment, piping, and ductwork encountered above existing ceilings.
- G. Where required, re-support existing to remain piping and ductwork above ceilings being removed.
- H. Remove piping and ductwork as described on the Drawings. Cap or plug as indicated or as required by Code. Identify in the field where piping or ductwork connections are to be reused.
- I. Provide drainage, capping, and re-filling as necessary to isolate portions of systems to enable full or partial demolition.
- J. Provide valves as necessary whether indicated or not to isolate portions of systems to enable full or partial demolition and to make ready for re-connection of the new work.
- K. In case of existing valves failures, replace valves in kind or as specified for new service to enable positive shut-off and keep with project schedule as much as possible. Report any such cases immediately upon discovery to the Architect or Engineer.
- L. For portions of existing piping and ductwork systems to be re-used, visually

inspect for signs of leaks. Report any such cases immediately upon discovery to the Architect or Engineer.

- M. Remove temperature control devices and components associated with removed equipment, piping, and ductwork including controllers, sensors, actuators, wiring, conduit, etc.
- N. Where Building Automation Systems wiring is interrupted because of the demolition Work, Contractor shall reroute or relocate, modify and reconnect to provide a continuous system.
- O. Cutting, patching, finishing, etc., for removed or relocated HVAC equipment, piping, ductwork, and systems shall be included as part of the HVAC Work. All holes and damage caused by the demolition work shall be properly patched with suitable materials to match existing construction. Patching shall be performed by the qualified trade.
- P. Where equipment, piping, ductwork and systems are removed from fire or smoke rated construction, penetrations shall be patched to match existing ratings with suitable materials matching existing construction. Patching shall be performed by the qualified trade.
- Q. Remove and reinstall existing ceiling tiles in areas outside the scope of demolition work as required to complete the demolition work outlined within these Specifications or indicated on the Demolition Drawings. Damaged tiles shall be replaced to match the existing.

3.02 MERCURY

- A. Where existing thermostats contain mercury or mercury based products follow EPA universal waste rule, Regulation 40 CFR 273 for removal, transportation and recycling.

END OF SECTION

SECTION 23 03 00 - HVAC BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 WORK INCLUDES

- Pipe and Fittings
- Valves
- Strainers
- Air Vents
- Unions
- Pressure/Temperature Test Plugs
- Combination Balancing/Shut-off Valves
- Floor, Ceiling and Wall Plates
- Sleeves
- Inserts, Hangers and Supports
- Roof Curbs and Supports
- Roof Flashings
- Access Doors
- Electrical Connections
- Motors
- Drives and Guards
- Vibration Control
- Nameplates, Markers and Tags
- General Installation Requirements
- Access to Equipment and Devices
- General Piping
- Hydronic Piping Systems
- Cleaning
- Startups
- Tests and Adjustments
- System and Equipment Identification

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 01 00 - HVAC General Provisions
- B. Section 23 05 13 - HVAC Variable Frequency Drives
- C. Section 23 07 00 - HVAC Insulation
- D. Section 23 09 00 - HVAC Instrumentation and Control
- E. Section 23 30 00 - HVAC Air Distribution
- F. Section 23 74 00 - Packaged Outdoor HVAC Equipment
- G. Section 23 80 00 - Decentralized HVAC Equipment

1.03 SUBMITTALS

A. Refer to Section 23 01 00.

1.04 CONSTRUCTION DOCUMENTATION

A. Refer to Section 23 01 00.

B. Submit draft copies of testing, adjusting and balancing report for review prior to final acceptance of Project. Include final copies in the Operating and Maintenance Manuals.

C. Submit pipe cleaning and pressure test documentation upon completion of cleaning and testing. Include final copies in the Operating and Maintenance Manuals.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Heating Hot Water – Schedule 40 black steel (ASTM A53) or Type "L" hard drawn seamless copper tube (ASTM B88).

B. Heating Piping "Underfloor" – Type "K" soft copper without joints (ASTM B88).

C. A/C Condensate Drain – Type "L" hard drawn seamless copper tube (ASTM B88) or DWV copper tubing, ASTM B306 or PVC DWV pipe and fittings ASTM D2665.

D. Drain – Piping shall match system piping type unless noted otherwise.

E. Fittings for black steel pipe.

1. Heating Hot Water – 125 PSIG, black cast iron screwed fittings on sizes through 2 inches and standard factory formed welding fittings on sizes over 2 inches. Flanges shall be Class 150 steel.

2. Chilled Water – 125 PSIG, black cast iron screwed fittings on sizes through 2 inches and standard factory formed welding fittings on sizes over 2 inches. Flanges shall be Class 150 steel.

F. Fittings for copper pipe – Wrought copper solder joint type ASTM B16.22. Where silver brazing alloy is used to join pipe and fittings, fittings to be suitable for brazing.

2.02 VALVES

A. Provide all valves of the same manufacturer where possible. Manufacturers: Apollo, Milwaukee, NIBCO, Hammond, Spence (steam only) or Watts. All valves to be of domestic manufacture.

B. Steel and copper hydronic systems:

1. Shutoff and drain valves 2 inches and smaller: two-piece ball valves with cast bronze body, Teflon seats, full port, blow-out proof stem, adjustable packing gland, chrome plated solid bronze ball, soldered or threaded ends, minimum 150 WSP, 600 WOG. Milwaukee BA-125.
 2. Shutoff valves 2-1/2 inches and larger: butterfly type, Class B cast iron body, stainless steel stem, aluminum bronze disc, and EPDM liner; 175 WOG. Lug type with lug drilled and tapped, extended neck. Operators: on-off throttling lever handles on sizes 2-1/2 inches to 6 inches, totally enclosed worm gear or Acme screw operators with hand wheel on sizes 8 inches to 20 inches. Equip valves used for balancing with memory stop. Milwaukee ML123E Series.
 3. Horizontal check valves 2 inches and smaller: swing type design, Class 125, 200 WOG, bronze body and cap with threaded or soldered ends conforming to ASTM B62. Milwaukee 509 or 1509.
 4. Vertical check valves 2 inches and smaller: 250 WOG, center guided, silent, non-slam type. Bronze body, stainless steel spring, threaded ends. Metraflex BSN.
- C. Automatic control valves furnished by the temperature control supplier for installation by Mechanical.
- D. Equip valves used for balancing with memory stop.
- E. Equip ball valves with handle stem extensions where valve is installed in insulated piping systems.
- F. Equip valves with locking handle suitable of being locked in the full open or full closed position where indicated. Locking handle design shall accommodate a standard 5/16" pad-lock.
- G. Other valves or valve requirements are specified in the Sections applicable to the various systems.

2.03 STRAINERS

- A. STR-1: 2 inches and smaller, 'Y' type pipe line strainer, brass or bronze body, threaded ends, 18-8 stainless steel screen with 20 mesh openings, 300 PSIG at 400 degree F. Provide pipe nipple with ball valve for blow down. ITT Hoffman 420C or equivalent by Armstrong, Metraflex, Mueller Steam Specialty or Keckley F150.

2.04 AIR VENTS

- A. Make provisions for elimination of air from high points on all piping, coils, finned tube radiation or equipment in closed loop water systems.
- B. Air vents on piping mains, heating, cooling coils, and equipment: ball valves

3/8 inch or 1/2 inch size, minimum 150 WSP, 600 WOG.

- C. Air vents for finned tube radiation and unit heaters: Dole No. 14A coin operated air valve assembly with 20 inches of 3/16 inch outside diameter copper tubing. Connect tubing to vent chamber, mount valve in accessible location.

2.05 UNIONS

- A. Unions in steel piping 2 inches and smaller, malleable iron, ground joint brass to iron seat suitable for 175 PSI working pressures.
- B. Unions in copper piping 2 inches and smaller, cast brass solder fittings with machined and lapped seats suitable for 175 PSI working pressures.
- C. Unions in stainless steel piping 2 inches and smaller, Type 304/304L stainless steel, threaded type with VicPress 304 ends.
- D. Unions on all piping 2-1/2 inches and larger: Use flanged connections. Gaskets used with flanged fittings: 1/16 inch thick, ring type, compressed graphite sheet.
- E. Where grooved joint piping systems are utilized, unions are not required. Couplings shall serve as unions.

2.06 DIELECTRIC CONNECTIONS

- A. Provide at connections between copper and ferrous metal piping materials in chilled water systems ASTM F441, Schedule 80, CPVC threaded pipe nipples, 4 inches minimum length. Provide for dielectric connections in pipe sizes 2 inches and smaller.
- B. Provide at connections between copper and ferrous piping in heating water systems Victaulic Clearflow dielectric waterway Style 47. Fitting consists of zinc plated casing with a chemically inert NSF/FDA listed dielectric thermoplastic lining.

2.07 THERMOMETERS

- A. Provide thermometers in piping at following locations:
 - 1. Heating system supply and return mains.
 - 2. Where additionally indicated.
- B. Thermometers: Blue color spirit filled glass type industrial thermometer with 9 inch Fahrenheit scale of proper range for service indicated, glass covered case with magnified liquid column, separable well, straight or angle mounted as required.
 - 1. Bi-metal dial type thermometers may be supplied in lieu of spirit filled

type.

2. Thermometers located below 6'-0" level: Spirit filled type with 9 inch scale, forward or straight type as required by project conditions. Thermometers serving locations above 6'-0" level to be dial type with remote bulb. Mount 4 inch diameter dials 5'-6" above floor on bracket at appropriate location.
- C. Select scale ranges so temperature will fall approximately at mid-scale.
- D. Manufacturers: Weiss Instruments, or equivalent by Trerice, Taylor or American.

2.08 PRESSURE/TEMPERATURE TEST PLUGS

- A. Provide combination pressure and temperature test plugs where indicated. Test plugs shall have a working pressure suitable for the piping systems where installed.
- B. Test plugs shall be ¼ inch, designed to be screwed into a pipe tee or "threadolet". Provide with extension where installed on insulated pipe.
- C. Plugs shall be solid brass with Nordel (EPDM) valve core, suitable for insertion of 1/8 inch test probe. When probe is withdrawn, valve core shall close to seal the system.
- D. Furnish with removable brass cap with retainer strap.
- E. Acceptable manufacturer: Peterson Equipment Company, Inc., "Pete's Plug", Flow Design Inc. or Trerice.

2.09 COMBINATION BALANCING/SHUT-OFF VALVES

A. Manual

1. 2 inches and smaller: Minimum working pressure – 250 PSIG @ 250°F. Bronze/brass body throttling type venturi valve with memory stop device indicating degree of opening, threaded connections and union end for removal.
 - a. Flow Design Inc. Model UA
 - b. Nexus UltraXB Orturi Model XB
 - c. Griswold Quickset (NTP)
 - d. Victaulic TA Series 78K
2. 2-1/2 inches and larger: Minimum working pressure – 200 PSIG @ 250°F. Cast iron, ductile iron or steel body. Venturi or pilot tube type measuring device with flanged connections for removal. Valve shall be

butterfly type for steel hydronic systems per Specification Section 23 03 00 where not integral with device.

- a. Flow Design Inc. Model VF
- b. Nexus Nextrol Model NXF
- c. Griswold Model 3QF Metering Station
- d. Victaulic TA Series 788

3. Equip with pressure/temperature test plugs per Specification Section 23 03 00 as required for connecting portable test thermometer, pressure gauge or read-out meter.

B. Manual balancing valve shall only be used for individual coil balancing in multiple coil installations and for by-pass balancing in 3-way control valve installations. All other balancing valves shall be automatic type.

C. Factory Assembled Valve Hookups

1. Contractor has the option to use factory assembled valve hookups for installations 2 inches and smaller.
2. The component order and arrangement shall comply with the piping diagrams shown on the Drawings.
3. The individual components of the assembly shall meet the specification requirements for components of a field-assembled system.
4. Acceptable Manufactures: Flow Design Inc., Nexus, Griswold or Vitaulic TA Series.

2.010 FLOOR, CEILING, AND WALL PLATES

A. Fit all pipe passing exposed through walls, floors, or ceilings in finished rooms with steel or brass escutcheons. Where surface is to receive a paint finish make escutcheons prime painted; otherwise make escutcheons nickel or chrome plated. Where piping is insulated, fit escutcheons outside insulation.

2.011 SLEEVES

- A. Where pipes pass through masonry or concrete walls, set Schedule 40 steel pipe sleeves 1 inch larger than outside diameter of pipe, with ends of sleeves flush with wall faces. Sleeves in walls other than masonry or concrete where firestopping is required: machine cut steel pipe or galvanized steel sheet sleeves as required by UL rated system penetration assembly.
- B. Where pipes pass through floors above grade, set Schedule 40 galvanized steel pipe sleeves 1 inch larger than the outside diameter of the pipe. Top of sleeve to be 4 inches above finished floor in machine rooms and wet floor

locations.

- C. Where pipes are insulated, provide sleeves large enough to allow insulation to pass through sleeve. Center pipes in sleeves.
- D. Set sleeves true to line, grade; position and plumb or level and so maintain throughout construction period.
- E. Where concrete or masonry walls are core drilled for pipe passage steel sleeves are not required.
- F. Provide fire stopping between pipe and sleeve or opening as required to maintain the integrity of the fire rating of all walls and floors.
- G. Where pipes pass through exterior walls below grade, set Schedule 40 steel pipe or manufactured castings or sleeves 1-1/2 inch larger than the outside diameter of the pipe. Make the pipe to wall penetration closure with "Link-Seal" as manufactured by the Thunderline Corp. or Metraseal.

2.012 INSERTS, HANGERS, AND SUPPORTS

- A. Manufacturer: Basis of design shall be Anvil. Other acceptable manufacturers include Mason, Modern or Erico/Caddy.
- B. Provide all inserts, hangers, anchors, guides and supports to properly support and retain piping, ductwork, conduits and equipment; to control expansion, contraction, anchorage, drainage and prevent sway and vibration.
- C. Provide inserts for support of work in concrete construction.
- D. Provide forged steel beam clamps when attaching to steel construction.
- E. Provide supplementary angles, channels, and plates where supports are required between building structural members, span the space and attach to building structural members by welding, bolting or anchors.
- F. Provide hangers, rollers, threaded rods, turnbuckles, saddles, insulation protectors, anchors, and all other miscellaneous specialties for the attachment of hangers and supports to structure.
 - 1. For up to 3/4 inch diameter rod: Anvil Figure 92, 93, or 94 beam clamps.
 - 2. For 7/8 inch and 1 inch diameter rod: Anvil Figure 134 beam clamp with Anvil Figure 290 eyenut.
 - 3. Pressed steel beam clamps are not permitted.
- G. Provide rods, angles, rails, struts, brace plates, and platforms required for suspension or support of piping, conduit and equipment.
- H. Support individual piping from hangers as follows:

1. Uninsulated piping 2 inches and smaller - Anvil Figure 97 malleable iron adjustable nut and wrot ring.
2. Uninsulated piping 2-1/2 inches and larger - Anvil Figure 260, Carbon Steel adjustable wrot clevis type.
3. Copper tubing (uninsulated) - Anvil Figure CT-99 carbon steel ring and malleable iron adjusting nut completely copper plated.
4. Insulated piping 2 inches and smaller - 18 gage galvanized steel shield (Anvil Figure 167) over insulation in 180 degree segments, minimum 12 inches long with Anvil Figure 260 adjustable clevis type hanger.
5. Insulated piping 2-1/2 inches and larger - Anvil Figure 260 adjustable clevis type hanger with pipe covering protection saddle or Anvil Figure 160 Series (depending on insulation thickness).
6. Rollers - Where thermal movement causes a hanger rod to deviate more than five degrees from the vertical or where longitudinal expansion may cause a movement of more than 1/2 inch in the piping, use and install roller hangers or chairs, Anvil Figure 181, 171, or 175.

I. Hanger Spacing (Steel Pipe)

<u>PIPE SIZE</u>	<u>MAXIMUM SPACING</u>	<u>MINIMUM ROD DIAMETER</u>
Up to 1"	6'	3/8"
1-1/4"	8'	3/8"
1-1/2", 2"	10'	3/8"
2-1/2", 3"	12'	1/2"
4", 5"	12'	5/8"
6"	12'	3/4"

- J. Provide additional lock nut on each threaded support rod.
- K. Provide additional hanger support within two feet of each elbow and at valves, strainers and other equipment in pipe lines.
- L. Support copper pipe at intervals of not over 10 feet for 1-1/2 inch and larger, and not over 5 feet for 1-1/4 inch and smaller. Provide additional supports where necessary to maintain proper alignment.
- M. Trapeze hangers may be used for multiple runs of piping. Construct of a channel with adjustable hanger rods. Determine hanger spacing by the smallest pipe supported. Install all piping free for independent movement on the trapeze hanger. Provide insulation protection saddles as specified for individual pipe support.
- N. Do not support piping or ductwork from another pipe or ductwork. Do not support piping or ductwork from conduit. Do not support ceiling framing or

lighting from piping or ductwork. Do not support any item from metal roof deck.

- O. Support ductwork with 16 gage galvanized steel strap hangers, steel rods, or steel angle trapeze hangers per SMACNA standards. Maximum spacing 8'-0".
- P. Provide support saddles where pipes are insulated. All insulation shall be continuous through all hangers.
- Q. Where fireproofing is removed or damaged to allow attachment to building structural members, repair to maintain integrity of fireproofing.

2.013 ROOF CURBS AND SUPPORTS

- A. Where curbs and supports are not specified with HVAC equipment; provide prefabricated roof curbs and equipment supports for equipment mounting.
- B. Provide prefabricated roof curbs for ductwork roof penetrations. Provide prefabricated pipe curb assemblies for piping roof penetrations.
- C. Provide prefabricated roof supports for horizontal ductwork and piping installed on the roof.
- D. Units shall be as manufactured by Custom Curb, Roof Products & System Corp, Pate, or Thycurb; 18 gauge galvanized steel, insulated, continuous welded seams, wood nailer, counterflashing of type and style as indicated.
- E. The height of roof curbs and supports shall be a minimum of 12 inches above the finished roof surface, total curb height shall accommodate the roof insulation thickness. Refer to Architectural Drawings for details.

2.014 CURB MOUNTED ISOLATION BASES

- A. Provide for curb mounted rooftop equipment where indicated Mason Model CMAB curb mounted aluminum base.
- B. Base shall consist of extruded aluminum main members, flexible neoprene weather seal and cadmium plated nominal 1" deflection steel springs with horizontal stiffness for wind resistance.
- C. The curb mounted isolation base shall:
 - 1. Fit on top of standard unit curbs and match underside of isolated equipment.
 - 2. Have wind and water seals that do not interfere with the spring action.

2.015 ROOF FLASHINGS

- A. Roof flashings for HVAC equipment are part of the membrane roofing system and provided under another Division of the Specification.

2.016 ACCESS DOORS

- A. Furnish access doors and frames for installation in building walls, partitions and ceilings, where necessary for access to concealed valves, traps, dampers and other equipment requiring service or inspection. The HVAC Contractor shall not be responsible for installation of such access doors. However, the cost of installation shall be included in the bid.
- B. Exact location, type, size and number of access doors shall be determined by the installer of the HVAC systems to suit requirements. Group valves, traps, dampers and other equipment to be accessible from a single door. Where practical, group HVAC components with other Division components to be accessible from a single door. Coordinate with all Divisions.
- C. The respective Contractor, as designated by the Architect or Construction Manager, shall install the required access doors and frames in designated locations after such locations are approved by the Architect.
- D. Access doors are not required in removable type ceilings. Installer of HVAC systems shall coordinate locations and requirements for removable ceiling sections with Architect, including a means of identifying removable sections.
- E. Access doors shall be sufficiently large enough for access but in all cases the minimum door size shall be 14 inches x 14 inches.
- F. Refer to Section 08 31 13 Access Doors and Frames for additional information.
- G. Access doors located in nonfire-rated walls, partitions and ceilings shall be equal in fabrication to the following Milcor styles and equipped with invisible spring hinges and standard screw driver cam-latches. All frames and anchors shall be compatible with the specific wall, partition or ceiling where it is to be installed.
 - 1. Access doors in drywall shall be 14-gauge steel with a 16-gauge steel frame surrounded by a 22-gauge galvanized steel drywall bead for a concealed frame finish. Milcor Style DW.
 - 2. Access doors in masonry or tile walls shall be 14-gauge steel with a 14-gauge steel exposed frame. Milcor Style M.
 - 3. Access doors in plaster shall be 14-gauge steel with a 16-gauge steel frame surrounded by a 22-gauge galvanized steel perimeter casing bead for a concealed frame finish. Milcor Style K.
 - 4. Access doors in pool or wet areas shall be 16-gauge stainless steel with a 16-gauge stainless steel exposed frame. Milcor Style MS.
- H. Access doors located in fire-rated walls, partitions and ceilings shall be UL listed and labeled 1-1/2 hour, Class B or to match construction rating, equal in fabrication to Milcor Style UFR. Door shall be 20-gauge steel with a 16-

gauge frame and include a continuous hinge, coil spring and cylinder lock with two keys. Door shall be insulated with 2" mineral fiber insulation sandwiched between inner and outer panels.

- I. Access doors shall be completely primed, including the frame assembly, before leaving the factory. Finish painting shall be by another Division.
- J. Access doors shall be as manufactured by Milcor, Nystrom or MIFAB.

2.017 ELECTRICAL CONNECTIONS

- A. Refer to those portions of the Contract Documents which establish electrical characteristics and furnish equipment to operate on that service.
- B. Starters shall be provided under Division 26 Work, unless otherwise noted. Starters to be provided with proper NEMA enclosures, surface or flush application as required. Where equipment has magnetic starters furnished as an integral part of the equipment, disconnect switches shall be provided under Division 26 Work.
- C. Provide coordinated wiring diagrams for motor equipment of heating, ventilating, air conditioning, and temperature control conforming to system operation specified. Provide line diagrams, power diagrams, terminal connections. Submit all such drawings as shop drawings.
- D. Provide power wiring from closest available circuit breaker for powering of the temperature controls system. Install according to the requirements of Division 26.
- E. Install all equipment requiring an electrical connection in such a manner so that proper clearance for service is provided per the National Electric Code.

2.018 MOTORS

- A. For each item of equipment requiring electric drive, provide a motor having starting and running characteristics consistent with the torque and speed requirements of the driven machine.
- B. For design, construction, and performance characteristics, conform to applicable provisions of latest NEMA, IEEE, and NEC Standards.
- C. Duty: Continuous duty at ambient temperature of 40 deg C.
- D. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
- E. For frame sizes 215T and above, furnish shouldered lifting eyebolts or cast provisions within for handling convenience.

F. Furnish with stainless steel nameplates with manufacturer's name, model number, serial number, horsepower, voltage, phase, frequency, RPM, full load amps, locked rotor amps or code, frame size, service factor, power factor, nominal full-load efficiency, bearing sizes, insulation class, and rated ambient temperature.

G. Three Phase Motors

1. Efficiency: NEMA premium efficient electric motors with efficiencies complying with NEMA MG 1 Table 12-12. Motors $\frac{3}{4}$ HP and smaller may be the equipment manufacturer's standard and need not conform to Table 12-12.
2. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
3. Thermal Protection: Conform to NEMA MG 1 requirements for thermally protected motors.
4. Insulation: Class F.
5. Service Factor: 1.15
6. Enclosure Type:
 - a. Open Drip Proof (ODP): Unless noted otherwise, all motors shall be ODP.
7. All equipment specified to operate with variable frequency drives shall be provided with motors specifically designed for variable speed operation with high efficiency at part load conditions as required by NEMA MG-1 and with motor insulation rated for variable frequency drive operation.
 - a. Include a maintenance free, circumferential, conductive micro fiber shaft grounding ring to discharge shaft currents to ground (AEGIS SGR Bearing Protection Ring).
 - b. Motors less than 100 HP size shall be provided with a single shaft grounding ring provided on the drive end of the motor.
8. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication and suitable for radial and thrust loading.

H. Single Phase Motors

1. Motors shall be one of the following, to suit starting torque and requirements of specific motor application. Refer to equipment specifications and schedules.
 - a. Permanent-split capacitor.

- b. Split phase.
 - c. Capacitor start, inductor run.
 - d. Capacitor start, capacitor run.
 - e. Electronically Commutated Motor (ECM).
- 2. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device shall automatically reset when motor temperature returns to normal range.
 - 3. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- I. Acceptable Manufacturers: Baldor, Lincoln, Marathon, or US Motor.

2.019 DRIVES AND GUARDS

- A. For each item of belt driven equipment, provide an adjustable drive sheave with adjustable limits plus or minus 12-1/2 percent, based on a service factor of 1.5 as applied to motor nameplate rating. Provide drives of one horsepower and over with at least two belts, with all multiple belt sets matched. Non-adjustable drive sheaves will be acceptable for motors of 30 HP and over.
- B. Provide substantial drive guard for each belt drive secured to the equipment. Provide openings in skirt guards for insertion of revolution counter at drive sheave and driven sheave centers. Provide conveniently removable coupling guard for direct driven equipment.
- C. For each item of direct driven equipment which is not of extended shaft or close coupled design, provide an approved type flexible coupling.
- D. Provide a typed list of belt drives, listing each item with pitch diameter, bore size, and key way dimensions of each sheave and manufacturer's replacement belt numbers. Bind lists in Operating and Maintenance Manuals.
- E. Provide all necessary changes in drive sheaves and/or belts as required to obtain specified air deliveries.

2.020 VIBRATION CONTROL

- A. Furnish and install vibration isolating mountings to isolate from the structure, by means of resilient vibration and noise isolators, HVAC equipment having rotating or reciprocating parts. Guarantee that isolators to provide isolation efficiencies according to this Specification. Base selection on equipment purchased, power dissipated, frequency, weight distribution and nature of

the building structure.

- B. Design mountings to permit attachment to the equipment base or pad and to the structure and select for uniform deflection allowing for unequal weight distribution.
- C. Provide selections by the manufacturer of the mountings to provide a transmissibility not exceeding 10 percent.
- D. Vibration or noise created in any part of the building by the operation of any equipment furnished and/or installed under this Contract will be prohibited. Take all precautions by isolating the various items of equipment from the building structure.
- E. Isolate HVAC equipment as follows:
 - 1. Air handling units with internally isolated fans do not require additional unit casing isolation.
- F. Support piping and ductwork independently of the mechanical equipment and isolate as follows:
 - 1. Support all suspended piping in Mechanical Equipment Rooms and the first three hangers outside equipment rooms from the overhead structure by threaded rods incorporating resilient hangers. Hangers shall contain steel springs and precompressed molded fiberglass inserts designed for static deflections of between 1 inch and 1-3/4 inch under operating conditions.
 - 2. Use flexible connections between ductwork and air handling equipment, and attach the ductwork rigidly to the structure.
- G. Base isolator efficiency on the lowest operating speed of the supported equipment. Furnish as part the isolator manufacturer's submittal data, deflections and isolating efficiencies for the isolators supporting each piece of equipment.
- H. Manufacturer: Mason Industries, Vibration Eliminator Co., Peabody Noise Control or Amber Booth.

2.021 NAMEPLATES, MARKERS AND TAGS

A. Equipment Nameplates

- 1. Equipment nameplates shall be laminated phenolic with a black surface and white core. Use 1/16 inch thick material for plates up to 2 inch by 4 inch. For larger sizes use 1/8 inch thick material
- 2. Lettering shall be condensed Gothic. The space between lines shall be equal to the width of the letters. Use ¼ inch minimum height letters which occupy four to the inch.

3. Nameplates shall be attached to equipment with brass screws or rivets; no adhesive attachments will be permitted.
4. Acceptable Manufacturers: Seton Nameplate Company, Marking Services Inc.

B. Stencils

1. Stencils shall be made with paint products as previously described in the Paint Specification Section. Apply one coat lacquer or varnish over the stencils.

C. Valve Tags

1. Tags shall be 2" diameter, 1/16" thick, multilayered acrylic with engraved letters.
2. Lettering shall be 3/4" high for type service and 1/2" for number. Tag shall indicate service and valve number. Letter and number designations shall be coordinated with the Owner.
3. Each service shall be a different color in conformance with the "Scheme for the Identifications of Piping Systems" (ANSI A13.1).
4. Tag shall be attached with chain similar to Seton No. 16 stainless steel jack chain. Use of beaded chain or wire is not acceptable.
5. Acceptable Manufacturers: Seton Nameplate Company, Marking Services Inc.

D. Pipe Markers

1. Each marker background shall be appropriately color coded with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identifications of Piping Systems" (ANSI A13.1).
2. Flow direction arrows shall be included on each marker.
3. Snap-around markers shall be used for overall diameters up to 6" and strap-around markers shall be used above 6" overall diameters.
4. Underground pipe markers shall be detectable tape, color coded and labeled same as indoors.
5. Acceptable Manufacturers: Seton Nameplate Company, Marking Services Inc.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Location of piping, equipment, ducts, etc., on the drawings are diagrammatic; indicated positions shall be followed as closely as possible, exact locations shall be subject to building construction and interferences with other work. In general, conceal piping and ductwork located outside of equipment rooms. Difficulties preventing the installation of any part of work as indicated, shall be called to the attention of the Architect. Architect will determine locations and changes. Contractor shall install the work accordingly. Architect reserves right to make minor changes in location of any part of the work up to the time of roughing-in without additional cost.
- B. Attempts have been made to identify existing equipment locations and piping and ductwork routing and sizes with use of existing drawings and field observations. Contractor shall field verify all existing information, report any discrepancies to the Architect or Engineer and note on the Record Drawings.
- C. At locations in project involving alterations, assume responsibility for removal, rerouting, protection and replacement of existing facilities as necessary to install new work. Work to be executed by craft which customarily or by jurisdictional award performs such service. Refer to 23 02 00 for additional information.
- D. Coordinate all work with the phasing of the Project. Certain services must remain active to serve occupied areas during construction. Coordinate all phasing requirements with the Owner.
- E. Install all materials and equipment in a neat and workmanlike manner by competent specialist for each subtrade. The installation of any materials and equipment not meeting these standards may require removal and reinstallation at no additional cost to the Owner.
- F. Locate piping, ductwork and other services, in pipe spaces, to ensure maximum accessibility. Where necessary to cross pipe spaces, crossing must be made near the floor or 6 feet or more above floor.
- G. Install, connect equipment, services, materials according to best engineering practice and in conformity with manufacturer's printed instructions. Provide complete auxiliary piping, water seals, valves, electric connections, controls, etc., as recommended by respective equipment manufacturer or required for proper operation.
- H. Take all measurements and determine all elevations at the building.
- I. All roof mounted equipment shall be installed a minimum of 10 feet from edge of roof, unless indicated otherwise.

3.02 ACCESS TO EQUIPMENT AND DEVICES

- A. All valves, dampers, air vents, equipment, control components and other devices requiring examination, adjustment, service, and maintenance shall be accessible. If located above drywall ceiling or behind finished walls,

provide an access door. Coordinate all access door locations with the Architect and General Trades.

- B. To ensure accessibility during and after construction, when a device is installed, its location shall be marked with securely attached temporary signage. Signage shall indicate the amount of clearance required for the specific device. Signage shall remain in place until the ceiling or access door is installed or until substantial completion.
- C. Clearance shall include not only code required clearance but also clearance for Owner's staff to access the device. This access shall be from the floor or from the floor level using normal maintenance ladders and apparatus to meet all OSHA requirements. Consideration shall be given to accessing a device through an access door.
- D. Where a device is installed above finished ceilings, signage shall be hung below the device at the finished ceiling level. Where a device is exposed, in open ceiling areas, signage shall be hung at approximately 8' above the floor level.
- E. HVAC Contractor shall monitor these access locations until substantial completion and notify Architect, Owner and Engineer when the access area is encroached upon so that corrective action may be taken immediately.
- F. Corrective action shall be the responsibility of the trade encroaching the access area unless identified that the equipment in question is installed incorrectly or not where indicated on the signed-off coordination drawings.

3.03 GENERAL PIPING

- A. Drawings (floor plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.
- B. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- C. Provide shutoff valves at all branch connections to main, at each piece of apparatus, and in mains to sectionalize the systems and elsewhere as indicated.
- D. Install gate valves with stems at 45 degrees or greater above the horizontal position.
- E. Install ball and butterfly valves with the stems at the horizontal position and the handle pointing in the direction of flow.
- F. Install all valves and equipment with unions or flanges or grooved couplings to

facilitate removal.

- G. Provide hose end drain valves with cap at all low points, trapped sections and on equipment side of all branch valves to permit draining of all or part of liquid piping systems. Install valves at high points of equipment and piping to allow venting.
- H. Pipe equipment drip bases to nearest drain.
- I. Locate covered piping a sufficient distance from walls, other pipe, ductwork, or other obstacles, to permit application of the full thickness of insulation specified; if necessary, use extra fittings and pipe.
- J. Use Dielectric Connectors where pipe materials change from ferrous to copper.
- K. Make piping connections to equipment indicated.
- L. Install all piping, including shut-off valves and strainers, to coils, pumps, and equipment line size with reduction in size being made only at inlet to control valve, pump or equipment. Install outlet piping from control valve, pump or equipment, including dirt pockets, full size of outlet connection. Increase to line size and install piping, check valves, strainers and shut-off valves line size.
- M. Plug open ends of pipe or equipment at all times during installation to keep dirt and foreign material out of system.
- N. Arrange and install all pipes, valves, cleanouts, access openings and equipment so as to be accessible for service. Locate equipment to maintain clearances for tube, coil pulling, periodic servicing.
- O. Unless otherwise specified, make branch connections in welded steel piping less than 2/3 of main size with weldolets, butt, or threaded type. Make branch connections 2/3 of main size and larger with weld tees, laterals, or crosses. Shaped nipples are not acceptable.
- P. Make reductions in piping lines with reducing coupling or weld fitting reducer.
- Q. Support piping so as not to place a strain on valves or equipment.

3.04 WELDING

- A. Install all pressure piping systems to conform to requirements of State Piping and Welding Codes where applicable.
 - 1. Perform any pipe welding not covered by code by certified welders according to code procedures.
 - 2. Construct, install, and inspect all pressure piping systems according to the requirements of Ohio Pressure Piping System Rules, Chapter 4101:8 and ASME B31.1.0.

3.05 JOINTS

- A. All pipes must be reamed and cleaned before assembly. Apply pipe compound to male end of threaded joints. Make all welded joints as previously specified.
- B. Assemble black steel pipe 2-1/2 inches and larger with welded joints, flanged joints or mechanically grooved joints, except for steam and condensate which shall be welded or flanged.
- C. Assemble black steel pipe 2 inches and smaller with welded or screwed joints.
- D. Assemble copper pipe with soldered joints. Make all soldered connections on copper piping by cleaning, fluxing, and soldering with 95-5 tin-antimony solder, except where a silver brazing alloy is specified.

3.06 COMBINATION PRESSURE AND TEMPERATURE TEST PLUGS

- A. Install test plugs at the inlet and outlet to each cooling coil, heating coil, heat exchanger and pump and at other locations where indicated. Provide test plugs in addition to thermometers and pressure gauges indicated.

3.07 EXPANSION

- A. Install all piping throughout the project with adequate allowance for expansion to prevent damage to building, equipment, and piping. Provide anchors, loops, expansion compensators, or expansion joints for complete control of movement.
 - 1. Make changes in directions with fittings.
 - 2. Make branch connections to mains for heating risers and equipment with at least two (2) 90 degree elbows.
 - 3. Bullhead connections in any piping service are prohibited.
 - 4. Supplement all loops, joints, compensators, etc. with adequate guides located as close to loops and joints as possible to preserve alignment and pitch. Provide control rods to prevent overextension or compression.
 - 5. Securely attach pipe guides to the building structure.
 - 6. Provide securely supported pipe anchors as required to control expansion, contraction in piping.
 - 7. Attach continuous radiation covers through elongated holes or by other means to prevent buckling.
 - 8. Locate the first pipe guide 4 pipe diameters from the expansion joint or expansion compensator. Locate the second pipe guide 14 pipe diameters from the expansion joint or expansion compensator. Install

pipe guides according to manufacturer's recommendations.

9. Provide for expansion in Grooved Piping Systems according to manufacturers published literature.
10. In Grooved Piping Systems, flexible couplings may be used in lieu of flexible pipe connections. Provide a minimum of three (3) flexible couplings immediately prior to and after the piece of equipment.

3.08 MOTORS

- A. During submittal phase, verify all motor voltage and horsepower requirements with Division 26. Notify engineer if these do not match.
- B. Install and align all motors. Prior to equipment startup recheck alignment after all piping and ductwork connections have been completed.
- C. Where required, grease all motor bearings per manufacturer's recommendations prior to equipment startup.
- D. Motors shall be protected from damage and kept clean during construction. If dust collects on or in a motor, it shall be cleaned per the manufacturer's recommendations.

3.09 INSTALLATION OF HYDRONIC PIPING SYSTEMS

- A. Run mains in general as indicated. Where lines are reduced in size, eccentric reducing fittings to align top of all mains shall be used to prevent air pockets. Branch connections from mains to risers and equipment below mains shall be taken from the bottom of the main and provided with at least three elbow joints for expansion. Supply run outs shall pitch down away from main 1 inch in 5'-0".
- B. Branch connections from mains to risers and equipment above mains shall be taken from the top of main. Supply runouts shall pitch up away from main 1 inch in 5'-0". Return runouts shall pitch down to main 1 inch in 5'-0". Mains to be provided with necessary loops or swing pieces where necessary to allow for expansion. Furnish and install hose end drain valves at all low points of the system.
- C. Install air vents at the high points in all piping, in all equipment coils, and radiation for complete air elimination from the system. Air vents are to be provided on supply mains or risers where indicated or otherwise needed due to rise in elevation of mains. All air vents shall be accessible for maintenance.
- D. Install all air vents on air chambers made from pipe and fittings.
- E. Provide a shutoff valve in the supply to each heating coil, convactor, finned tube radiator or unit heater and a balancing valve in the return line.

Balancing device shall also serve as a shutoff valve.

- F. Provide a strainer in the suction line to each system water pump. Install a 3/4 inch blowoff valve on each strainer.

3.010 CLEANING

- A. Do not operate air handling equipment without proper filtration. Replace all filters used during construction with proper system filters at completion of work.
- B. Provide chemical cleaning for piping systems with an approved detergent to remove pipe dope, slushing compounds, oils, welding slag, loose mill scale and other extraneous materials. All flushing and cleaning shall be scheduled and documented. Include copy of flushing/cleaning report in the Operating and Maintenance Manual.
 - 1. Fill hydronic systems with clean water and flush; refill with clean water to which proper amount of detergent has been added, circulate for at least 8 hours. Drain system and flush with clean cold water. Add water treatment at this time.
 - 2. Prior to installation of steam traps, fill steam and condensate systems with clean water and flush; refill with clean water to which proper amount of detergent has been added, circulate for at least 8 hours. Drain system and flush with clean water. Clean strainers and install traps at this time.
- C. After initial period of operation clean all strainers, traps and dirt legs.

3.011 STARTUPS

- A. Coordinate schedule for start-up of various equipment and systems. Notify Architect/Engineer and Owner seven days prior to start-up of each item.
- B. Lubrication, Packing and Supplies
 - 1. Properly lubricate all rotating, reciprocating equipment before it is started with correct grade, type and quantity of lubricant.
 - 2. Check each shaft containing a packing gland for condition by backing packing gland off and examine for proper grade, amount and type of packing as recommended by manufacturer.
 - 3. Maintain all lubrication, gaskets and packing during construction; assure that at the time of acceptance all are in first class condition.
 - 4. Provide all supplies required to place equipment in operation
- C. Verify that each piece of equipment or system has been checked for proper drive rotation, alignment, belt tension, control sequence, or other conditions

which may cause damage.

- D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up by service technicians employed or authorized by the manufacturer to provide startup service according to manufacturer's instructions.
- G. Provide a factory authorized representative for startup of the following equipment. Representative shall be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
 - 1. Rooftop units
 - 2. Variable frequency drives
 - 3. Temperature control system
- H. Provide written reports that equipment and systems have been properly installed and are functioning correctly. Where start-up is by a factory authorized representative, report shall be on manufacturer's forms intended for the purpose. Reports shall be included in the Operating and Maintenance Manual.
- I. Equipment and systems not installed properly or operating correctly shall be corrected or replaced and its proper operation shall again be verified. This Contractor shall be responsible for the costs of any and all re-inspections.

3.012 TESTS AND ADJUSTMENTS

- A. Obtain all inspections required by law, ordinances, rules, regulations of authorities having jurisdiction, furnish certificates of such inspections. Pay all fees, and provide all equipment, power and labor necessary for inspections and tests.
- B. During testing period maintain on the project an engineer thoroughly familiar with all phases for as long a period as required to thoroughly adjust all systems and demonstrate that they are functioning properly.
- C. Perform all tests, including but not limited to those specified, make necessary adjustments to obtain specified equipment and system characteristics.
- D. Do not consider work under this Specification complete until required inspections have been obtained, tests performed, necessary adjustments made and satisfactory evidence of compliance has been submitted. Architect reserves right to make spot checks to determine accuracy and completeness of final adjustments.

E. Piping Pressure Tests:

1. All piping shall be given the following pressure test without pressure drop. Equipment which would be damaged by the required test pressure shall be isolated from the system during test.

<u>SERVICE</u>	<u>MEDIUM</u>	<u>(PSI)</u>	<u>HRS.</u>
Heating hot water	Water	125	6

2. Test medium for refrigerant piping shall be oil free pumped dry nitrogen. Twenty-four hour standing time minimum. Tests shall include both the high and low pressure sides of each system at not less than the lower of the design pressures or the setting of the pressure relief device(s). The design pressures for testing shall be those listed on the condensing unit, compressor or compressor unit nameplate, as required by ASHRAE 15. A dated declaration of test shall be provided for all systems containing 55 lb or more of refrigerant.
3. Correct minor leaks in welded joints by chipping out weld and rewelding. Correct leaks in screwed joints by replacing thread or fitting or both. Caulking of threaded joints is not permitted. Repair leaks in copper tubing by sweating out joints, thoroughly cleaning both tube and fitting, and resoldering.
4. Perform all tests before piping is concealed or covered.
5. Be responsible for completely draining the systems after hydrostatic tests are performed. Any damage from freezing prior to acceptance of the completed installation shall be repaired at no additional cost to the Owner.
6. All tests shall be scheduled and documented. Include copy of the piping system pressure test reports in the Operating and Maintenance Manual.

F. Ductwork Leakage Testing

1. Refer to Specification Section 23 30 00.

G. HVAC Systems Adjustments & Balance:

1. Provide services of a certified AABC or NEBB test agency to test and balance HVAC systems. Conduct all tests according to with Associated Air Balance Council, National Standards for Field Measurements and Instrumentation.
2. The testing and balancing agency and the temperature control installer shall cooperate in a joint effort as necessary to achieve properly tested and balanced systems.
 - a. The responsibility of the temperature control installer will be to

establish the mode of operation required by the testing and balancing agency for proper testing and to perform programming and/or setpoint changes as required by the testing and balancing agency.

- b. The responsibility of the testing and balancing agency is to perform all the actual testing and balancing of all HVAC equipment and to verify the operation of HVAC temperature control system.
3. The Mechanical Contractor shall make all changes in sheaves, belts, and dampers and shall add dampers as requested by the Air Balance Agency for correct balance at no additional cost to the Owner.
4. Do not begin adjustments until systems have been completed and are in full working order. Put all heating, ventilating, exhaust and air conditioning systems and equipment into full operation and continue operation of same during each working day of testing and balancing. All testing and balancing shall be done under both summer and winter design conditions.
5. Perform tests and balance systems in accordance with following requirements:
 - a. Test and adjust all air handling systems for design flow of supply, return, relief, exhaust and outside air to within 10 percent of design requirements. Where supply and return or exhaust air quantities in a room or area are not equal the required air quantity differential indicated must be obtained to maintain a positive or negative pressure.
 - b. Identify each diffuser, grille and register as to location and area; in readings and tests of diffusers, grilles and registers, tabulate required velocity and CFM, and test velocity and CFM after adjustment and list size, type and manufacturer of diffusers, grilles and registers. Adjust supply diffusers, grilles and registers for proper air distribution pattern to eliminate drafts.
 - c. For each piece of air handling equipment, list fan data, motor and drive. Test and record fan motor horsepower, full load amperes, fan speed, system suction and discharge static pressure. Determine CFM by means of velocity traverse at a minimum of three fan diameters from fan outlet.
 - d. Balance hot water heating radiation, coils and unit heaters to obtain required water temperature drop corrected for entering water conditions.
 - e. Balance all water using equipment, such as convertors, cooling coils, condensers, chillers, reheat coils, etc., to obtain required water pressure drop and flow rate. List specified flow rate and water

pressure drop for each piece of equipment. Tabulate an air/water balance showing entering and leaving water temperatures and entering and leaving air dry and wet bulb temperatures.

- f. List design data for each pump, obtain by measurement and tabulate pump motor voltage, pump motor operating current, pump head with no flow and with full flow. Submit manufacturer's pump curves, indicating operating point of each pump.
 - g. Set minimum outside air damper position by relationship to mixed air temperature.
 - h. Calibrate all temperature control and other automatic devices and thoroughly test. Guarantee all instruments to function on a variation of plus or minus 1-1/2 degrees and make adjustments to achieve this result during first year without cost to Owner.
 - i. Furnish one (1) electronic AABC certified copy of balancing results.
 - j. Perform a "spot" recheck of balancing conditions between 30 to 90 days after balancing operations jointly with a representative of the temperature control installer, who is capable of making adjustments to the temperature control system. Include a check of space temperatures, calibration of controls, pump heads, fan performance, and any adjustments, thereto. Submit written report to Architect.
 - k. After or during one complete heating cooling season, make any minor adjustments that may be necessary to insure uniform temperatures throughout the space.
6. Submit Testing, Adjusting and Balancing Report to Engineer for review. After review, perform additional testing, adjusting and balancing as noted and revise report as required. Final report shall be included in the Operating and Maintenance Manual.

3.013 SYSTEM AND EQUIPMENT IDENTIFICATION

- A. Identify each piece of equipment as to nature of service and system number corresponding to designation in Contract Documents, by stenciling with 1 inch high letters or attaching two color engraved nameplates. Equipment designations shall conform to the Owner's Standard.

<u>Item</u>	<u>Type Identification</u>
Supply, Return and Exhaust Fans	Nameplate
Pumps	Nameplate
Motor Starters	Nameplate
Variable Frequency Drives	Nameplate
Air Handling Units	Nameplate
Condensing Units, Condensers	Nameplate
DDC Control Panels	Nameplate

Fire/Smoke Damper Access Points (on duct or insulation)

Stencil

B. Valve Identification

1. Identify all valves with tags attached with chain. Local valves need not be tagged. All valves shall be designated by distinguishing numbers and letters carefully coordinated with a valve directory. All letter and number designations shall be coordinated with the Owner.
2. Designations and locations shall be accurately recorded on the Record Drawings.
3. At completion of project, provide a framed valve directory, under Plexiglass, giving number of valve, service, building location by column coordinates, floor location, manufacturer's figure number, size, and equipment controlled. For service, use designation shown in legend on drawings. Mount where directed by Owner.

C. Pipe Markers

1. Markers shall be located:
 - a. Adjacent to each valve.
 - b. At each branch.
 - c. At each riser takeoff.
 - d. At each pipe passage through wall (each side).
 - e. At each pipe passage 20' - 0" intervals maximum.
 - f. At each piece of equipment.
 - g. At all access doors.
 - h. A minimum of one (1) marker shall be provided at each room.

D. Ductwork Identification

1. All ductwork (supply, return, exhaust, etc.) serving multiple spaces or floors shall be identified with directional flow arrows and unit identification numbers (AHU-1, EF-1, etc.) on the side of each duct (or bottom if abutting other systems or obstructions).
2. All identification numbers and flow arrows shall be stencil painted or similar to Seton Name Plate Company vinyl labels.

END OF SECTION

SECTION 23 05 13 – HVAC VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 WORK INCLUDES

- A. Variable Frequency Drives (VFD) for the various items of HVAC equipment indicated.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 01 00 – HVAC General Provisions
- B. Section 23 03 00 – HVAC Basic Materials and Methods
- C. Section 23 09 00 – HVAC Instrumentation and Control
- D. Section 23 30 00 – HVAC Air Distribution
- E. Section 23 74 00 – Packaged Outdoor HVAC Equipment
- F. Section 23 80 00 – Decentralized HVAC Equipment
- G. Section 26 21 00 – Power Distribution Equipment
- H. Section 26 25 00 – Power Distribution System Studies

1.03 SUBMITTALS

- A. Refer to Section 23 01 00.
- B. Submit manufacturer's electrical requirements for power supply wiring and ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.
- C. Submit dimensioned drawings indicating dimensions for each size furnished with required and/or recommended clearances.
- D. Clearly indicate on submittal any and all deviations from this specification and the equipment schedule included on the drawings.
- E. Submit a harmonic analysis, specific for this installation, including total harmonic voltage distortion (THvD). The VFD manufacturer shall provide calculations showing that the THvD of the VFDs is less than 5%.

1.04 QUALITY ASSURANCE

- A. The VFD and options shall be tested to ANSI/UL Standard 508C. The complete VFD, including all specified options shall be assembled by the manufacturer. Assembly of the option panels by a third-party is not acceptable.

- B. The entire VFD enclosure, including the bypass shall be seismically certified and labeled in accordance with the IBC 2006 International Building Code.
- C. Manufacturer's service centers: Maintain and staff nationwide service centers with the ability to test both the controller and the motor in these service centers.
- D. Provide start up, first year service and second year parts and onsite labor warranty for each variable frequency drive and bypass provided.

PART 2 - PRODUCTS

2.01 VARIABLE FREQUENCY DRIVES (VFDS)

- A. General: For field installed VFDs, Division 23 shall furnish to Division 26, and Division 26 shall install and wire variable frequency drives where indicated. For VFDs integral to equipment packages, VFDs shall be factory installed by the equipment manufacturer.
- B. Manufacturer: All variable frequency drives shall be provided by a single source manufacturer. Subject to compliance with requirements, provide variable frequency drives and all specified accessories of one of the following manufacturers. VFDs that are manufactured by a third party and brand labeled shall not be acceptable. VFDs that are manufactured by one of the following manufacturers and brand labeled shall not be acceptable.
 - 1. ABB ACH Series
 - 2. Danfoss VLT Series
 - 3. Yaskawa Z1000
- C. General Design Characteristics:
 - 1. Using the voltage scheduled, input voltage tolerance on the low and high end of the input shall be 3 phase 208 +/- 10% to 230 +/- 10% and 380 +/- 10% to 480 +/- 10% at 48-63 Hz.
 - 2. Microprocessor based input diodes to DC bus through DC bus chokes with PWM output utilizing power transistors.
 - 3. The base VFD shall be UL listed for 100kA SCCR without the need for input fuses.
 - 4. Factory mount the VFD together with all options and modifications within a standard NEMA enclosure suitable for continuous current output at 4kHz switching and operation at maximum ambient temperature of 40 degrees C, minimum 0 degrees C, humidity non-condensing to 90 percent. All high voltage components within the enclosure shall be isolated with steel covers. Refer to VFD Schedule for enclosure NEMA Rating.

5. Advanced PWM control techniques to enable quiet motor operation as well as quiet VFD operation. Drive shall meet or exceed output current at all operating conditions. The drive shall observe safeties in all modes of operation.
6. Input impedance shall be a minimum of 5% without the use of input line reactors external to the VFD.
7. Capable of starting into a rotating load (any speed or direction) without delay, and accelerate or decelerate to set speed without tripping or component loss.
8. Input Phase Loss, Phase Reversal or Phase Imbalance protection in all modes of operation.
9. Continued operation during an intermittent loss of power for 0.1 seconds (three cycles). Opening of the VFD's input switch or output line switches while operating shall not result in damage to the power circuit component.
10. Control circuit voltages physically and electrically isolated from power circuit voltages to insure safety to maintenance personnel.
11. Protective circuits causing instantaneous trip (IET) should any of the following faults occur:
 - a. 110 percent of VFD maximum current rating is exceeded.
 - b. Output phase to phase and phase to ground (ground fault) short circuit condition.
 - c. High input line voltage.
 - d. Loss of input phase.
 - e. External fault: allowing by means of terminal strip wiring of remote safety contact closure signal such as freezestat, smoke detector, etc., to shut down the VFD.
 - f. Heat sink over temperature.
12. A customer interlock for remote starting and stopping. The VFD shall also contain outputs for customer interlock indicating drive status, and drive fault.
13. Capability of following 4-20 mA; 0-10 VDC grounded or ungrounded process control interface signals.
14. In the event of loss of input follower reference signal, the VFD shall by user selection, go to either a preset speed which shall be user adjustable, or hold the VFD speed based on the last reference received.

15. Electronic motor protection, which is capable of predicting motor winding temperature based on inputting motor specific parameters. This protection shall provide an orderly shutdown should the motor's thermal capabilities be exceeded.
16. A minimum of two selectable critical frequency avoidance jump points, in 1.5 Hz increments, to be used to avoid critical resonance frequencies of the mechanical system.
17. True ground fault protection in all modes, starting and running, without any component failure.
18. The VFD shall automatically attempt to restart up to three times after a drive or external fault, or an interruption in power. The number of attempted restarts shall be adjustable (0 to 3). Program time delays between attempts to restart shall also be adjustable.
19. Face-mounted, digital LED or LCD display and digital input programming capability on the main logic board. The display shall be at a minimum programmable for indication of current, voltage or frequency. The display shall also function as a first fault indicator. Keypad shall include electronic lock-out feature to prevent unauthorized personnel from parameter access.
20. The VFD keypad shall include a built-in time clock. The clock shall have a battery backup with a minimum life span of 10 years. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. VFD programming shall be held in non-volatile memory and is not dependent on battery power. The following adjustments shall be available and retained in non-volatile memory:
 - a. Maximum and minimum frequency.
 - b. Acceleration and deceleration rates.
 - c. Volts/hertz ratio.
 - d. Voltage offset or boost.
 - e. Current limit
 - f. KWH totalization
21. Door-mounted operator controls consisting of auto/manual switch, start/stop (reset) switch, and manual speed control.
22. Local setpoint control.
23. An input displacement factor of greater than 0.95 at all operating speeds and loads.

24. Two analog output signals for volts, amps, and frequency.
25. Circuit Breaker to disconnect all phases of incoming line. It shall be door interlocked and able to be padlocked.
26. Fast-acting drive input fuses.
27. All necessary VFD and bypass interlocks required to achieve the sequences of operation for all equipment controlled by the VFDs. Refer to Specification Section 23 09 00.
28. Serial Communications
 - a. The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet MS/TP. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL for BACnet).
 - b. Serial communication capabilities shall include, but not be limited to, run-stop control; speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, and accel/decel time adjustments. The drive shall have the capability of allowing the DDC system to monitor feedback such as process variable feedback, output speed/frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), relay outputs, and diagnostic warning and fault information. Additionally, remote (LAN) VFD fault reset shall be possible. A minimum of 15 field parameters shall be capable of being monitored. The DDC system shall be able to monitor if the motor is running in the VFD mode or bypass mode over serial communications.
 - c. The VFD shall allow the DDC system to control the drive's digital and analog outputs via the serial interface. The serial communications interface shall allow for DO (digital) control and AO (analog) control. This control shall be independent of any VFD function. The outputs can be used for modulating chilled water valves via the analog output, actuate a damper EP, etc. In addition, all drive digital and analog inputs shall be capable of being monitored by the DDC system.
29. Options: Furnish the following to be designed for installation within the standard VFD enclosure. Maintain the VFD UL or ETL listing with factory mounting and wiring.
 - a. Bypass
 - 1) The bypass shall be two contactor type.

- 2) The bypass shall have the same 100kA SCCR rating as the drive and observe the same safeties and voltage tolerances as the drive.
- 3) Provide bypass with a VFD isolation disconnect.
- 4) The bypass shall maintain positive contactor control throughout the voltage tolerance window of nominal voltage +30%, -35%. The bypass system must be able to monitor input voltage, disengage the motor in a controlled fashion, and relay an under or over voltage tolerance alarm to the building automation system.
- 5) Motor protection from Input Phase Loss, Phase Reversal or Phase Imbalance while running in bypass. Disengage the motor in a controlled fashion and give an input power indication to the building automation system.
- 6) The following relay outputs from the bypass shall be provided: Input Phase Loss, Phase Reversal, Phase Imbalance, Drive run, Bypass run, Drive fault, Bypass fault (motor overload or broken belt).
- 7) The bypass system shall NOT depend on the VFD for bypass operation. The bypass system shall be designed for standalone operation and shall be completely functional in bypass mode even if the VFD has been removed from the system for repair or replacement. Serial communications shall remain functional even with the VFD removed.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Coordinate installation of variable frequency drives at locations indicated, securely supported and anchored, and according to manufacturer's installation instructions.
- B. Line and load wiring shall be in separate metallic conduit. Provide three (3) copper conductors and unbroken ground wire. The ground wire shall be terminated on the VFD and motor conduit box. Do not combine line, load, or control wiring in a common trough.
- C. Coordinate the size of variable frequency drive lugs with the electrical contractor.
- D. Locate the variable frequency drives for proper operational access, including visibility, and for safety.
- E. VFDs shall be protected from damage and kept clean during construction. If dust collects on or in a VFD, it shall be cleaned per the manufacturer's recommendations

- F. Startup Service: Provide by service engineers employed or authorized by the manufacturer to provide start-up service including physical inspection of the drive and connected wiring and final adjustments to meet specified performance requirements. Coordinate all set point parameters with Engineer. Record in the start-up report. Include copies of the startup report in the operating and maintenance manual. Refer to Section 23 01 00.
- G. Training: Provide a minimum of eight hours of onsite training by employees of the manufacturer in addition to the start-up services. Training shall include system concepts and basic troubleshooting

END OF SECTION

SECTION 23 07 00 – HVAC INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDES

1. All labor, equipment, accessories, materials and services required to furnish and install all insulation, fittings and finishes for piping, ducts and related HVAC equipment in the heating, ventilating and air conditioning systems.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- Section 23 01 00 - HVAC General Provisions
- Section 23 03 00 - HVAC Basic Materials and Methods
- Section 23 30 00 - HVAC Air Distribution
- Section 23 80 00 - Decentralized HVAC Equipment

1.03 SUBMITTALS

Refer to Section 23 01 00.

PART 2 - PRODUCTS

2.01 GENERAL

1. Provide all insulation material (insulation, jackets, fitting covers, adhesives, cements, mastics, sealers coatings and finishes) with a composite Fire and Smoke Hazard rating as tested under procedure ASTM E-84, NFPA 255 or UL 723, not exceeding, as follows:
 1. Flame Spread 25
 2. Smoke Developed 50
2. External duct insulation shall be legibly printed or identified at intervals not to exceed 36 inches with the name of the manufacturer, the thermal resistance R-value at the specified thickness and the flame and smoke development of the composite materials.

2.02 INSULATION PRODUCTS

Provide the following insulation products as manufactured by Owens-Corning. Insulation products as manufactured by Armstrong, Johns Manville, Certain Teed, or Knauf are acceptable. Adhesives shall be Foster Products or equal.

OWENS-CORNING FIBERGLASS: ASJ/SSL-II ONE PIECE PIPE INSULATION (refer to thickness schedule.)

<u>Service</u>	<u>Thickness Schedule Type</u>
Heating water (up to 250°degrees F)	C
Air conditioning condensate drain (indoors)	E

AP ARMAFLEX: 1/2 INCH THICK PIPE INSULATION

Service

Air conditioning condensate drain (outdoors)
Air conditioning condensate drain within air conditioning unit cabinets
Refrigerant suction (up to 1-1/8 inch OD)
Refrigerant Hot gas bypass
Refrigerant Liquid line (exterior to the building)

AP ARMAFLEX: 1 INCH THICK PIPE INSULATION

Service

Refrigerant Suction (1-3/8 inch OD and larger)

OWENS CORNING FIBERGLASS 705 (FOIL REINFORCED KRAFT)
EQUIPMENT INSULATION: 2 inch thick

Service

Supply return and outside air ductwork exposed to outdoors

OWENS-CORNING SoftR ALL SERVICE DUCTWRAP TYPE 100: 1-1/2 INCH THICK

Service

Linear diffuser plenum boxes
Laminar flow diffuser plenum boxes
Sound Attenuators in supply or outside air ductwork
Reheat coils

OWENS-CORNING SoftR ALL SERVICE DUCTWRAP TYPE 100: 2 INCH THICK

Service

Concealed outside air intake ductwork
VVT system supply air ductwork (entire system)
VVT system by-pass air ductwork
Concealed supply and return air ductwork including standing seams, flanges,
and supports

2.03 SCHEDULE OF FIBERGLASS PIPE INSULATION THICKNESS
MINIMUM PIPE INSULATION THICKNESS (inches.)

Thickness Schedule Type	PIPE SIZES (INCHES)					MAX 'K' FACTOR	MEAN TEMP RATING °F
	To ¾	1 to 1¼	1-1/2 to 3	4 to 6	8 and above		
A	2-1/2	3	3	4	4	0.34	250
B	2	2-1/2	3	3	3	0.32	200
C	1-1/2	1-1/2	2	2	2	0.30	150
D	1	1	1	1	1	0.28	100
E	½	½	1	1	1	0.25	75
F	1	1-1/2	1-1/2	1-1/2	1-1/2	0.28	100

PART 3 - EXECUTION

3.01 GENERAL

- A. Install insulation products according to manufacturer's printed instructions and this specification.
- B. Install all insulation over clean dry surfaces. Insulation must be dry and in good condition. Wet or damaged insulation will not be acceptable.
- C. Install insulation subsequent to installation of heat tracing, painting, and pressure tests.
- D. Install insulation materials with smooth even surfaces.
- E. Repair existing pipe, duct and equipment insulation where removed to make new connections, to add temperature controls, or where damaged by new construction. Use same insulation as specified for new service.
- F. Where existing asbestos insulation is discovered or suspected notify the building Owner immediately so it can be removed under a separate "Asbestos Removal Contract" direct with the Owner.

3.02 INSTALLATION - PIPING INSULATION

- A. On exposed piping, locate insulation and cover seams in least visible locations.
- B. Install insulation continuous through all wall, floor and ceiling openings, sleeves and pipe hanger locations.
- C. Install fiberglass pipe insulation with joints butted firmly together. Seal jacket laps with butt strips, having factory applied adhesives. Insulate valves and fittings using mitered sections of insulation cement, or premolded fitting insulation. Cover valves and fittings with the same type of insulation as used on the piping.
- D. Do not cover valve bonnets, unions and strainers with insulation except for chilled water and refrigerant piping systems. Taper all insulation ends, seal and cover with glass cloth regardless of service. Where vapor barrier jackets are used on cold surfaces apply insulation with vapor seal integrity maintained throughout the entire system.
- E. Extend all pipe insulation through floor and countertops. Wherever subject to moisture or cleaning equipment provide 0.016 inch thick aluminum jacket of sufficient length for protection.
- F. Wrap pipe insulation exposed to the weather with Alumaguard, a rubberized bitumen vapor barrier membrane system specifically designed for installation over insulation on exterior piping. Alumaguard is manufactured by polyguard

Products (1-800-541-4994). Alumaguard is a peel and stick system that must be installed over a clean, dry, and oil free surface. The piping must be pressure tested and insulation must be installed prior to installation of the Alumaguard membrane system. Polyguard's cold Weather Activator or heat gun must be used to ensure adhesions of Alumaguard at temperatures below 50 degrees F. Coordinate proper installation methods with manufacturer. Equivalent system as manufactured by Venture Tape - VentureClad 1577CW is acceptable.

- G. Apply the manufacturer's recommended adhesive for Armaflex pipe and sheet insulation based on the working temperature of service. Insulate all valves and fittings to match adjacent piping. Apply two coats of WP Armaflex Finish on insulation located outdoors.
- H. Cover exposed pipe insulation located in mechanical rooms with PVC jacket.
- I. Insulation on steam relief valve discharge piping can be reduced to 1" thick at 8 feet above the floor. Terminate insulation just below roof line.

3.03 INSTALLATION - DUCT INSULATION

- A. Impale rigid duct insulation over welded pins at maximum of 12 inches on center and secure with self-locking caps. Seal all insulation edges and butt joints firmly with 5 inch wide pressure sensitive joint sealing tape.
- B. Wrap faced duct wrap insulation tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2 inches. Secure insulation to the bottom of rectangular ductwork over 24 inches with mechanical fasteners at not more than 18 inches on center. Secure facing for circumferential and longitudinal joints using reinforced Kraft tape. Tape all pin penetrations or punctures in facing.
- C. Duct insulation shall be continuous through all wall and floor openings except at fire and smoke damper locations.
- D. Wrap duct insulation exposed to the weather with Alumaguard, a rubberized bitumen vapor barrier membrane system specifically designed for installation over insulation on exterior insulation. Alumaguard is manufactured by polyguard Products (1-800-541-4994). Alumaguard is a peel and stick system that must be installed over a clean, dry, and oil free surface. The ductwork must be pressure tested and insulation must be installed prior to installation of the Alumaguard membrane system. Polyguard's cold Weather Activator or heat gun must be used to ensure adhesions of Alumaguard at temperatures below 50 degrees F. Coordinate proper installation methods with manufacturer. Equivalent system as manufactured by Venture Tape - VentureClad 1577CW is acceptable.

3.04 INSTALLATION - EQUIPMENT INSULATION

- A. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose
- B. Install insulation materials with smooth and even surfaces. Rework poorly fitted joint. Do not use joint sealer or mastic as filler for joint gaps and excessive voids resulting from poor workmanship. Apply using staggered joint method for both single and multi-layer installation, applying each layer of insulation separately.
- C. Coat insulated surfaces without vapor barrier with a layer of insulating cement,

- troweled to a smooth and continuous surface. Fill in seams, broken edges, and depressions. Cover over wire mesh and joints with cement sufficiently thick to remove surface irregularities.
- D. Maintain the integrity of factory-applied vapor barrier jacketing on all insulation, protecting it against puncture, tears or other damage.
 - E. For field-applied all-service vapor barrier jacketing, neatly fit and tightly secure. Lap seams 2 inches minimum. Seal all joints with adhesive. Tape with 3 inch matching pressure-sensitive tape or 3 inch glass fabric and mastic.
 - F. Removable insulation: Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance, such as vessel covers, fasteners, flanges, frames and accessories.
 - G. Areas left uninsulated: Items such as boiler manholes, handholes, clean-outs, ASME stamp, and manufacture's nameplates, shall be left uninsulated unless omitting insulation would cause a condensation problem. When such is the case, appropriate tagging shall be provided to identify the presence of these items. Provide neatly beveled edges at interruptions of insulation.
 - H. Miter rigid fiberglass equipment insulation to fit shape of equipment and secure in place with steel bands on 12 to 18 inches on center. Seal all joints with matching pressure sensitive joint sealing tape.

3.05 FIELD QUALITY ASSURANCE

- 1. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be accomplished while work is in progress to assure compliance with requirements to cover and protect insulation materials during installation.

3.06 PROTECTION

- 1. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.
- 2. The insulation installer shall advise the General and the HVAC Contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

END OF SECTION

SECTION 23 09 00 – HVAC INSTRUMENTATION AND CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDES

- A. The BAS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for a complete, fully functional and commissioned BAS meeting the specified sequence of operation.
- B. All new controllers shall connect to the existing Honeywell controls system at the facility.
- C. All wiring, conduit and panels for all temperature controls.
- D. Controls installer shall be responsible for all electrical work associated with the BAS control system.
 1. All wiring incidental to this temperature control system shall be provided by the BAS Installer.
 2. The term "Wiring" shall be construed to include furnishing of wire, conduit, miscellaneous materials and labor as required for mounting and connecting electrical control devices, and providing electrical interlocks between equipment.
 3. Provide all control transformers as required for control system.
 4. Conceal all wiring in occupied finished spaces.
- E. Preparing Submittals and Shop Drawings for all hardware and software and submit within 30 days of the award of Contract.
- F. Providing all stand-alone BAS panel hardware and related peripherals, including interconnecting cabling and power supply required.
- G. Providing all field devices including remote input/output devices, sensors, transmitters, relays, contactors, transducers, and associated electronics required to affect all interfaces.
- H. Providing all communications hardware necessary for implementing data links between the BAS panel(s) and all field devices.
- I. Providing all specified software required to implement a complete and

operational BAS, including verification and graphics of systems.

- J. Furnishing complete Operating and Maintenance Manuals, and field training of operators and maintenance personnel.
- K. Accomplishing all factory and field acceptance tests as indicated.
- L. Provide graphics for operator workstations. Indicate via floor plans the location of mechanical equipment. The operator shall be viewing/controlling these systems via graphical displays. Provide all necessary software upgrades to the operator's workstation required for graphics upgrades. Project will not be considered complete until graphics have been completed and the school district has complete control over all new BAS components.
- M. System commissioning, checkout and Owner training.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 22 - Plumbing
- B. Section 23 01 00 - HVAC General Provisions
- C. Section 23 03 00 - HVAC Basic Materials and Methods
- D. Section 23 05 13 - HVAC Variable Frequency Drives
- E. Section 23 30 00 - HVAC Air Distribution
- F. Section 23 74 00 - Packaged Outdoor HVAC Equipment
- G. Section 23 80 00 - Decentralized HVAC Equipment
- H. Division 26, 27- Electrical

1.03 APPROVED CONTROL SYSTEM CONTRACTORS AND MANAGERS

- A. Johnson Controls, Inc. - METASYS
- B. Siemens Building Technologies, Inc. - APOGEE System
- C. Honeywell

1.04 SUBMITTALS

- A. Refer to Section 23 01 00.
- B. Submit complete temperature control Shop Drawings, including control diagrams, sequence of operation and component specification data prior to installation or fabrication of any equipment. Submittal data shall include a schedule of all devices and materials to be installed, selected for optimum system operation; including location, schedules, properly sized control

valves and dampers. Submittals shall also include all control devices, control panel and communication wiring diagrams.

- C. Deviations in details from the specified sequence of operation shall be clearly noted on the submittal.

1.05 ITEMS FURNISHED BUT NOT INSTALLED

- A. Automatic control dampers
- B. Automatic control valves
- C. Immersion wells
- D. Pressure taps
- E. Flow Switches

1.06 QUALITY ASSURANCE

- A. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.
- B. All BAS controllers shall be UL Listed at the time of bid.

1.07 SERVICE AND GUARANTEE

- A. The BAS Supplier shall be fully responsible for the debugging, calibration and proper operation of the Building Automation System, including but not limited to, sensors, controls, communication links, and peripheral devices.
- B. The BAS Supplier shall also be fully responsible for providing and loading the specified software packages, to include the loading of all necessary operational parameters. Any debugging of software shall be performed solely by the BAS Supplier.
- C. The BAS system shall be designed and installed, commissioned and serviced by factory trained personnel. BAS contractor shall have an in-place support facility within 100 miles of the site with technical staff, spare parts inventory and necessary test and diagnostic equipment. The BAS contractor shall provide an experienced project manager for this work, responsible for direct supervision of the design, installation, start up and commissioning of the BAS. The Bidder shall be regularly engaged in the installation and maintenance of BAS systems and shall have a minimum of ten (10) years of demonstrated technical expertise and experience in the installation and maintenance of BAS systems similar in size and complexity to this project.
- D. After completion of system installation adjust all new thermostats, control valves, motors and other equipment provided under this section with trained

personnel. Place controls in operating condition subject to the approval of the Engineer. Instruct operating personnel in the operation and maintenance of the control system.

- E. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Failures on control systems that include all computer equipment, transmission equipment and all sensors and control devices during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.
- F. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
- G. Provide updates to operator workstation software, project-specific software, graphic software, database software, and firmware that resolve Contractor identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with the above-mentioned items. Do not install updates or upgrades without Owner's written authorization.
- H. Exception:
 - 1. Contractor shall not be required to warrant reused devices, except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.
 - 2. Contractor shall not be required to warrant systems, equipment and devices or software if the damages and/or failures were caused by lack of training, unauthorized use, negligence or deliberate action of other parties, or job site conditions.

1.08 TRAINING

- A. Provide competent instructors to instruct Owner's designated personnel in the adjustment, operation and maintenance of the system installed. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach.

All training shall be held during normal working hours, 8:00 a.m. to 4:30 p.m. weekdays or as requested by the Owner:

- B. Provide sixteen (16) hours on-site training for Owner's operating personnel. Training shall include:

1. Explanation of Drawings, Operations and Maintenance Manuals.
2. Walk-thru of the job to locate control components.
3. Direct Digital Controller and Application Specific Controller operation/function.
4. Explanation of adjustment, calibration and replacement procedures.

PART 2 - PRODUCTS

2.01 CONTROL SYSTEM ARCHITECTURE (DDC SYSTEM)

- A. The building automation system (BAS) shall integrate multiple functions of the building including equipment supervision and control, alarm management, energy management, historical data collection and lighting control.
- B. The building automation system shall consist of the following:
 1. Stand-alone DDC Controllers
 2. Stand-alone Application Specific Controllers (ASC)
- C. The system shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, DDC Controllers, Application Specific Controllers and operator devices.
- D. System Architecture shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O and data collection. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
- E. DDC Controllers shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller or combination of controllers on the network without dependence upon a central processing device. DDC Controllers shall also be able to send alarm reports to the workstation without dependence upon a central processing device.
- F. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be the manufacturer's latest standard design that complies with the Specification requirements.
- G. Single source responsibility of the supplier shall be the complete installation of the Building Automation System and control system including debugging and proper calibration of each system component.
- H. All electronic equipment shall conform to the requirements of FCC Regulation,

Part 15, Section 15, Governing Radio Frequency Electromagnetic Interference.

- I. All system components shall be fault-tolerant.
 1. Satisfactory operation within a range of 85 percent to 110 percent of rated voltage and at 3 Hertz variation in-line frequency without damage.
 2. Static, transient and short-circuit protection on all inputs and outputs.
 3. Protect communication lines against incorrect wiring, static transients and induced magnetic interference.
 4. Network-connected devices to be AC coupled or equivalent so that any single device failure will not disrupt or halt network communication.
 5. All real time clocks and data file RAM shall be battery-backed for a minimum 48-hours and include local and system low battery indication.
 6. System shall be capable of receiving and printing alarms at the central location even when the workstation at that location is non-operational or taken out of service for periodic maintenance.

2.02 NETWORKING COMMUNICATIONS (DDC SYSTEM)

- A. The design of the BAS shall network the operator workstation and stand-alone DDC Controllers. The network architecture shall consist of two levels, a high performance peer-to-peer network and DDC Controller specific local area networks.
- B. Access to system data shall not be restricted by the hardware configuration of the building automation system. The hardware configuration of the BAS network shall be totally transparent to the user when accessing data or developing control programs.
- C. Peer-to-Peer Network Level
 1. The operator workstation and DDC Controllers shall directly reside on a network such that communications may be executed directly between DDC Controllers and between DDC Controllers and workstation on a peer-to-peer basis.
 2. All operator devices either network resident or connected via dial-up modems shall have the ability to access all point status and application report data or execute control functions for any and all other devices via the peer-to-peer network. Access to data shall be based upon logical identification of building equipment. No hardware or software limits shall be imposed on the number of devices with global access to the network data.
 3. Network design shall include the following:

- a. High-speed data transfer rates for alarm reporting, quick report generation from multiple controllers and upload/download efficiency between network devices. System performance shall insure that an alarm occurring at any DDC Controller is displayed at workstation[s] and/or alarm printers within 5 seconds.
- b. Support of any combination of DDC Controllers and the operator workstation directly connected to the peer-to-peer network. A minimum of 32 devices shall be supported on a single network.
- c. Message and alarm buffering to prevent information from being lost.
- d. Error detection, correction and retransmission to guarantee data integrity.
- e. Synchronization of real-time clocks; include automatic daylight savings time updating between all DDC Controllers.

D. DDC Controller Local Area Network (LAN)

1. This level communication shall support a family of application specific controllers and shall communicate bi-directionally with the peer-to-peer network through DDC Controllers for transmission of global data.
2. Application specific controllers shall be arranged on the LAN(s) in a functional relationship manner with DDC Controllers. [For example, a terminal unit controller shall be on a LAN from the DDC Controller that is controlling the corresponding AHU]. [Each building or addition shall be on its own LAN].

2.03 DDC CONTROLLER

- A. Stand-alone DDC Controllers shall be microprocessor-based with a minimum word size of 16 bits. They shall also be multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors, communication controllers, power supplies and input/output point modules. Controller size shall be sufficient to fully meet the requirements of this Specification.
- B. Each DDC Controller shall have sufficient memory, a minimum of 1 megabyte, to support its own operating system and databases, including:
 1. Control processes
 2. Energy management applications
 3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
 4. Historical/trend data for points specified

5. Maintenance support applications
6. Custom processes
7. Operator I/O
8. Dial-up communications
9. Manual override monitoring

C. Each DDC Controller shall support:

1. Monitoring of the following types of inputs, without the addition of equipment outside the DDC Controller cabinet:
 - a. Analog inputs
 - 1) 20 mA
 - 2) 0-10 Volts DC
 - 3) Thermistors
 - 4) 1000 ohm RTD's
 - b. Digital inputs
 - 1) Dry contact closure
 - 2) Pulse accumulator
 - 3) Voltage sensing

D. Each DDC Controller shall have a minimum of 10 percent spare capacity for future point connection. The type of spares shall be in the same proportion as the implemented I/O functions of the panel, but in no case shall there be less than two spares of each implemented I/O type. Provide all processors, power supplies and communication controllers complete so that the implementation of a point only requires the addition of the appropriate point input/output termination module and wiring.

1. Provide sufficient internal memory for the specified control sequences and have at least 25 percent of the memory available for future use.

2.04 DDC CONTROLLER RESIDENT SOFTWARE FEATURES

A. General

1. Provide all necessary software for a complete operating system.
2. The software programs shall be provided as an integral part of DDC

Controllers and shall not be dependent upon any higher level computer for execution.

B. Control Software Description

1. The DDC Controller shall have the ability to perform the following pre-tested control algorithms:
 - a. Two-position control
 - b. Proportional control
 - c. Proportional plus integral control
 - d. Proportional, integral, plus derivative control
2. Control software shall include a provision for limiting the number of times each piece of equipment may be cycled within any one-hour period.
3. The system shall provide protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical load.
4. Upon the resumption of normal power, each DDC Controller shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling and turn equipment on or off as necessary to resume normal operations.

C. DDC Controllers shall have the ability to perform any or all of the following energy management routines:

1. Time-of-day scheduling
2. Calendar-based scheduling
3. Holiday scheduling
4. Temporary schedule overrides
5. Start-stop time optimization
6. Automatic daylight savings time switchover
7. Night setback control
8. Temperature-compensated duty cycling
9. Fan speed
10. Heating/cooling interlock

- D. DDC Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.
1. It shall be possible to use any of the following in a custom process:
 - a. Any system measured point data or status
 - b. Any calculated data
 - c. Any results from other processes
 - d. User-defined constants
 - e. Arithmetic functions (addition, subtraction, multiplication, division, square root, exp, etc.)
 - f. Boolean logic operators (and/or, exclusive or, etc.)
 - g. On-delay/off-delay/one-shot timers
 2. Custom processes may be triggered based on any combination of the following:
 - a. Time interval
 - b. Time-of-day
 - c. Date
 - d. Other processes
 - e. Time programming
 - f. Events (e.g., point alarms)
 3. A single process shall be able to incorporate measured or calculated data from any and all other DDC Controllers on the network. In addition, a single process shall be able to issue commands to points in any and all other DDC Controllers on the network.
 4. Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of a dial-up connection to a remote device such as printer or pager.
 5. The custom control programming feature shall be documented via English language descriptors.
- E. Alarm management shall be provided to monitor and direct alarm information to operator devices. Each DDC Controller shall perform distributed,

independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the DDC Controllers ability to report alarms be affected by either operator or activity at a workstation, local I/O device or communications with other panels on the network.

1. All alarm or point change reports shall include the point's English language description and the time and date of occurrence.
 2. Alarm reports and messages will be directed to a user-defined list of operator devices.
 3. In dial-up applications, operator-selected alarms shall initiate a call to a remote operator device.
- F. A variety of historical data collection utilities shall be provided to manually or automatically sample, store and display system data for points as specified.
1. DDC Controllers shall store point history data for selected analog and digital inputs and outputs.
- G. DDC Controllers shall automatically accumulate and store run-time hours for digital input and output points as specified in the point I/O summary.
1. The totalization routine shall have a sampling resolution of one minute or less.
 2. The user shall have the ability to define a warning limit for run-time totalization. Unique, user-specified messages shall be generated when the limit is reached.
- H. DDC Controllers shall have the ability to count events such as the number of times a system is cycled on and off. Event totalization shall be performed on a daily, weekly or monthly basis for points as specified in the point I/O summary.
1. The event totalization feature shall be able to store the records associated with a minimum of 9,999.9 events before reset.
 2. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

2.05 APPLICATION SPECIFIC CONTROLLERS (ASC)

A. General

1. Each DDC Controller shall be able to extend its performance and capacity through the use of remote application specific controllers (ASC).
2. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in

the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

3. Each ASC shall have sufficient memory to support its own operating system and data bases including:
 - a. Control Processes
 - b. Energy Management Applications
 - c. Operator I/O (Portable Service Terminal)
4. The operator interface to any ASC point data or programs shall be through the network PC workstation, or a PC or portable operator's terminal connected to any panel in the network.
5. Application Specific Controllers shall directly support the temporary use of a portable service terminal. The capabilities of the portable service terminal shall include but not be limited to the following:
 - a. Display temperatures
 - b. Display status
 - c. Display setpoints
 - d. Display control parameters
 - e. Override binary output control
 - f. Override analog setpoints
 - g. Modification of gain and offset constants
6. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.
7. Configuration and Download: The ASC shall have the capability of receiving configuration and program loading by all of the following:
 - a. Locally, via a direct connect portable laptop service tool
 - b. Over the network, from the portable laptop service tool
 - c. From an Operator Workstation, via the communication network
8. Hardware Override Switches: The operators shall have the ability to manually override automatic or centrally executed commands at the network panel via local, point discrete, onboard hand/off/auto operator

override switches for binary control points and gradual switches for analog control type points. These override switches shall be operable whether the panel is powered or not.

9. Hardware Override Monitoring: Network panels shall monitor the status or position of all overrides, and include this information in logs and summaries to inform the operator that automatic control has been inhibited. Network panels shall also collect override activity information for daily and monthly reports.
10. Local Status Indicator Lamps: The network panel shall provide local status indication for each binary input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.

B. Unitary Controllers

1. Unitary Controllers shall support, but not be limited to, the following types of systems:
 - a. Packaged Rooftop Units
2. Unitary Controllers shall support the following types of point inputs and outputs:
 - a. Economizer Switchover Inputs
 - 1) Drybulb
 - 2) Outdoor Air Enthalpy
 - 3) Differential Temperature
 - 4) Binary Input from a separate Controller
 - b. Economizer Outputs
 - 1) Integrated Analog with minimum position
 - 2) Binary output to enable self-contained economizer actuator
 - c. Heating and Cooling Outputs
 - 1) 1 to 3 Stages
 - 2) Analog Output with two-pipe logic
 - 3) Reversing valve logic for Heat Pumps
 - d. Fan Output

- 1) On/Off Logic Control
3. Unitary controllers shall support the following library of control strategies:
 - a. Daily/Weekly Schedules
 - b. Comfort/Occupancy Mode
 - c. Economy Mode
 - 1) Standby Mode/Economizer Available
 - 2) Unoccupied/Economizer Not Available
 - 3) Shutdown
 - 4) Lighting Logic Interlock to Economy Mode
 - d. Temporary Override Mode
 - 1) Temporary Comfort Mode (Occupancy-Based Control)
 - 2) Boost (Occupant Warmer/Cooler Control)
4. Occupancy-Based Standby/Comfort Mode Control: Each Unitary Controller shall have a provision for occupancy sensing overrides. Based upon the contact status of a manual wall switch, or an occupancy sensing device, the Unitary Controller shall automatically select either Standby or Comfort mode to minimize the heating/cooling requirements while satisfying comfort conditions.
5. Occupancy-Based Zone Lighting Control: Unitary Controllers shall include an auxiliary binary output to serve as the interface to an associated lighting relay.

Based upon the status of either an occupancy sensing device or a manual wall switch, the Unitary Controller shall provide a contact output to automatically adjust the lighting level to accommodate occupant requirements while reducing electrical consumption. Standby/Comfort (described in the previous section) and Lighting overrides shall be served by the same occupancy override input.

6. Continuous Zone Temperature Histories: Each Unitary Controller shall automatically and continuously, maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.
7. Alarm Management: Each Unitary Controller shall perform its own limit and status monitoring and analysis to maximize network performance by

reducing unnecessary communications.

2.06 OPERATOR INTERFACE SOFTWARE

A. Basic Interface Description

1. Operator Workstation interface software shall minimize operator training through the use of English language prompting, English language point identification, and industry standard PC application software. The operator interface shall minimize the use of a typewriter-style keyboard through the use of a mouse and with finger touch screen interface to provide a "point and click" approach to menu selection. The system operator shall perform all person machine interface functions (ie., start/stop, setpoints) by use of the mouse and by finger touch on monitor screen. Touch devices which overlay on monitor screen are not acceptable.
2. The operator workstation software shall be based on Microsoft Windows. The operator shall have the ability to incorporate industry-standard Microsoft Windows Dynamic Data Exchange Interface (DDE) for client applications using any third-party software package (Microsoft compatible).
3. The BAS graphic software package shall allow the Owner to import AutoCAD files of floor plans for display.
4. At the option of the user, Operator Workstations shall provide consistent graphical or text-based displays of all system point and application data described in this Specification. Point identification, Engineering units, status indication and application naming conventions shall be the same at all workstations.
5. The Operator Interface shall provide the ability to simultaneously view several different types of system displays in overlapping windows to speed building analysis. For example, the interface shall provide the ability to simultaneously display a graphic depicting an air handling unit, while displaying the trend graph of several associated space temperatures to allow the user to analyze system performance.
6. Multiple-level password access protection shall be provided to limit workstation control, display and database manipulation capabilities as deemed appropriate for each user, based upon an assigned password.
 - a. Passwords shall be exactly the same for all operator devices, including portable or panel-mounted network terminals.

Any additions or changes made to password definition shall automatically cause passwords at all network panels on a network to be updated and downloaded to minimize the task of maintaining system security.

- b. A minimum of five levels of access shall be supported:
 - 1) Level 1 = Data Access and Display
 - 2) Level 2 = Level 1 plus Operator Overrides
 - 3) Level 3 = Level 2 plus Database Modification
 - 4) Level 4 = Level 3 plus Database Generation
 - 5) Level 5 = Level 4 plus Password Add/Modification
 - c. A minimum of 50 passwords shall be supported at each network panel.
 - d. Operators will be able to perform only those commands available for their respective passwords. Menu selections displayed at any operator device, including portable or panel mounted devices, shall be limited to only those items defined for the access level of the password used to log-on.
 - e. User-definable, automatic log-off timers of from 1 to 60 minutes shall be provided to prevent operators from inadvertently leaving devices on-line.
7. The operator interface shall allow the operator to perform commands including, but not limited to, the following:
- a. Start-up or shutdown selected equipment
 - b. Adjust setpoints
 - c. Add/Modify/Delete time programming
 - d. Enable/Disable process execution
 - e. Lock/Unlock alarm reporting for each point
 - f. Enable/Disable Totalization for each point
 - g. Enable/Disable Trending for each point
 - h. Override PID loop setpoints
 - i. Enter temporary override schedules
 - j. Define Holiday schedules
 - k. Change time/date
 - l. Enter/Modify analog alarm limits

- m. Enter/Modify analog warning limits
 - n. View limits
 - o. Enable/Disable Demand Limiting for each meter
 - p. Enable/Disable Duty Cycle for each load
8. Reports shall be generated automatically or manually, and directed to either CRT displays, printers, or disk files. As a minimum, the system shall allow the user to easily obtain the following types of reports:
- a. A general listing of all points in the network
 - b. List all points currently in alarm
 - c. List of all off-line points
 - d. List all points currently in override status
 - e. List of all disabled points
 - f. List all points currently locked out
 - g. List of all items defined in a "follow-up" file
 - h. List all Weekly schedules
 - i. List all Holiday programming
 - j. List of limits and deadbands

Summaries shall be provided for specific points, for a logical point group, for a user-selected group of groups, or for the entire facility without restriction due to the hardware configuration of the facility management system. Under no conditions shall the operator need to specify the address of hardware controller to obtain system information.

- B. Provide Color graphic floor plan displays, and system schematics for mechanical equipment.
- 1. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection, or text-based commands.
 - 2. Dynamic temperature values, humidity values, flow values, and status indication shall be shown in their actual respective locations, and shall automatically update to represent current conditions without operator intervention.
 - 3. The windowing environment of the PC Operator Workstation shall allow

the user to simultaneously view several graphics at the same time to analyze total building operation, or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.

4. Graphic generation software shall be provided to allow the user to add, modify, or delete system graphic displays.
 - a. The BAS Contractor shall provide libraries of pre-engineered screens and symbols depicting standard air handling unit components [i.e., fans, cooling coils, filters, dampers, etc.], complete mechanical systems [i.e., heat pump, condenser water, etc.] and electrical symbols similar to those indicated on the drawings.
 - b. The graphic development package shall use a mouse or similar pointing device in conjunction with a drawing program to allow the user to perform the following:
 - 1) Define symbols
 - 2) Position and size symbols
 - 3) Define background screens
 - 4) Define connecting lines and curves
 - 5) Locate, orient and size descriptive text
 - 6) Define and display colors for all elements
 - 7) Establish correlation between symbols or text and associated system points or other displays
 - c. Graphical displays can be created to represent any logical grouping of system points or calculated data based upon building function, mechanical system, building layout, or any other logical grouping of points which aids the operator in the analysis of the facility. To accomplish this, the user shall be able to build displays that include point data from multiple network panels, including application specific controllers used for DDC unitary control.
- C. All temperature and equipment control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.
 1. The system shall be provided complete with all equipment and documentation necessary to allow an operator to independently perform the following functions:
 - a. Add/Delete/Modify Stand-alone network panels

- b. Add/Delete/Modify Operator Workstations
 - c. Add/Delete/Modify Application Specific Controllers
 - d. Add/Delete/Modify points of any type, and all associated point parameters, and tuning constants
 - e. Add/Delete/Modify alarm reporting definition for each point
 - f. Add/Delete/Modify control loops
 - g. Add/Delete/Modify energy management applications
 - h. Add/Delete/Modify time and calendar-based programming
 - i. Add/Delete/Modify Totalization for every point
 - j. Add/Delete/Modify Historical Data Trending for every point
 - k. Add/Delete/Modify custom control processes
 - l. Add/Delete/Modify any and all graphic displays, symbols, and cross-references to point data
 - m. Add/Delete/Modify dial-up telecommunication definition
 - n. Add/Delete/Modify all operator passwords
 - o. Add/Delete/Modify Alarm Messages
2. Definition of operator device characteristics, network panels, individual points, applications and control sequences shall be performed through fill-in-the-blank templates and graphical programming approach.

Graphical programming shall allow the user to define the software configuration of DDC control logic for HVAC system control sequences, fan interlocks, PID control loops, and other control relationships through the creation of graphical logic flow diagrams.

- a. Graphical Programming: Control sequences are created by using a mouse input device to draw interconnecting lines between symbols depicting inputs, operators (comparisons and mathematical calculations), and outputs of a control sequence. As a minimum, graphic symbols shall be used to represent:
 - 1) Process inputs, such as temperature, humidity, or pressure values, status, time, date, or any other measured or calculated system data
 - 2) Mathematical Process Operators, such as addition, subtraction, multiplication, or greater than, equal to, less than, etc.

- 3) Logical Process Operators such as AND, OR, Exclusive OR, NOT, etc.
 - 4) Time delays
 - 5) Process Control Outputs such as start/stop control points, analog adjust points, etc.
 - 6) Process Calculation Outputs
 - 7) Text file Outputs and Advisories
- b. Network-Wide Strategy Development: Inputs and outputs for any process shall not be restricted to a single network panel, but shall be able to include data from any and all other network panels to allow the development of network-wide control strategies. Processes shall also allow the operator to use the results of one process as the input to any number of other processes (cascading).
 - c. Sequence Testing and Simulation: A software tool shall be provided, which allows a user to simulate control sequence execution to test strategies before they are actually applied to mechanical systems. Users shall be able to enter hypothetical input data, and verify desired control response and calculation results via graphical displays and hardcopy printouts.
3. All portions of system definition shall be self-documenting to provide hardcopy printouts of all configuration and application data. Control process and DDC control loop documentation shall be provided in logical, graphical flow diagram format to allow control sequences to be easily interpreted and modified at any time in the future.
 4. Back-up copies of all stand-alone network panel databases shall be stored in [the][at least one] personal computer operator workstation. Continuous supervision of the integrity of all network panel data bases shall be provided. In the event that any network panel on the network experiences a loss of its database for any reason, the system shall automatically download a new copy of the respective database to restore proper operation. Data base back-up/download shall occur over the local area network without operator intervention. Users shall also have the ability to manually execute downloads of any or all portions of a network panels database.

2.07 CONTROL SYSTEM COMPONENTS (GENERAL)

A. Control Valves

1. Valves: Single-seated, two-way straight through body type or three-way mixing or diverting body, polished stainless steel stems, and spring loaded teflon packing.

Valves shall have a modulating plug for steam or water service depending upon its particular use. Where required valves shall be spring sequenced to give proper operation of control and the operator shall be of sufficient size and power to give positive shutoff or gradual modulation as required.

2. Water valves shall be sized on the basis of 15 percent of the total system pressure drop, but not more than 10 feet of head drop. Size 3-way hot water zone valves for not more than 5 feet of head drop. Steam valves shall be of size to provide a maximum pressure drop of system inlet, minus equipment design or 5 psi whichever is less.
3. Valves 2 inches and smaller: screwed bodies; 2-1/2 inches and larger: flanged bodies; designed for 125 psi operating pressure. Arranged to fail-safe as called for, tight closing and quiet operating.
4. Physical sizes of valves will be such that they will fit within the physical space provided within radiation and equipment enclosures. Verify before ordering materials.
5. The controls supplier shall correctly size all valves and supervise their installation. Submit valve sizing as part of shop drawing submittal.

B. Electric Operators (Valve)

1. Provide 24 Volts AC valve actuators which are 0-10 Volt DC input proportional or two position with spring return as required by control sequence, designed for water service valve bodies.

Operator shall be synchronous motor driven with up to 150 inch-pound force with force sensor safety stop. Enclosure shall be cast aluminum.

C. Electric Operators (Damper)

1. Provide 24 Volts (or voltage indicated on drawings) AC damper actuators which are 0-10 Volt DC input proportional or two position with spring return as required by control sequence, designed to operate control dampers. Operator shall be synchronous motor driven with up to 150 inch-pound force with force sensor safety stop and spring return as required. Enclosure shall be cast aluminum.

D. Air Flow Control Dampers

1. Provide low leakage air flow control dampers of size indicated on plans. Dampers shall be opposed or parallel blade operation to suit application.
2. The damper leakage rate at 4.0 inches w.g. pressure differential shall not be greater than 4.2 cfm per sq. ft.
3. Control dampers shall meet the following minimum construction standards. Frame shall be 16 gage galvanized steel structural hat

channel with tabbed corners for reinforcement for 11 gage structural equivalence. Blades shall be 14 gage equivalent thickness galvanized steel, airfoil type. Blade edge seals shall be neoprene type or equivalent suitable for -72 degrees F to +275 degrees F, mechanically locked into the blade edge. Jamb seals shall be flexible metal, compression type to prevent leakage between blade end and damper frame.

4. No individual section of a damper shall be larger than 48 inch by 48 inch size. Dampers larger than 48 inch by 48 inch shall be made up of multiple damper sections. Provide jack shafts between multiple sections for connection to damper operator(s).
5. Bearings shall be corrosion resistant, permanently lubricated stainless steel sleeve type turning in an extruded hole in the damper frame. Axles shall be constructed of plated steel and be square or hexagonal positively locked into the damper blade. Linkage shall be concealed out of the airstream, within the damper frame.
6. Submittal shall include leakage, maximum air flow and maximum pressure ratings based on AMCA Publication 500.
7. Dampers shall be in all respects equivalent to Ruskin model CD60. Acceptable manufacturers are Ruskin and American Warming.

E. Local Control Panels

1. Provide for each control system a control panel suitable for wall mounting. Locate panel adjacent to systems served. All controllers, transducers, and associated control components shall be mounted in control panels.
2. Fabricate panels of 14 gauge furniture steel or aluminum totally enclosed on all sides with hinged door and key lock. Shop paint with manufacturer's standard color. Panel shall carry a NEMA rating suitable for installed location. Cabinets shall be grounded per Division 16 requirements.
3. Flush mount on the hinged door all manual switches: such as; damper positioning switches, summer/winter switches, plus all dial thermometers and/or indicating receiver gauges.
4. Provide proper cooling of cabinets to prevent inside temperature from exceeding component maximum operating temperature limits.

F. Low Limit Thermostat (Freezestat)

1. Provide low temperature thermostats at all air handling unit heating coils and where indicated by the Sequence of Operation.
2. Thermostat shall have a DPDT switch and 20 foot long sensing element.

Thermostat shall be adjustable from 34 degrees F. to 70 degrees F.

3. Provide one thermostat for each coil up to 20 square feet of coil surface. Provide multiple thermostats for coils greater than 20 square feet. Install element in serpentine pattern across coil at minimum rate of 1 foot of element for each square foot of coil. Provide grommets at element supports to prevent damage to element.
4. Thermostats shall be hard wired to the air handling unit fan and require a manual reset after activation. Thermostats on DDC system shall be auto reset when the DDC system is alarmed on trip. Fan lockout and reset shall be by Software.
5. Thermostat shall trip when any 1 foot of element senses air temperature below set point.

G. Control Transformers

1. 120 to 24 Vac with circuit breaker type overcurrent protection and foot and dual threaded hub mounted.
2. Transformer size shall be as required by control system.

2.08 DDC SYSTEM SENSORS

A. Temperature Sensors

1. Temperature sensors shall be 1,000 OHM RTD type or thermistors with 0.36 degrees F accuracy. Analog temperature sensors shall provide an output signal that varies continuously with the sensed temperature, within a specified range.
2. All sensors of a particular category shall be of the same type and manufacturer. Provide temperature sensors suitable for one or more of the following mounting methods:
 - a. Insertion Type - suitable for insertion into air ducts at any angle and shall have a minimum insertion of 6 inches.
 - b. Immersion Type - suitable for immersion into fluids in tanks or pipes with separable well and heat transfer compound.
 - c. Averaging Type with Extended Element - suitable for duct mounting to obtain average temperature by sampling along a capillary tube element not less than 8 feet in length.
 - d. Outside Air Sensing Type - shall have sun shades to minimize solar effects and shall be mounted to minimize building outside air film effects.
 - e. Space Type - [provide [plastic] [metal] vented, lockable guard

enclosure where indicated on plans].

f. [Provide occupied/unoccupied override switch where indicated. Refer to Sequence of Operation.]

3. The following shall apply to temperature sensors:

a. All external trim material shall be completely corrosion resistant with all parts assembled into a watertight, vibration-proof, heat resistant assembly.

b. Sensor wells shall be brass and compatible with the sensor.

B. Static Pressure Transmitters (Air)

1. The sensors shall be a variable capacitance type, utilizing a stainless steel diaphragm and insulated electrode for positioning of the diaphragm.

2. The sensor shall produce a linear 4 to 20 mA or 0-5 Volt DC with accuracies of 1 percent full scale in normal ambient temperature environments.

3. Pressure ranges 0 to 0.1 inch water gauge through 0 to 25 inch water gauge.

4. The transmitter shall be temperature compensated to account for any thermal error over the entire temperature range of 40 degrees F to 100 degrees F, 0 to 95 percent relative humidity. Over-pressurization 10 inch water gauge up to ten times range.

5. The transmitter shall have zero span adjustment capability, but shall be factory calibrated.

C. Relative Humidity Sensors

1. Relative humidity sensors shall be an analog precision resistance type relative humidity detector. Sensor shall have an overall accuracy of plus or minus 2 percent of span over a range of 20 to 80 percent relative humidity.

2. Humidity sensor shall be capable of electronic calibration. Salt bath calibration is not acceptable.

D. Current Switch

1. Current switch shall be solid state self-powered and designed to sense AC current in a conductor passed through its circular window opening and provide an ON/OFF status indication of the powered equipment.

E. Room Pressure Monitor

1. The space pressure monitor shall be capable of measuring the differential pressure between two individual spaces utilizing industrial quality differential pressure transducer technology. Implied pressure measurement systems utilizing thermal (hot wire) air velocity measurement are not acceptable. The space pressure monitor shall provide an analog output linear to the space pressure being monitored and a digital output to indicate the alarm status of the space for remote monitoring purposes. Remote alarm status shall be via a dry contact. Local, high visibility, LED space pressure status lights and audible alarm with alarm acknowledge (silence) button shall be provided. Local indication shall display the measure differential pressure to the ten thousandth of an inch of water column.
2. Field set up of the space pressure monitor shall allow for positive or negative space pressure monitoring; both positive and negative pressure alarm activation setpoint adjustment; and delayed activation of the alarms to be adjustable from one to thirty seconds.
3. The space pressure monitor shall be the Guardian as manufactured by Paragon Controls Incorporated or equal by Phoenix.

2.09 CARBON DIOXIDE MONITORING

A. Carbon Dioxide (CO₂) Detection and Control System

1. Provide a Carbon Dioxide (CO₂) detection and control system capable of monitoring all sensors indicated on drawings.
2. Provide remote CO₂ sensors as located on the drawings. The remote CO₂ sensors shall utilize a non-dispersive infrared optical sensor cell for long life and accurate, stable CO₂ sensing. The CO₂ sensing range shall be 0 to 2000 ppm and shall be calibrated to initiate exhaust fan operation at 700 ppm above ambient CO₂ concentration. See equipment sequences of operation for individual system actions to reduce CO₂ concentrations in spaces monitored.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. General

1. Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.
2. Install all equipment in readily accessible locations as defined by the National Electrical Code (NEC).
3. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

4. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.
5. As soon as the systems are operable, all controls, sensors and switches shall be properly calibrated.
6. Furnish and mount all relays, switches, pressure switches, extra contacts, as required in enclosures.
7. Each instrument shall be tagged by the use of embossed tape, corresponding to the symbol used on the control diagrams. Each Control panel and controller shall be identified by engraved nameplate.
8. Provide all line voltage temperature control devices. Wherever such devices are shown on electrical drawings, they shall be wired by Division 26; when not indicated on electrical drawings, they shall be wired by controls installer.
9. Provide all temperature control devices and all transformers required for the systems.
10. Motor operated dampers and valves furnished under this Section shall be installed under the applicable Section of Division 23 specification.
 - a. This controls supplier shall supervise, and shall be held fully responsible for proper installation and operation of these devices.
 - b. Whenever the installation of the dampers and valves is incorrect, controls supplier shall arrange for necessary corrections.
11. All controllers shall be provided with necessary contacts and devices for remote control point adjustment.
12. Provide dial thermometers at all duct and pipe sensors. Locate thermometer adjacent to sensor.
13. All equipment isolated for vibration shall have all electrical connections made within flex conduit.
14. Provide all initial schedules and setpoints per the Owner's direction. All setpoints and schedules shall be adjustable.
15. All room names and numbers in the BAS interface shall be adjustable and shall be updated to match the final room names and numbers of the project.

3.02 WIRING:

- A. All control and interlock wiring shall comply with national and local electrical

codes and Divisions 26 of this specification.

- B. All NEC Class 1 (line voltage) wiring shall be UL Listed in approved conduit according to NEC and Divisions 26 requirements.
- C. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub fused when required to meet Class 2 current limit.)
- D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in conduit may be used provided that cables are UL Listed for the intended application. For example, cables used in ceiling plenums shall be UL Listed specifically for that purpose.
- E. All wiring in mechanical, electrical, or service rooms—or where subject to mechanical damage— shall be installed in conduit.
- F. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).
- G. Do not install wiring in conduit containing tubing.
- H. Where plenum rated cable is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 10 ft intervals.
- I. Where plenum rated cable is used without conduit, it shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical conduits, piping, or ceiling suspension systems.
- J. All wire-to-device connections shall be made at a terminal block or wire nut. All wire-to-wire connections shall be at a terminal strip or wire nut.
- K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- L. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers or interposing relays.
- M. All plenum rated wiring shall be installed as continuous lengths, with no splices permitted between termination points
- N. All wiring in conduit shall be installed as continuous lengths, with no splices permitted between termination points or junction boxes.
- O. Maintain fire rating at all penetrations. Install plenum wiring in sleeves where it passes through walls and floors.

- P. Size and type of conduit and size and type of wire shall be the responsibility of the contractor, in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.
- Q. Conceal all conduit, except within mechanical, electrical, or service rooms. Install conduit to maintain a minimum clearance of 6 in. from high-temperature equipment (e.g., steam pipes or flues).
- R. Secure conduit with conduit clamps fastened to the structure and spaced according to code requirements. Conduit and pull boxes may not be hung on flexible duct strap or tie rods. Conduits may not be run on or attached to ductwork.
- S. Adhere to this specification's Divisions 26 requirements where conduit crosses building expansion joints.
- T. The Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- U. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 3 ft in length and shall be supported at each end. Flexible metal conduit less than ½ in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal conduits shall be used.
- V. Conduit must be adequately supported, properly reamed at both ends, and left clean and free of obstructions. Conduit sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

3.03 COMMUNICATION WIRING:

- A. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.
- B. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.
- C. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.
- D. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.
- E. When a cable enters or exits a building, a lightning arrestor shall be installed between the lines and ground. The lightning arrestor shall be installed according to the manufacturer's instructions.
- F. All runs of communication wiring shall be unspliced length when that length is

commercially available.

- G. All communication wiring shall be labeled to indicate origination and destination data.

3.04 INSTALLATION OF SENSORS AND PANELS:

A. General:

1. Install sensors in accordance with the manufacturer's recommendations.
2. Mount sensors rigidly and adequately for the environment within which the sensor operates.
3. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing. Locations on drawings are diagrammatic and may be changed with the approval of the Engineer.
4. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.
5. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type.
6. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across the full face of the coil.
7. All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.
8. Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.
9. Control Panel locations shall be as indicated on plans or for the convenience of adjustment and service. Location shall be approved by Architect prior to installation.

3.05 ACTUATORS:

A. Electric/Electronic

1. Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations.
2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted

following the actuator manufacturer's recommendations.

3.06 TESTING AND DEMONSTRATION

A. General

1. Whenever seasonal operating portions of the system occur at a time when final control settings and adjustments cannot be properly made due to outside weather conditions (cooling or heating), such final retesting and rebalancing as required shall be made during the first full load operating conditions of the respective seasons.
2. Demonstration: Upon complete installation and testing of the system, the controls installer shall demonstrate to the satisfaction of the Engineer that all requirements of the installation have been fulfilled as specified.

B. Testing and Balancing

1. The installation, programming, establishment of initial setpoints and debugging of all control systems is the responsibility of the controls supplier. The testing and balancing of the entire HVAC system including the temperature control system is the responsibility of the balancing agency.
2. During the testing and balancing phase of work, the controls supplier shall provide a technician to assist the balancing agency in the operation of the control system to establish the mode of operation required to properly test and balance the HVAC system and test and verify temperature control system operation.
3. Programming or setpoint changes required as a result of system analysis and balancing shall be made by the controls supplier.
4. Acceptance of tests by the Architect shall not relieve controls supplier of any responsibility for the complete system meeting the requirements of these Specifications after installation.

3.07 INSTALLATION OF AIRFLOW MEASURING STATIONS

- A. Location and sizing of airflow measurement elements shall be confirmed in the field by local factory representative. Velocity profile and corresponding differential pressure calculations will be based on field measured values.
- B. Elements shall be installed in strict accordance with the manufacturer's published requirements; therefore, it shall be the responsibility of the contractor to verify the installation, to assure that accurate primary signals are obtained.

3.08 SEQUENCE OF OPERATION

A. Rooftop unit (Base Bid: RTU-1, Alternate Bid: RTU-CAFE, RTU-LIB):

1. Unit shall be provided with factory mounted BACnet controls package that shall be interlocked into the existing Honeywell building automation system.
2. Unit shall operate as a variable volume, single zone unit with demand controlled ventilation (DCV) with CO₂ monitoring and control. These controls shall be integral to the unit controls from unit manufacturer.
3. The RTU shall be set to the occupied/unoccupied modes through the remote mounted temperature sensor. Programmable space thermostat shall be provided by the unit manufacturer. Indoor and outdoor building static pressure sensors shall be provided by the unit manufacturer; outdoor pressure sensor shall be permitted to be programmed as a global/shared point (if Alternate for RTU-LIB and RTU-CAFÉ is accepted). The BAS shall be capable of starting and stopping the unit's operation and sequencing of the occupied and unoccupied schedules.
4. Unoccupied hours sequence:
 - a. The supply and relief fans shall be off unless there is a call for (using unoccupied space temperature setpoints). Upon a call for heating, only the supply fan shall operate to maintain discharge air temperatures at or below 95°F in sequence with the modulating gas burner. The OA damper shall be closed, and the RA damper shall be 100% open.
 - b. The gas fired burner shall modulate to maintain unoccupied space temperature setpoint, in sequence with the supply fan speed. Unit discharge air shall be limited to a maximum of 95°F.
 - c. Cooling shall be locked out.
 - d. Unoccupied space temperature setpoints shall be adjustable through the local space temperature sensor and through the BAS.
5. Occupied hours sequence:
 - a. The supply fan, controlled through an integral unit-mounted VFD, shall operate continuously at minimum speed or higher. The OA/RA dampers shall be in the min. min. OA position unless commanded to provide more OA based on either the enthalpy based economizer sequence, or the DCV CO₂ setpoint control. At all occupied times, the unit shall introduce at least the min. min. OA quantity indicated in the RTU schedule.
 - b. DCV control shall maintain return air CO₂ concentrations at a maximum of 700 ppm (parts per million) above the sensed ambient CO₂ concentration. Unless over-ridden by the enthalpy economizer

sequence, the OA quantity introduced to the space shall not exceed the max. min. quantity indicated in the RTU schedule.

- c. The RTU integral controls shall stage/modulate the heating/cooling sequence to maintain space temperature setpoint. A programmable space temperature sensor shall be provided by the equipment manufacturer to control unit operation and maintain occupied space temperatures at setpoint (adjustable).
 - d. Unit relief fans shall be controlled through the unit's integral VFD to maintain the space at a positive pressure of 0.05" w.g. relative to ambient conditions.
 - e. Occupied space temperature setpoints shall be adjustable through the local space temperature sensor and through the BAS.
6. Fan status, building pressure, cooling capacity modulation, and heating capacity modulation shall be monitored by the factory mounted controls package and report to the BAS.
 7. Filter status of each filter bank shall be monitored by the factory mounted controls package and report to the BAS.
 8. Economizer control shall be enthalpy-based. The OA damper and return air damper shall modulate for economizer control; two position dampers are not acceptable.
 9. The RTU shall shut down upon detection of smoke by the duct-mounted addressable duct smoke detectors. Alarm shall be sent to the BAS.

B. Unit heater / cabinet unit heater

1. Upon a call for heating at the remote-mounted line voltage thermostat, the unit control valve shall open and unit fan shall start when unit aquastat is satisfied and closed. After space temperature has reached setpoint, the unit fan shall stop and the valve shall close.
2. The unit shall be provided with an integral aquastat preventing unit operation when heating water temperatures are below 120°F (adjustable).

C. Finned Tube Convectors

1. Upon a call for heating at the remote-mounted thermostat, the unit control valve shall open. After space temperature has reached setpoint, the valve shall close.
2. Existing Honeywell BAS shall be extended for control of temperature sensor and two-position control valve.

D. Exhaust Fan (EF-1)

1. Fan shall operate on an occupancy schedule, matching associated RTU-1. Normally, exhaust fan shall be off. When RTU-1 is scheduled as occupied, exhaust fan shall operate.
2. Provide two-position insulated blade low leakage damper below fan, operated on line voltage power for operation, interlocked with exhaust fan motor. Actuator shall fully stroke in no more than 3 seconds.

3.09 INTERFACE WITH EXISTING BAS SYSTEM

- A. All devices and controls installed in this project shall be fully integrated with the existing Honeywell software and graphics for complete monitoring and control.

END OF SECTION

SECTION 23 30 00 – HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.01 WORK INCLUDES

- Ductwork
- Flexible Duct
- Flexible Duct Connections
- Access Doors
- Dampers and Deflectors
- Grilles and Diffusers
- Fire Dampers
- Fans
- Filters

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 01 00 - HVAC General Provisions
- B. Section 23 03 00 - HVAC Basic Materials and Methods
- C. Section 23 07 00 - HVAC Insulation
- D. Section 23 09 00 - HVAC Instrumentation and Controls
- E. Section 23 74 00 - Packaged Outdoor HVAC Equipment
- F. Section 23 80 00 - Decentralized HVAC Equipment

1.03 SUBMITTALS

- A. Refer to Section 23 01 00.
- B. Prior to start of work submit electronic ductwork fabrication drawings in AutoCAD format indicating duct layout, fittings, gauges, sizes, welds, reinforcing, elevations and configuration.

1.04 CONSTRUCTION DOCUMENTATION

- A. Refer to Section 23 01 00.
- B. Submit ductwork pressure test documentation upon completion of testing. Include final copies in the Operating and Maintenance Manuals.

1.05 QUALITY ASSURANCE

- A. Air Distribution System Cleanliness
 - 1. The air distribution system shall be free of construction debris. New ductwork installation shall comply with this Specification and SMACA

Duct Cleanliness for New Construction Guidelines – Intermediate Duct Cleanliness Level.

- a. Protect ductwork and air distribution equipment stored on site and during delivery, from construction dust and debris and from moisture such as rainwater and building system leaks. Ductwork stored on the project site shall be stored off the ground, on wood pallets or blocks and covered with plastic or tarps to prevent from becoming covered with construction dust or debris prior to installation.
 - b. The internal surfaces of ductwork and air distribution equipment shall be wiped to remove dust, immediately prior to installation.
 - c. Installed ductwork and air distribution equipment shall be protected prior to air distribution system operation. All open ends of ductwork or openings to equipment shall be covered/sealed to prevent entry of dust and debris. This includes both completed systems and overnight work in progress.
 - d. Protect ductwork and air distribution equipment with methods meeting the following minimum standards.
 - 1) Ductwork openings for ductwork installed or stored on site:
 - (a) Plastic adhesive film: colored for easy identification on the project site. Thickness: minimum 2.5 mils. Tensile strength: minimum 11 pounds per inch.
 - (b) Protective cover bag: colored for easy identification on the project site. Polypropylene plastic. Thickness: .002 mil. Elastic end band.
 - 2) Air distribution equipment openings:
 - (a) Plastic coverings as described for ductwork.
 - (b) Plywood or sheet metal with protective tape around edges.
 - (c) Plastic shrink wrap.
 - 3) Plastic garbage bags, grocery bags, scrap plastic sheeting, are not acceptable for use in protection of air distribution systems.
 - e. Remove all ductwork and air distribution equipment protection prior to equipment start up, testing, and balancing. Dispose of removed materials properly and remove from site.
2. If air distribution system is to be used during construction, comply with the following requirements:
- a. Cover all outdoor air and return air openings to duct system with temporary construction filters. Filters shall be a minimum of MERV 8.

Replace filters when dirty. At completion of construction, filters shall be removed.

- b. In addition to filters specified on outdoor air and return air duct openings, provide specified pre-filters and final filters in air handling units. Replace periodically when dirty. Do not operate air handling units without specified pre-filters and final filters installed.
 - c. After construction is complete and before project turnover, provide new (clean) pre-filters and final filters in air handling units.
3. If ductwork and/or air distribution equipment become dirty or contaminated with construction dust, dirt, or debris, during delivery or installation, while stored or installed on site, or being operated during construction, equipment and/or ductwork shall be cleaned.
- a. Cleaning to include air handling units, fans, ductwork, terminal units, coils, dampers, louvers, grilles and diffusers.
 - b. Contractor shall be a member of the National Air Duct Cleaners Association (NADCA) and certified by NADCA to perform Air Conveyance System (ACS) cleaning.
 - c. The standard of cleanliness shall be consistent with the current NADCA Standard 1992-01, titled "Mechanical Cleaning of Non-Porous Air Conveyance System Components.
 - d. Interior of the entire air distribution system shall be cleaned using direct contact vacuum methods. Provide access openings at intervals that will enable the cleaning technician to maintain close contact with the surfaces being cleaned. Remote type vacuuming, air washing or cleaning methods utilizing hoses longer than can be visually observed from the point of insertion are not acceptable.
 - e. All access openings shall be closed with prefabricated sheet metal cover plates, fastened with sheet metal screws and caulked to prevent air leakage. Access openings cut into round ductwork shall be closed with Ductmate brand round access doors to ensure proper air tight enclosure. Any rigid or blanket type insulation removed to allow for installation of duct access openings shall be re-installed and seams covered and secured to eliminate any heat or cooling loss.

PART 2 - PRODUCTS

2.01 DUCTWORK

A. General Ductwork

1. Ductwork and plenum chambers shall be constructed to the gauge and corresponding reinforcing schedule as indicated in the latest edition of

SMACNA Standards.

2. All ductwork shall be constructed of galvanized steel except where indicated to be of another material. Exposed ductwork in Architecturally finished spaces shall be fabricated G90 galvanized steel and thoroughly cleaned prior to painting.

B. Ductwork with a static pressure above 2-inches.

1. Round Ductwork

- a. Galvanized steel spiral conduit, lock seam construction.

Fittings, welded steel construction for tight slip fit with spiral. Provide connections from mains to branches or to flexible ducts with conical tee take-off.

All spiral ducts and fittings shall be as manufactured by United Sheet Metal Co., Semco or Lindab.

2. Rectangular Ductwork

- a. Construct of galvanized steel of the U.S. standard gauge indicated in the latest edition of SMACNA Standards.

C. Dual Wall Ductwork

1. Provide dual wall ductwork where indicated on plans.
2. Ductwork to have perforated inner liner, solid outer shell, galvanized steel construction, 1 inch thick insulation in annular space.
3. Insulation to be United McGill "Acousti-Line" insulation with acrylic coating to resist growth of fungus and bacteria per ASTM C-1071 and ASTM G21. Insulation shall be tested per UL-181 for erosion resistance.
4. Manufacturers: United McGill corporation "Acousti-k27" or equivalent by Semco, Lindab, T.H. Martin or Hranec.

D. Air Duct Sealants

1. Air duct sealants shall conform to NFPA 90A, ASTM E84, ASTM E96, UL181A, and UL181B.
2. Acceptable manufacturers: Ductmate Industries, Inc. "Proseal" or "Fiberseal", RCD Corp. Provide all products in this section from a single manufacturer.
3. Air duct sealant: Ductmate Industries, Inc. "Proseal", water-based, 66% solids content, 11 lbs. per gallon, non-flammable, synthetic latex emulsion for permanently sealing fabricated joints and seams of sheet

metal air ducts, UL 181 listed rigid fiberglass air ducts, UL181 listed flexible air ducts and thermal insulation; for repairing damaged and leaking air duct.

4. Air duct sealant where fiberglass reinforcement is required. Ductmate Industries, Inc. "Fiberseal", water-based, 66% solids content, 11 lbs. per gallon, non-flammable, synthetic latex emulsion with polypropylene fiber reinforcement for permanently sealing fabricated joints and seams of sheet metal air ducts, UL181 listed rigid fiberglass air ducts, UL181 listed flexible air ducts and thermal insulation; for repairing damaged and leaking air ducts.
5. Sealant application temperature: 35 degrees F to 110 degrees F; Sealant service temperature: -25 degrees F to 175 degrees F; Storage temperature: 40 degrees F to 85 degrees F.
6. VOC content of air duct sealants shall not exceed 10 grams per liter.

2.02 FLEXIBLE DUCT

A. Type 1 - Insulated

1. Tested and classified by Underwriters Laboratories, Inc. as Class 1 Air Duct and labeled in accordance with Underwriters Laboratories, Inc. Standard for Air Ducts, UL 181. The flame spread rating shall be 25 or less and the smoke developed rating shall not exceed 50.
2. Flexible ductwork shall be rated for low or high pressure with a vapor transmittance of 0.05 perm per ASTM E96, Procedure A. Minimum positive pressure rating shall be 6" w.g. for sizes up to 12", and 4" w.g for size 14" and above. Minimum negative pressure rating shall be $\frac{3}{4}$ " w.g for sizes up to 12", and $\frac{1}{2}$ " w.g for sizes 14" and above. Minimum rated air velocity of 5000 feet per minute.
3. Inner core construction shall be double or triple laminated, polyester, or Chlorinated polyethylene (CPE) that is permanently bonded to or encapsulating a steel wire helix. Outer jacket shall be made of fiberglass scrim reinforced metalized polyester.
4. Fiberglass insulation sleeve shall have minimum thermal resistance value of R-4.2. Flexible duct shall be manufactured with the following information printed on the exterior jacket: name of manufacturer, thermal resistance R-value at the specified thickness, flame spread and smoke development of the composite material.
5. Product shall carry a minimum 5 year limited warranty.
6. Manufacturer: Atco UPC #030, Flexmaster Type 5M, or Thermaflex Type M-KE.

2.03 FLEXIBLE DUCT CONNECTIONS

- A. Provide flexible connections with 1 inch slack between ducts and fans where indicated. Flexible material shall be Duro Dyne Metal Fab with "Grip Loc" metal to fabric seam.
- B. Flexible fabric shall be UL classified black neoprene coated woven fiberglass (weight 30 oz/sq.yd.)

2.04 ACCESS DOORS

- A. Furnish access doors for each automatic damper, fire damper, smoke damper, smoke detector, reheat coil inlet and outlet, humidifier and where indicated. Access door material and pressure classification shall match ductwork in which it is installed.
- B. Provide access doors double wall with 1 inch thick insulation, latches, hinges and felt gaskets Cesco-Advanced Air model HADF-10, Ventlock, Dura-Dyne or Ruskin.

2.05 DAMPERS AND DEFLECTORS

- A. Furnish and install all manual dampers, and deflectors where indicated or where necessary to properly distribute and balance air. Provide damper in each supply duct leaving duct main and in each branch serving individual supply, return and exhaust outlets and where otherwise indicated.
- B. Dampers shall be fabricated with blades no larger than 8 inches wide by 48 inches long. Dampers over 48 inches in length shall have intermediate support and bearings.
- C. Provide all manual dampers with Young Regulator Company, Ventlock or Dura-Dyne operators. Use Young Regulator No. 443-B operators for balancing dampers. Opposite end of damper rod shall have Young Regulator No. 670 or 656 bearing set.
- D. Where dampers are concealed above inaccessible ceilings or behind walls provide adjustable concealed ceiling regulators with flush prime coated cover plate.
- E. Install additional dampers where required by the Air Balance Contractor to properly adjust the system air volumes.

2.06 GRILLES AND DIFFUSERS

- A. See Drawings for all grille, diffuser and accessory specifications, locations and air quantity.
- B. In general, Titus grilles and diffusers are specified, equals as manufactured by Anemostat, Krueger, E. H. Price Company, Tuttle and Bailey or Nailor-Hart are acceptable.

C. All grilles, registers and diffusers shall have a factory applied white finish unless noted otherwise.

D. Refer to Architectural Drawings for exact location of ceiling diffusers.

2.07 FIRE AND SMOKE DAMPERS

A. Fire Dampers DYNAMIC

1. Provide dynamic fire dampers where indicated. Dampers shall be constructed, tested and labeled in accordance with the latest edition of UL Standard 555.
2. Provide fire damper types per the following:
 - a. Curtain type for ductwork equal to or less than 24" wide x 12" high.
 - b. Multiple blade type for ductwork greater than 24" wide x 12" high.
 - c. Multiple blade type, where access to a horizontal damper is from the floor below, regardless of size.
3. Curtain type fire dampers shall be interlocking blade type suitable for horizontal or vertical mounting. Dampers shall include a stainless steel constant force or spring clip type closure spring. Dampers shall be rated for dynamic closure at 2000 fpm and 4 inches w.g. static pressure and rated for closure with airflow in either direction.

- a. Provide the following dampers equal to the listed Ruskin Model:

<u>Material</u>	<u>Rating</u>	<u>Ruskin Model</u>
Galvanized Steel	1-1/2 hr	DIBD2

- b. Provide the following style dampers for the application listed:

<u>Application</u>	<u>Frame Style</u>
Grille access	GA

4. Multiple blade type fire dampers shall include galvanized steel airfoil blades and be suitable for horizontal or vertical mounting. Dampers shall be rated for dynamic closure at 2000 fpm and 4 inches w.g. static pressure and rated for closure with airflow in either direction. Bearings shall be stainless steel, permanently lubricated sleeve type, turning in an extruded hole in the frame for maximum life. Linkage shall be concealed in the frame. Furnish with crank lever to assist with testing and fusible link replacement. Crank lever shall be located in the airstream.
 - a. Provide the following dampers equal to the listed Ruskin Model:

<u>Material</u>	<u>Rating</u>	<u>Ruskin Model</u>
Galvanized Steel	1-1/2 hr	DFD60

5. Dampers shall be furnished from the factory with a steel sleeve and retaining angles.
6. Dampers shall be furnished with a 165°F fusible link.

B. Acceptable Manufacturers: Ruskin, Greenheck, Air Balance Inc.

2.08 FANS

A. Power Roof Exhaust Fans - Upblast (UPRE) Greenheck CUBE, Cook VCR

1. Roof exhaust fans where indicated shall be upblast centrifugal belt driven type of model, size and capacity scheduled.
2. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
3. The fan housing shall be constructed of heavy gauge aluminum, with a rigid internal support structure. Windbands shall have a rolled bead and shall be joined to curbcaps with a welded seam.
4. Motors shall be heavy duty ball bearing type, furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted on vibration isolators, out of the airstream. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants.
5. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.
6. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speed.
7. Drives shall be sized for a minimum of 150 percent of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
8. Fans shall bear the AMCA Certified Ratings Seals for sound and air performance and shall be UL listed for the removal of smoke and grease laden vapors. Fans shall also meet NFPA 96 requirements.
9. Fans shall be provided with pre-fabricated curb, hinged curb cap assembly, and vented curb extension. Overall height of the curb, curb

extension and fan shall be a minimum of 40 inch from the roof to the fan outlet.

10. Furnish a weatherproof disconnect switch on the outside of the motor compartment. A fan conduit chase shall be provided through the curb cap to the motor compartment.
11. Equip fans used for kitchen hood exhaust with a heavy duty, glass fiber filled grease collection canister similar to Loren Cook "Grease Terminator."
12. Provide fan with accessories as scheduled.
13. Acceptable manufacturers: Greenheck, Jenn, Loren Cook, Acme or Twin City Fans.

2.09 FILTERS

A. Temporary Filters (During Construction)

1. General

- a. Filters shall be cut to fit bulk media.
- b. 1" deep.

2. Construction

- a. Filter media shall be a polyester fiber media.

3. Performance

- a. The filter shall have a Minimum Efficiency Reporting Value of MERV 8 when evaluated under the guidelines of ASHRAE Standard 52.2-2007.
- b. Initial resistance to airflow shall not exceed 0.35" w.g. at an airflow of 300 fpm.
- c. The filter shall be listed by Underwriters Laboratories as UL 900.

4. Acceptable Manufacturers:

- a. Filtration Group: Aerostar VL-OR1
- b. Fiberbond: Dual-Ply Dustlok 1"DL
- c. Viskon-Aire: Super Tack MERV 8 Media

B. Prefilters

1. General

- a. Air filters shall be medium efficiency pleated media, disposable panel type consisting of media, media support grid and enclosing frame.
- b. Sizes shall be noted on drawings or other supporting specification sections.
- c. 2" deep
- d. Holding frames are not part of this specification and are the responsibility of the HVAC equipment manufacturer. Exact holding frame type is dependant on the specific filter application.
- e. Provide two sets of new (clean) filter media. One set installed at project turnover and one additional set to be turned over to Owner. If HVAC System is used during construction, see Specification Section 23 01 00.

2. Construction

- a. Filter media shall be a synthetic or a non synthetic media.
- b. Media shall be bonded to a corrosion-resistant metal support grid.
- c. An enclosing frame of high wet-strength beverage board shall provide a rigid and durable enclosure. The frame shall be bonded to the media to prevent air bypass, and include integral diagonal support members on the air entering and air exiting side to maintain uniform pleat spacing in varying airflows.

3. Performance

- a. A synthetic media filter shall have a Minimum Efficiency Reporting Value MERV & MERV-A rating of 8 or 11 (as scheduled) when evaluated under the guidelines of ASHRAE Standard 52.2-2007 and Appendix J.
- b. A non synthetic media filter shall have a Minimum Efficiency Reporting Value MERV rating of 8 or 11 (as scheduled) when evaluated under the guidelines of ASHRAE Standard 52.2-2007.
- c. Initial (clean) resistance to airflow shall not exceed 0.4" w.g. at an airflow of 500 fpm.
- d. The filter shall be listed by Underwriters Laboratories as UL 900.

4. Acceptable manufacturers:

- a. Camfil Farr: Farr 30/30, AP-Eleven

- b. Purolator: Mark 80-D
- c. American Air Filter: PerfectPleat HC M8

C. Draft Gauges

1. Provide air filter gauges for measuring the resistance to air flow through air distribution system filters. Provide one gauge for each bank of filters.
2. The gauge shall be diaphragm actuated and shall have 3-7/8 inch diameter white dial with black figures and graduations, and pointer zero adjustment.
3. Provide complete with two static pressure tips, fittings for ¼ inch metal tubing and means for mounting the gauge.
4. Gauges shall be Dwyer No. 2002-AF, reading 0-2 inches of water gauge in 0.05 inch increments.

2.010 CLEANING OF AIR CONVEYANCE SYSTEMS

A. General Description of Work

1. The work to be accomplished under this project includes thoroughly cleaning existing ductwork and air handling equipment associated with the HVAC systems as identified on the drawings.
2. The area of operation is an occupied facility and disruptions shall be held to a minimum.
3. Refer to Part 3 - Execution of this section.

B. Scope of Work

1. The work consists of furnishing all labor, supervision, materials and equipment necessary to clean the ductwork and HVAC components as indicated. Cleaning to include existing supply, exhaust and return ductwork, reheat coils, dampers, grilles and diffusers.

C. Project Scheduling

1. Schedule and coordinate all work with the Owner and with work of other trades.
2. Prior to start of work, Contractor shall provide the Owner with a schedule of the work to be performed.

D. Work Hours

1. Work hours will be pre-approved by the Owner.

2. All systems shall be assumed to be in operation during cleaning. Coordinate with the progress of other construction.

E. Project Reports

1. The Contractor will be required to leave a daily status report for the Owner's Construction Representative.
2. Provide a list of any mechanical or ductwork deficiencies noted during performance of services, to allow for immediate corrective action.

F. Qualifications of Contractor and Required Standards

1. Contractor shall be member to the National Air Duct Cleaners Association (NADCA) and is certified by NADCA to perform Air Conveyance System (ACS) cleaning.
2. Contractor shall be regularly engaged in the field of ACS cleaning and submit a list of references upon request.
3. The standard of cleanliness shall be consistent with the current NADCA Standard 1992-01, titled "Mechanical Cleaning of Non-Porous Air Conveyance System Components".

G. Protection of Property and Occupants

1. Keep doorways and aisles clear of any equipment and materials at all times.
2. All equipment and furniture shall be covered and protected from any dust or contaminants in each work area.
3. Keep work areas neat and orderly at all times.
4. All vacuum equipment utilized to clean the Air Conveyance System shall be HEPA filtered to prevent contamination of the occupied space.

H. Materials, Services and Utilities

Water: Furnished by the Owner at no cost to the Contractor.

Electricity: Furnished by the Owner at no cost to the Contractor, from existing electrical system adjacent to the site. All connections to the power source - cables, equipment, temporary lighting, etc., shall be provided by the Contractor.

Waste Disposal: Contractor will be responsible for the disposal of all solid and liquid waste.

PART 3 - EXECUTION

3.01 GENERAL

- A. Provide all sheet metal work as indicated and according to the latest edition of the ASHRAE guide and data book, SMACNA standards and this specification, the most demanding of which shall be the minimum standard.
- B. Install ductwork where indicated. Make all necessary changes in cross sections and offsets, whether or not specifically indicated.
- C. All changes in cross section shall be made without reducing the design area of the duct.
- D. Cap all open ends of ductwork until connected to grilles, diffusers, equipment to prevent entrance of debris, dust, etc.
- E. No pipe or other obstructions shall pass through air ducts.
- F. Install all ductwork run above ceiling so as to maintain design ceiling heights, ductwork run exposed shall be installed to provide maximum headroom in all rooms and corridors.
- G. Locate ductwork a sufficient distance from walls, piping, other ductwork, other obstacles, to permit application of full thickness of insulation specified.
- H. Ducts passing through exterior walls shall be provided with weatherproof flashings, ducts passing through roof shall be provided with roof curb and counter flashing. Where ducts pass exposed through interior building walls provide a sheet metal collar to conceal the gap between the wall opening and the duct.
- I. Ducts shall not be hung from other ducts, pipe, conduit or from metal deck.
- J. Set all automatic air control dampers furnished by the Automatic Temperature Control Contractor.
- K. All joints and seams in ducts shall be air-tight; poorly made joints, splits, visible holes at corners, etc., shall be reworked or new pieces of ductwork installed. Where excessive pulsating of ductwork or plenum housing is found, additional stiffeners shall be added. Any cracking in the coating around seams or joints, or in any other part of the formed ducts that is apparent upon inspection shall be sufficient to warrant rejection.
- L. Sheet metal exposed to view through air distribution devices in finished areas of the building shall be coated with primer and a flat black finish coat.
- M. Provide flexible duct connections at all fan inlets and outlets.
- N. Size openings for ductwork penetrating non fire-rated walls and floor or ceilings so the opening is 1/2 to 3/4 inches larger than the duct or sleeve.

Loosely stuff the annular opening with glass or mineral fiber, and caulk both sides with a non-aging, non-hardening acoustical sealant.

3.02 DUCTWORK

A. General Ductwork

1. Ductwork shall be constructed per SMACNA Standard for the static pressure and seal class as follows:

<u>System</u>	<u>Static Press.</u>	<u>Seal Class</u>
Supply ductwork	2	A
Return ductwork	2	A
Exhaust ductwork	2	A

2. Radius elbow shall be utilized throughout the ductwork systems where possible and as shown on the Drawings. Do not substitute 90° mitered elbows with turning vanes unless specifically shown on the Drawings or without prior approval of the Engineer.
3. Branch connections shall be 45 degree entry for rectangular and round ducts. Straight taps are not permitted. Conical tees are acceptable in round branch take-off from round duct mains.
4. Seal all seams, joints, fasteners, penetrations and connections per SMACNA requirements.

3.03 FLEXIBLE DUCT

- A. Flexible duct shall only be used in non-visible locations above a ceiling. Type shall be as follows:

Type 1: Supply air connections to diffusers and air terminal unit inlets.

Type 2: Return and exhaust air connections to grilles.

- B. Flexible duct shall not be used where ductwork is exposed (visible). Flexible duct shall not penetrate through walls or floors – rigid sheetmetal ductwork is required at all wall or floor penetrations. Flexible duct shall not be installed in chases.

- C. Install flexible duct per manufacturer's recommendations.

- D. The minimum length of flexible duct shall be used. Install flexible duct fully extended free of sags and properly supported to avoid any kinks or airflow restrictions. Support with 3 inch wide saddle type supports as manufactured by Thermo Manufacturing Inc. Do not lay unsupported on ceiling tiles.

- E. Secure flexible duct in place with duct adhesive and plastic band using banding tool supplied by manufacturer. Adhesive shall be RCD No. 8, Duro Dyne "DSW" or MEI ECC EZ Seal 44-41. Adhesive must be compatible with flexible duct material. Where insulated flexible duct is used, insulation vapor barrier shall be taped in place tight to duct collar connections with two (2) complete wraps of duct tape.
- F. Maximum length of flexible duct connections to diffusers and grilles shall be 60 inches. Bends shall be made with not less than one duct diameter centerline radius.
- G. Maximum length of flexible duct connections to air terminal unit inlets shall be 24 inches. Maximum bend shall be 22 degrees.

3.04 FIRE DAMPERS

- A. Dampers shall be installed in accordance with the Manufacturer's UL installation instructions - include sleeve and retaining angles to ensure appropriate installation.
- B. Provide a ductwork access door for access to each damper. Access door location shall permit access to all fusible links and release devices. Where damper has multiple sections, provide access doors of quantity and location as required for access to all damper sections.
- C. Install dampers in the proper position based on vertical or horizontal orientation and/or airflow direction as indicated on the fire damper label.

END OF SECTION

SECTION 23 74 00 - PACKAGED OUTDOOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDES

Packaged Rooftop Air Conditioning Units

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 01 00 - HVAC General Provisions
- B. Section 23 03 00 - HVAC Basic Materials and Methods
- C. Section 23 05 13 - HVAC Variable Frequency Drives
- D. Section 23 07 00 - HVAC Insulation
- E. Section 23 09 00 - HVAC Instrumentation and Controls
- F. Section 23 30 00 - HVAC Air Distribution
- G. Section 23 80 00 - Decentralized HVAC Equipment
- H. Division 22 - Plumbing

1.03 SUBMITTALS

A. Refer to Section 23 01 00.

1.04 QUALITY ASSURANCE

- A. Unit capacity rated according to ARI Standard 210/240.
- B. Unit sound rating according to ARI Standard 270.
- C. Roof curb designed to conform to NRCA standards.
- D. Unit insulation and adhesive shall meet NFPA 90A.

PART 2 - PRODUCTS

2.01 PACKAGED ROOFTOP HEATING AND COOLING UNIT:

- A. General: Packaged rooftop heating and cooling units shall be type, size and configuration indicated. Designed for outdoor installation completely assembled on a rigid base, suitable for mounting on a roof curb.
- B. Casing: Constructed of heavy gauge corrosion resistant steel casing complete with access panels. Casing designed and gasketed to ensure an air and watertight seal for outdoor installation. Panels to be insulated with 1 inch thick, 1 pound density fiberglass insulation. Exterior surfaces to be

phosphatized and finished with a weather-resistant, baked enamel finish.

- C. Refrigeration system: Hermetic scroll type compressors with crankcase heater, internal temperature and current overloads. Furnish spring type vibration isolation for compressor. Furnish high pressure cutout. Furnish low pressure switch. Refer to Drawing schedule for number of compressors. Furnish each refrigerant circuit with factory installed expansion devices, service ports, and refrigerant line filter driers. Evaporator and condenser coils constructed with copper tubes mechanically expanded onto aluminum fins. Condenser fan shall be propeller type, statically and dynamically balanced with a direct drive permanently lubricated, built-in thermally protected, weather-proofed motor, UL listed for outdoor use.
- D. Evaporator fan: Belt drive, forward curved centrifugal type with thermal overload protected motor. Sheave and belt arrangement shall be fully adjustable.
- E. Heating Section: Natural gas, modulating firing with mechanical draft, stainless steel heat exchanger.
- F. Filters: 2 inch throwaway type.
- G. Controls: Factory wired. Designed for one point electrical power connection. Provide a method of controlling compressor anti-short cycle times and, where applicable, time delay between compressors. Unit mounted microprocessor controls. Furnish the following control options:
 - 1. Conventional thermostat interface.
 - 2. Fan failure differential pressure switch
 - 3. Dirty filter differential pressure switch
- H. Controls shall be capable of BAS integration through standard non-proprietary communication protocol to the existing Honeywell building automation system.
- I. Accessories shall include:
 - 1. Full perimeter, insulated roof curb.
 - 2. Fully modulating 100 percent outdoor air economizer complete with motorized outdoor and return air dampers.
 - 3. Powered relief fan unit, remotely installed from unit.
 - a. Relief unit to include all controls to operate relief fan based on building static pressure. Relief fan receives power separately from primary air handling equipment.
 - 4. Remote potentiometer to adjust minimum setting of economizer.

5. Motorized outside air dampers.
 6. Condenser coil guards.
 7. Factory mounted GFI receptacle.
 8. Factory mounted disconnect switch.
- J. Manufacturers: Trane or equivalent by Aaon, Carrier, York.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install condensate piping with trap and route from drain pan to splash block on roof.
- B. Install unit on roof curb. Coordinate the roof curb installation with roofing installer.
- C. Level, remove blocking, reset, and seal the rooftop units on the roof curbs prior to any start-up of the units.
- D. Install all loose equipment and accessories furnished by rooftop unit manufacturer.
- E. Contact manufacturer to review installation procedures for all field installed accessories.
- F. Dispose of panels removed from the rooftop units during installation of economizer and dampers.
- G. Perform all miscellaneous wiring not specifically shown on the Electrical Drawings in order that all field installed accessories operate in accordance with the manufacturer's intentions.
- H. Make final duct connections to the unit.
- I. Make final natural gas piping connections to the unit.

END OF SECTION

SECTION 23 80 00 – DECENTRALIZED HVAC EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDES

Hydronic Equipment Specialties
Unit Heaters
Finned Tube Radiation

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 23 01 00 - HVAC General Provisions
- B. Section 23 03 00 - HVAC Basic Materials and Methods
- C. Section 23 05 13 – HVAC Variable Frequency Drives
- D. Section 23 07 00 – HVAC Insulation
- E. Section 23 09 00 – HVAC Instrumentation and Control
- F. Section 23 30 00 – HVAC Air Distribution
- G. Section 23 74 00 - Packaged Outdoor HVAC Equipment

1.03 SUBMITTALS

- A. Refer to Section 23 01 00.

PART 2 - PRODUCTS

2.01 CABINET UNIT HEATERS

- A. Provide cabinet unit heaters of type, size and configuration indicated and with the following features and accessories.
- B. Cabinet unit heaters shall be furnished with permanent filters and factory pre-wired with built-in speed controller switch, disconnect switch, manual starter and controls. Exposed portions of cabinet shall be finished with a baked enamel coating. Color to be selected by Architect.
- C. Cabinet: Minimum 18 gauge steel. Stamped louver on return and supply side unless indicated as a recessed/concealed unit for duct connection or unless indicated otherwise.
- D. Fans: Centrifugal, forward curved type, DWDI. Fan motors permanent split capacitor type. Motor and fan assembly easily removable for maintenance. Fan motor furnished with integral thermal overload protection.
- E. Hot Water Heating Coil: Constructed of 5/8 inch copper tubes with aluminum fins mechanically bonded to tubes. Coils shall be tested for 200 psi working

pressure.

F. Manufacturers: Airtherm, Vulcan, McQuay, Trane, Rittling or Airedale.

2.02 FINNED TUBE RADIATION

A. Provide finned tube radiation of capacity, type, element size and configuration indicated and with the following features and accessories.

B. Finned tube radiation system shall include wall gaskets, brackets, end caps, wall sleeves, pipe enclosures, access doors, as required for a complete installation. Enclosure shall be constructed of 16 gauge steel with 20 gauge steel back. Finish selected by Architect.

C. Manufacturer: Vulcan, Rosemex, Rittling, Sterling, Trane or Airedale.

PART 3 - Not Applicable

END OF SECTION

SECTION 26 01 00 – ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED CONTRACT DOCUMENTS

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates and Addenda are a part of this Specification. Contractors and Subcontractors shall examine these provisions as they may affect work under this Division.
- B. Contractor shall examine Division 1 Contract Documents for general project requirements.
- C. Contractor shall also examine the Contract Documents of all Divisions which may affect work under this Division. Contractor shall be responsible for electrical work required.

1.02 DESCRIPTION OF WORK

- A. This project involves work in an existing operating facility and will require close communication with Owner in regards to access and work hours. Coordinate all work schedules prior to bidding with Owner.
- B. Electrical, Architectural, HVAC, Plumbing, Fire Protection, Structural, Civil, Technology and all other Drawings as well as the Specifications for all the Divisions shall be defined as the Contract Documents. Contractor shall review entire set of Contract Documents prior to bidding.
- C. Drawings and Specifications are to be considered as supplementing each other. Work specified but not shown, or shown but not specified, shall be performed or furnished as though mentioned in both the Specifications and the Drawings.
- D. Prior to submitting bid, Contractor shall examine all Drawings and Specifications to develop a complete understanding of the project scope. Contractor shall ask for clarifications during the pre-bid phase of the project. Failure to do so will not relieve the Contractor of their responsibility to perform all required work.
- E. Where the project scope involves renovations and additions, it is recommended that Contractors visit the site of the work and become familiar with the conditions affecting the installation. Submission of a bid shall presuppose knowledge of such conditions and no additional compensation shall be allowed where extra labor or materials are required because of the lack of knowledge of these conditions.
- F. Bid shall include any special phasing requirements related to the construction

work as described in the Contract Documents. Coordinate with Division 1.

- G. Extra costs which might result from deviations from the Drawings, so as to avoid interferences, shall be considered a "Job Condition", and no additional compensation shall be considered applicable. In the event that such interferences occur in course of the work, due to an error, omission, or oversight by the Contractor, no additional compensation shall be allowed. Interferences that may occur during the course of construction shall be brought to the immediate attention of the Architect and Engineer, and the Architect and Engineer's decision, confirmed in writing, shall be final.
- H. The following general terms as used within the context of the Electrical Contract Documents shall be defined as follows:
1. "Contract Documents" - The complete set of Drawings and Specifications for all Divisions included in the project.
 2. "Drawings" - Drawings furnished as part of the Contract Documents.
 3. "Contractor" - Electrical Contractor and the Electrical Contractor's Subcontractors.
 4. "Responsible" - To perform work required.
 5. "Furnish" - To supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations.
 6. "Install" - Work which includes the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
 7. "Provide" - To furnish and install, complete and ready for the intended use.
 8. "Equal" - To meet or exceed the standards of the specified products or listed manufacturers.
 9. "Mechanical" - HVAC, Plumbing and Fire Protection Divisions as applicable.
 10. The term "Technology" shall refer to all low voltage systems, related cabling infrastructure and conduit/backbox rough-in work indicated on the Division 27 Contract Documents. Refer to the Technology General Provisions section for additional Technology definitions.

1.03 WORK INCLUDES

- A. The Electrical Contractor is responsible for all work scope included in the Division 26 Contract Documents and applicable Division 26 scope indicated in the Division 27 Contract Documents. A separate Technology Contractor is

responsible for all work scope included in the Division 27 Contract Documents unless otherwise indicated in the Division 27 Contract Documents.

- B. Include all labor, material, equipment, services, permits, coordination, supervision and administration necessary for the proper completion of all electrical work shown. Items omitted, but necessary to make the Electrical systems complete and workable shall be understood to form part of the work.
- C. Material for work required to complete installation such as patching and painting shall be provided as specified in other applicable Divisions covering such work.
- D. Provide material and labor which is neither drawn nor specified but which is obviously a component part of and necessary to complete work and which is customarily a part of work of similar character.
- E. Include all testing, test reports, system programming, start-up reports and warranties for each system as outlined elsewhere in these Specifications. Refer to "Operating and Maintenance Manuals" for additional requirements.

1.04 ALTERNATES

- A. Refer to Division 1 for a description of alternates.

1.05 UNIT PRICING

- A. Contractor shall provide unit pricing that shall be used as the basis for both adds and deducts to the project. The Unit pricing shall include separate line items for materials and labor, and shall include all major components of each System, including, but not be limited to the following items. Unit pricing shall be valid for entire duration of the project. All items listed shall be based on materials and labor that is compliant with the associated Specifications herein.
 - 1. Fire alarm system unit pricing. Unit pricing shall include a detailed list of each component required to install a complete fire alarm system. The unit pricing shall include a complete and segregated cost for device, installation, wiring and programming. 50 feet of cabling shall be assumed for each device.

1.06 PERMITS AND FEES

- A. Secure and pay for permits and inspections required for the electrical work. Turn over certificates of approval to the Owner or Construction Manager promptly when received, and before payment is made for the work.
- B. Give proper authorities notice as required by law relative to the work in their charge. Comply with the regulations regarding temporary enclosures, obstructions or excavations and pay all legal fees involved.

1.07 QUALITY ASSURANCE

- A. Work shall be installed in accordance with all applicable provisions of the National Electrical Code, as interpreted by the local Authority Having Jurisdiction (AHJ), as well as any further modifications or regulations published by local or State Authorities.
- B. Reference to the code and standards listed shall constitute the minimum acceptable requirements. Nothing in the Specifications shall be construed to permit deviation from the requirements of the governing code. Where requirements of the Drawings and Specifications exceed those of the code listed, follow the Drawings and Specifications.
- C. Provisions of the latest revisions to the following adopted codes and standards shall be followed where applicable:
 - 1. Ohio Building Code, 2011 with amendments
 - 2. Ohio Fire Code, 2011
 - 3. Ohio Energy Code (IECC, 2006 or ASHRAE 90.1, 2007)
- D. Applicable portions of the following codes, standards, societies and agencies shall be followed. Where a specific edition is listed, it shall be used. Where not listed, the edition recognized by the Authority Having Jurisdiction shall be used. Listing of a specific portion of a code, standard, society or agency does not preclude the Contractor from following all other applicable portions of the code, standard, society or agency.
 - 1. National Fire Protection Association (NFPA):
 - a. NFPA 70 - National Electrical Code, 2014
 - b. NFPA 72 - National Fire Alarm Code, 2010
 - 2. American National Standards Institute (ANSI):
 - a. ANSI 117.1 - Specifications for Making Buildings and Facilities Accessible To, and Usable By, the Physically Handicapped
 - 3. Americans with Disabilities Act (ADA) - [Americans with Disabilities Act Accessibility Guidelines](#) (ADAAG), 2004.
 - 4. Federal Occupational Safety and Health Act (OSHA)
 - 5. National Electrical Manufacturers Association (NEMA)
 - 6. Institute of Electrical and Electronic Engineers (IEEE)
 - 7. American Society of Testing and Materials (ASTM)

8. Illuminating Engineering Society (IES)
 9. Underwriters Laboratories, Inc., Standards for Safety (UL)
- E. Workmanship shall be in accordance with the best NECA (National Electrical Contractor Association) practices of the trade. Electrical work shall be installed by journeymen electricians under the supervision of a competent foreman.

1.08 WORK REQUIRED FOR EQUIPMENT FURNISHED OR PROVIDED BY OTHERS

- A. Low voltage (under 120 volts) temperature and interlock controls shall be provided and wired by the HVAC or Plumbing Contractor. The Electrical Contractor shall provide necessary 120 volt power, terminated at junction boxes, as directed by the HVAC or Plumbing Contractor.
- B. 120 volt control devices, such as thermostats and aquastats, which control fractional horsepower, 120 volt motors shall be furnished by the HVAC or Plumbing Contractor and shall be installed and wired by the Electrical Contractor. The exact wiring requirements shall be as recommended by the Manufacturer of the equipment.
- C. 120 volt control devices, such as thermostats and aquastats, which control motors rated 208 volts and higher shall be furnished, installed and wired by the HVAC or Plumbing Contractor. Refer to the Mechanical Controls Specification for additional requirements.
- D. The Electrical Contractor shall wire items normally associated with equipment supplied by others such as line voltage limit switches and motor operated dampers. Line voltage shall be defined as the same voltage that the associated equipment is rated.
- E. Starters supplied as an integral part of the equipment shall be provided under the Division furnishing the equipment. All other disconnect switches and starters shall be provided and wired by the Electrical Contractor.
- F. Variable frequency drives furnished under the Division providing the equipment being controlled shall be installed and wired by the Electrical Contractor. Any associated additional disconnect switches shall be provided by the Electrical Contractor.

1.09 ELECTRONIC MEDIA

- A. Electronic drawing files are available to the Contractor, from the Engineer for coordination purposes as defined in Division 0 and Division 1.
- B. Contractor shall deliver closeout documents on a portable memory device. Portable memory device shall refer to CD, DVD, Flash Drive, external hard

drive or any other portable media used for storing electronic files.

1.010 SUBMITTALS

- A. Prior to commencing work, submit product data and/or shop drawings for Electrical equipment, materials and systems as described herein and as required in each individual Division 26 Specification section. Provide all submittals far enough in advance of scheduled dates for installation to provide sufficient time for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery.
- B. Conform to submittal requirements outlined in Division 1 Specifications. Provide Submittals in an electronic format. The file format shall be portable data file (.pdf).
- C. Prepare Submittals with adequate details and dimensions as necessary to clearly show construction. Clearly identify each item on the Submittal with designation as indicated on Drawings including location and use. Include with Submittals, Manufacturer's published descriptive literature, specifications, performance data (normal operating characteristics, ratings, etc.), wiring diagrams, and installation instructions. Indicate for each item the operating characteristics, design conditions, features, and optional items that are intended for application on this project. Where contents of Submittal literature includes data not pertinent to the Submittal, clearly indicate (highlight) which portion of content is being submitted for review.
- D. If for any reason, the Submittal shows variations from the requirements of the Contract Documents, the Contractor shall make mention of such variation in the letter of transmittal. The Contractor shall note in red on the Submittal any change in design or dimension on the items submitted including changes made by the Manufacturer which may differ from catalog information.
- E. Where additional installation drawings, wiring diagrams or other drawings are specified elsewhere as part of the project requirements, they shall be submitted at the same time as the Submittals and product data. Partial Submittals are not acceptable.
- F. Contractor shall review each Submittal prior to submission and check for compliance with the Contract Documents. Corrections shall be noted. Mark with approval stamp prior to submission. Submittals that do not bear the Contractor's approval stamp will be returned without action.
- G. The Submittals will be reviewed only for General compliance and not for dimensions, quantities, etc. The Submittals that are returned shall be used for procurement. The responsibility of correct procurement remains solely with the Contractor. The Submittal review shall not relieve the Contractor of responsibility for errors or omissions and deviations from the Contract Document requirements. Submittals which are not required under this

Division shall be returned to the Contractor.

- H. After review of submittals by the Engineer, the Contractor shall revise and resubmit if required to establish compliance with the Contract Document requirements. Resubmittal shall include a document with a written response to each of the Engineer's previous comments.
- I. The Contractor shall notify the Engineer when all product data and/or shop drawings for electrical equipment, materials and systems have been submitted for review.
- J. The Contractor agrees that Submittals, processed by the Engineer, are not change orders; that the purpose of submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design intent of the project. This understanding is demonstrated by indicating which equipment and material is required, and by what methods of fabrication and installation will be utilized.
- K. The Contractor further agrees that if deviations, discrepancies or conflicts between the Submittals and the Contract Documents are discovered, either prior to or after Submittals are processed by the Engineer, the Drawings and Specifications shall control and shall be followed.
- L. Final reviewed submittals shall be included in the Operating and Maintenance Manuals. Where Submittals are returned "REVIEWED, EXCEPTIONS AS NOTED", the final Submittals shall be updated to include the exceptions. Upon ordering equipment, order sufficient number of sets of product data literature for the Operating and Maintenance Manuals.
- M. Submit product data for the following. Refer to specific Specification sections for additional requirements.
 - 1. Grounding System Components and Fittings
 - 2. Panelboards
 - 3. Conductors
 - 4. Pipe Seals through Walls, Roofs, Floors, Foundations, and interior to conduits
 - 5. Overcurrent Protection Devices
 - 6. Disconnect Switches and Motor Starters
 - 7. Luminaires, Lamps, Ballasts and Drivers
 - 8. Switches, Occupancy Sensors Dimmers

9. Receptacles
10. Surface Raceways
11. Fire Alarm System Devices
12. Firestop Details
13. Any other specified system or equipment not listed

1.011 CONSTRUCTION DOCUMENTATION

A. Coordination Drawings:

1. Refer to Division 1 for additional requirements.
2. Preparation of the Coordination Drawings shall be the responsibility of the HVAC Contractor.
3. Coordination Drawings shall include but not be limited to: locations of equipment and devices, ductwork, piping, and conduit routing and required service clearances for all trades. Show the relationship of all components as related to installation and future access for maintenance and removal. Where access doors are required, indicate locations and type. Show locations of all ductwork, piping and conduit penetrations through wall and floors.
4. Supply HVAC Contractor information necessary for the development of coordination drawings. Information shall include but not be limited to: locations and sizes of Electrical equipment and devices; conduit routing and sizes; and required service clearances affecting the work of other trades. How this information is supplied shall be discussed and decided between all trades. Coordination meetings between all trades are required.
5. Before supplying information to the HVAC Contractor, coordinate locations of all floor, wall, and roof penetrations including sleeve requirements with General Trades. Coordinate locations and types of all access doors with the Architect and General Trades.
6. Contractor shall approve Coordination Drawings prior to Submittal to Architect for review and must indicate acceptance of illustrated conditions by attaching their endorsement to each Drawing.
7. Proceed with installation only after review of Coordination Drawings by Architect and approval from other trades affected. Architect does not approve Coordination Drawings.
8. The Coordination Drawings shall be updated to include any deviations made during construction as required to create Record Drawings.

B. Tests, Start Ups and Adjustments

1. During the construction period provide the following tests:
 - a. Voltage and confirmation that voltage is within acceptable tolerance.
 - b. Ground ohm readings and confirmation that readings are within acceptable tolerance.

1.012 GUARANTEE AND WARRANTIES

- A. Warrant that equipment and all work is installed in accordance with good workmanship practice. All equipment shall be installed in accordance with the Manufacturer's recommendation and shall meet the requirement specified. Any equipment failing to perform or function as specified shall be replaced with complying equipment without cost to the Owner. Warranty shall commence upon acceptance of substantial completion of construction by the Owner. Sign-off of individual equipment start-up procedures shall not activate the warranty commencement.
- B. Guarantee against defects in workmanship and materials; repair or replace any defective work, material or equipment within one year from date of formal written warranty commencement. Longer product warranties provided by individual equipment manufacturers shall supersede this one year guarantee; however, the Contractor shall maintain the one year workmanship and materials guarantee for installation of such equipment. Coordinate guarantee and warranty requirements with Division 1 Specifications.

1.013 CLOSEOUT DOCUMENTS

A. Record Drawings:

1. Record Drawings shall consist of updated Coordination Drawings as defined elsewhere in the Specifications. Refer to Division 1 for quantities, special formatting, and additional requirements.
2. Updated Coordination Drawings shall be reproduced electronically from the original Coordination Drawings in an approved format. Drawings shall include any deviations or changes made during construction. Drawings shall only include Division 26 work. Work of other divisions shall be removed. At the end of the project, the electronic drawing files shall be transferred onto a portable memory device. Both hard copy drawings and the portable memory device shall be provided as Record Drawings.
3. Record Drawings shall indicate the location of all underground, under floor and concealed conduits.
4. Record Drawings shall indicate the location of each respective

penetration made through any fire rated assembly. Include the corresponding UL system number, from the current UL Fire Resistant Directory that was used to firestop the penetration.

5. After the project is completed, the Record Drawings shall be delivered to the Architect for inclusion into Operating and Maintenance Manuals, as a permanent record of the installation as constructed.

B. Operating and Maintenance Manual (OMM)

1. Furnish complete bound sets of Operating and Maintenance Manuals. Refer to Division 1 Specifications for quantities and for additional requirements.
2. Each OMM shall be assembled into one book.
3. Bind the required material into a hard-backed binder where they can be accommodated into 8-1/2" x 11" size. Material shall be assembled as follows, unless otherwise directed in Division 1 Specifications:
 - a. First Page --- Title of Project, Owner, Address, Date of Submittal, Name of Contractor and Name of Engineer, including contact information, phone number and email addresses.
 - b. Second Page --- Index
 - c. First Section --- Written description of system contents including where actually located in building, how each part functions individually, and how system works as a whole. Conclude with a list of items requiring service and either state the service needed or refer to the Manufacturer's data in the binder that describes the proper service.
 - d. Second Section --- A copy of each shop drawing and catalog data sheet with an index at the beginning of the section.
 - e. Third Section --- A copy of each Manufacturer's operating and maintenance instructions with an index at the beginning of the section, and a copy of each Manufacturer's start up report.
 - f. Fourth Section --- A copy of each wiring diagram utilized in the installation.
 - g. Fifth Section --- A copy of all test results, in chart form, performed by the Contractor.
 - h. Sixth Section --- Copies of all warranties, approvals, etc.
 - i. Seventh Section --- Owner training sign-in sheets and a copy of all digitally recorded training sessions.

j. Eighth Section – Record Drawings.

k. Ninth Section – A list of attic stock furnished for the project.

l. An index shall be included at the beginning of each individual section.

4. Once submittals are completed, provide an OMM index to the Engineer for review. Once index is approved, submit an electronic copy of the OMM to the Engineer for acceptance. If any sections are incomplete, include section title tab and a page describing what is missing. After acceptance, submit the required quantity of final hard copies to the Architect for delivery to the Owner. If data is missing from final copies, a page shall be inserted into the front of the OMM listing what is missing and a date when the data will be available for insertion into the OMM.
5. After acceptance, information contained within the OMM shall be transferred onto a portable memory device and delivered with the OMM. Data shall be in .pdf format and shall utilize interactive index tabs. In addition, a portable memory device shall be delivered to the Engineer.

1.014 SITE REPORTS AND PUNCHLISTS

A. The Engineer may visit the site periodically during construction and provide written Construction Observation Reports to the Contractor identifying areas where installation does not meet the intent of the Contract Documents. The Contractor shall provide a written response to these reports within 5 business days, indicating the reason the installation is out of compliance with the Contract Documents. After review, the Engineer may or may not require the Contractor to correct the installation.

B. Final Punch List

1. The Engineer will visit the site to perform a scheduled Final Punch List to identify areas where the installation is incomplete or does not meet the intent of the Contract Documents.
2. If the Engineer is requested to perform the Final Punch List, prior to the Contractor being 100% complete with their scope of work, the Contractor shall furnish a Contractor's Completion List, indicating all incomplete work. This list shall be furnished to the Engineer a minimum of 24 hours prior to the scheduled Final Punch List.
3. The Contractor shall respond to each punch list item along with a date, indicating that the item has been completed or corrected.
4. The Engineer is not responsible for visiting the site to verify that punch list items are completed or corrected.
5. A copy of the Final Punch List with the Contractor's responses shall be included in the Operation and Maintenance Manual.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. All equipment and materials used on this project shall be new and UL Listed for the intended application. Where possible, the same brand or Manufacturer shall be used for each type of material or equipment.
- B. Equipment and materials for the construction shall be the responsibility of the Contractor and shall be protected by the Contractor until formally accepted by the Owner.
- C. All Manufacturers of electrical equipment shall verify to the satisfaction of the Contractor and Engineer that their equipment will function properly under the conditions of use, as shown on the Drawings and as specified herein. dimensions, weights, operating characteristics and all other related appurtenances shall be verified before submittal of shop drawings.
- D. Domestic steel shall be used for all steel products as required by the (Ohio Revised Code, Chapter 153). (Pennsylvania Steel Products Procurement Act).

2.02 MATERIAL SUBSTITUTIONS

- A. Bids shall be based upon the specified products, suppliers or listed alternatives. The Drawings and Specifications are based on the products specified by type, model, size and suppliers if indicated and thus establish minimum qualities which substitutes must meet to qualify for review.
- B. Should the Contractor propose to furnish materials, equipment and/or suppliers other than those specified, submit a written request for substitutions to the Architect or Engineer in accordance with Division 1 requirements. The request shall be an alternate to the original bid and shall be accompanied with complete descriptive (manufacturer, brand name, catalog number, supplier name and references, etc.) and technical data for all items. Indicate any additions or deductions to the base bid price.
- C. Where listed alternatives, substitutions or equipment manufacturers (other than the basis of design) alter the design or space requirements indicated on the Drawings, the Contractor shall be responsible for the revised design and construction including cost of all associated trades involved.
- D. Acceptance or rejection of the proposed substitutions shall be subject to approval of the Architect or Engineer. If requested, the Contractor shall submit inspection samples of both the specified and the proposed substitute items for review.
- E. In all cases where substitutions are permitted, the Contractor shall bear any

and all extra cost of evaluating the equality of the material and equipment to be installed.

- F. Where only one Manufacturer or supplier is named in the Contract Documents, the system or equipment shall be provided as specified.
- G. Verbal requests or approvals of substitutions shall not be binding on the Architect, Engineer or Owner.

PART 3 - EXECUTION

3.01 SAFETY

- A. The Contractor shall follow all safety requirements as defined herein, as described in Division 1, and as defined by Owner safety protocols.
- B. Work shall be performed on de-energized equipment in accordance with NFPA 70E.
- C. Should hazardous materials be encountered, Contractor shall adhere to procedures, methods and regulations of the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) and immediately notify Owner.

3.02 COORDINATION

- A. Consult the Contract Documents and Submittals pertaining to the work for other trades. Review the field layouts for all trades and make adjustments accordingly in laying out the Division 26 work.
- B. Examine the work of all other trades when it comes in contact with, or is covered by, work in this Division. Do not attach to, cover up, or finish against any defective work, or install work in a manner which will prevent proper installation of the work of other trades. Contractor shall be responsible for the costs of adjustments required.
- C. Take all field measurements necessary and assume responsibility for the accuracy.
- D. Install work that is to be concealed within the building construction in sufficient time to secure proper location without delay to the Work of other trades.
- E. Assume responsibility for location of chases, other openings through masonry and concrete construction. When work cannot be installed concurrent with building construction, arrange for rough-in boxes, sleeves, inserts and other items, as necessary for installation thereof at a later date.
- F. If any work is installed such that the architectural design cannot be adhered to,

Contractor is responsible for cost of making such changes as Architect may require. Before installing work, report any interference between work of this Division and work of other Divisions to Architect as soon as discovered. Architect will determine which work must be relocated, or make adjustments to maintain clearances, maximum headroom and to avoid conflict with other work.

- G. Become familiar with the construction where work attaches. Review Structural Drawings for coordination of openings. Cut no structural members or slabs without Architect's written approval.
- H. Exercise caution when working in areas where concealed systems or materials may exist. Any costs for repair of damage incurred shall be the responsibility of Contractor causing the damage.

3.03 PROTECTION

- A. All finished surfaces shall be protected from damage and spills during construction.
 - 1. Protect finished floors with a heavy duty flexible fiber reinforced floor protection board - Ram Board or equal.
 - 2. When setting up pipe cutting and threading machines, protect area against staining and abrasion.
 - 3. Protect finished surfaces from chips and cutting oil by use of a chip receiving pan and oil proof cover.
 - 4. Protect finished surfaces from paint droppings, insulation adhesive, etc. by use of drop cloths.
- B. Cost of correcting any such condition will be charged against the respective Contractor.

3.04 PRODUCT HANDLING

- A. Pay all costs for transportation of materials, equipment to job site.
- B. Provide all scaffolding, tackle, hoists, rigging necessary for placing electrical materials and equipment in their proper place. Scaffolding, hoisting equipment: comply with applicable Federal, State, and Local regulations. Remove temporary work when no longer required.
- C. Arrange for packaging of equipment, which must be hoisted, so that there will be no damage or distortion caused by hoisting operation.
- D. Store Electrical equipment, etc., in a dry location and protect all Electrical equipment from dirt and moisture until the building is ready to receive them.

- E. Coordinate location of stored items with other trades. Where necessary, store materials and equipment on movable carts so they may be moved when interfering with the work of other trades.

3.05 CUTTING AND PATCHING

- A. All cutting and patching in construction as necessary for installation of this work shall be the responsibility of this Division and performed by the Tradesmen related to that specific Division of Work. Subcontract this work to the appropriate Trade Division.
- B. Do not cut any structural member, including but not limited to steel framing and structural floors, without specific permission from the Architect and Structural Engineer.
- C. Do not cut openings in roof or floor construction without specific permission from the Architect.
- D. Where locations of penetrations are inaccurate or where building components are improperly cut by inadequate methods, the Contractor in error shall be responsible for complete repair.
- E. The Contractor shall assume responsibility for removing and replacing existing ceiling tiles as required for installation of all work. Areas include that as outlined by the project scope and areas outside the scope where the Contractor is required to make connections to existing systems and install new work. Damaged tiles shall be replaced.

3.06 DAMAGE AND EMERGENCY REPAIRS

- A. Assume responsibility for any damage to new and existing building components caused by work provided as part of Contract Documents. Repair all damage without extra cost to Owner.
- B. Owner reserves the right to make emergency repairs as required to keep equipment in operation, without voiding Contractor's guarantee or relieving him of responsibility during warranty period.
- C. Restore building components, etc., to their original condition whenever this work causes damage.

3.07 CLEANING

- A. At all times keep premises and building in neat and orderly condition, follow explicitly any instructions in regard to storing of materials, protective measures and disposing of debris.
- B. After all tests and adjustments have been completed, clean all equipment

leaving everything in working order at the completion of this work. Clean all equipment of dirt, dust, grease, oil, debris and paint, after all other trades have completed their work.

- C. All debris created by the execution of this work shall be removed as directed by the Architect or Owner.
- D. Upon completion of work remove all tools, equipment and surplus materials.

3.08 PAINTING

- A. Finish painting is included under Division 9 - Finishes, except where specifically called for in Basic Materials and Methods.
- B. Materials and equipment installed under this Division shall be left free from dirt, grease and foreign matter, ready for painting.
- C. No equipment or conduits shall be field painted before being connected or terminated. Where in-field painting occurs, insure components required for continuation of grounding systems are protected from paint until connected and installed.
- D. Damaged surfaces of prefinished materials and equipment shall be touch-up painted to match the existing finish.
- E. Under no circumstance shall any open cabling be painted.

3.09 SERVICE SHUTDOWNS

- A. This project involves remodeling of existing areas in an operating facility. Plan work including alterations and connections to existing facilities, to permit carrying on normal building functions. When necessary to temporarily interrupt a service, shutdowns shall be scheduled through the Owner and shall be done at a time as directed by the Owner. No additional compensation shall be allowed for these shutdown periods even though premium time work may be required unless specifically defined in Division 1.
- B. Provide temporary service to equipment or systems that cannot be shut down, and as determined by Owner, or as described in the Contract Documents. Remove temporary services when permanent work is completed.
- C. Provide a minimum of one week's notice to the Owner before any service shutdown is scheduled.

3.010 TEMPORARY JOBSITE SERVICE

- A. Provide a temporary electrical service adequate in size for power tools, heating, for the use of all trades and for the lighting of each room during construction.

Include all utility company charges for providing this service to the project site. This service shall be provided as described in the Division 1 Specifications.

1. Provide temporary lighting and power distribution equipment as directed by the General Contractor.
2. Provide a written description and/or typical layouts of temporary lighting for construction as required by the local Authority.
3. Provide temporary service to equipment or systems which cannot be shut down, as determined by the Owner.

B. Temporary wiring shall conform to OSHA requirements.

C. The temporary electrical service can be extended from the Owner's existing power distribution system. The Owner must approve of the point of supply, the method of extension and the routing of necessary temporary feeders. No temporary service shall be extended from the emergency system unless approved by Owner.

END OF SECTION

SECTION 26 02 00 – ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE

- A. Electrical General Provisions
- B. Electrical Basic Materials and Methods
- C. Firestopping

1.02 WORK INCLUDES

- A. Electrical equipment indicated on the Demolition Drawings is shown to indicate the extent of demolition only, and is not intended to be a record drawing of the existing conditions. The Drawings and Specifications establish the minimum standards for workmanship and materials.
 - 1. If additional interpretation is required regarding the scope of demolition, contact the Engineer prior to bid.
- B. Include all labor, materials, equipment, services, and permits necessary for completion of the demolition work.
- C. Provide protection for all adjacent areas before, during and after execution of the demolition work.
- D. "Electrical equipment" as used in this section shall refer to lighting fixtures, light switches, receptacles and all other power and low voltage communication system devices.
- E. Comply with all the rules and regulations of local and state Authorities Having Jurisdiction, including applicable OSHA safety requirements.
- F. Visit the site and become familiar with conditions affecting the demolition work. No additional compensation shall be approved on claims that arise from a lack of knowledge of the existing conditions.
- G. Normal building functions shall be maintained during the demolition work. Coordinate the day and time of any temporary building system interruptions with the Owner. Additional compensation shall not be approved for premium time effort.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide materials and equipment for completion of the demolition work as described within the Specifications and on the Drawings.

- B. Materials and equipment shall be new and UL labeled for the application.

PART 3 - EXECUTION

3.01 GENERAL DEMOLITION WORK

- A. Disconnect and remove the existing Electrical Work made necessary because of Project alterations as indicated or implied on the Contract Documents of all trades. Existing electrical equipment and systems not affected by these changes shall remain and shall be protected whether shown on the Drawings or not. Relocate equipment and/or devices where indicated. Maintain existing circuit continuity as described in the Specifications and on the Drawings, or as required for continued operation of the electrical equipment and systems.
- B. The Contractor shall de-energize circuits and panel feeders as required to make areas being demolished safe for demolition work. Coordinate exact power shutdown procedures with the Owner. Maintain power to areas that cannot be shutdown as determined by the Owner. All work shown on Contract Documents assumes work is performed on de-energized equipment unless otherwise noted.
- C. Demolition Work under this Contract shall be accomplished by the Contractor in complete accordance with the Construction Procedure and Progress Schedule specified under Division 1. Proposal shall include any special phasing requirements related to demolition work as described in the Division 1 Specifications.
- D. Where required, re-support existing conduits and cabling above ceilings being removed. Electrically disconnect equipment to be removed at the point of power supply. Remove conduit and wiring from equipment to be removed complete to the point of power supply.
- E. Where building systems or circuits are interrupted because of the demolition work, Contractor shall reroute or relocate, modify and reconnect to provide a continuous system.
- F. Cutting, patching and finishing, etc., for removed and relocated electrical equipment shall be included as part of the electrical work. All holes and damage caused by the demolition work shall be properly patched with suitable materials to match existing construction. Patching shall be performed by the qualified trade.
- G. Where devices or conduits are removed from fire or smoke rated construction, penetrations shall be patched to match existing ratings with suitable materials to match existing construction. Patching shall be performed by the qualified trade.
- H. Existing electrical equipment shown as being reused or relocated shall be carefully removed, stored on the premises, and refurbished before

reinstallation.

- I. Where existing electrical equipment is indicated on the Drawings to remain, the existing wiring shall remain, along with the related conduit system, unless otherwise shown or noted on the Drawings.
- J. In all cases where existing branch circuit conduit and wiring is to be re-used or extended within the remodeled area, the Contractor shall test for grounding continuity and shall test the existing branch circuit wiring as though new, in accordance with the testing procedures outlined elsewhere in these Specifications.
- K. Cap existing empty conduits and plug open knockouts in existing electrical boxes or enclosures.
- L. The Contractor shall be responsible for the complete removal of all abandoned cabling as required by the National Electrical Code.
- M. Remove and reinstall existing ceiling tiles in areas outside the scope of demolition work as required to complete the demolition work outlined within these Specifications or indicated on the Demolition Drawings. Damaged tiles shall be replaced to match existing.

3.02 DISPOSAL

A. Mercury Abatement

- 1. Remove and recycle mercury containing fluorescent and HID lamps as universal waste, in accordance with the EPA universal waste rule.
- 2. All Mercury-related operations shall be performed in accordance with the EPA universal waste rule, Regulation 40 CFR Parts 260, 261, 264, 265, 268, 270 and 273 for mercury containing fluorescent and HID lamps.

B. PCB Abatement

- 1. Remove ballasts which contain polychlorinated biphenyl (PCB), in accordance with current environmental regulations.
- 2. All PCB-related operations shall be performed in accordance with EPA Regulation 40 CFR 761, Polychlorinated Biphenyls, Manufacturing, Process, Distribution in Commercial Use Prohibition.

END OF SECTION

SECTION 26 03 00 – ELECTRICAL BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 WORK INCLUDES

- Boxes
- Conduits
- Toggle Switches
- Luminaire Control Devices
- Receptacles
- Coverplates and Identification
- Wire and Cable
- Surface Mounted Raceways
- Equipment Identification
- Painting
- Standard Electrical System Testing

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Electrical General Provisions
- B. Electrical Firestopping
- C. Technology Systems Rough-In
- D. Technology Specification Sections
- E. Refer to all specific system Specifications for additional Basic Materials and Methods requirements.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment installed under this Contract shall be new and of the quality herein specified. Each class of materials shall be of the same type and make throughout the building.
- B. Raceway systems, conduit, boxes, grounding, busbars, hardware, cable tray, etc. required for all Technology systems, cabling and/or devices shall be provided by the Electrical Contractor unless otherwise indicated on the Drawings (Scope Matrix) or as indicated in the Division 27 Contract Documents. The Electrical Contractor shall fully coordinate all requirements with the systems suppliers and shall review the Technology Drawings and Specifications prior to bidding.

2.02 BOXES

- A. Contractor shall provide junction boxes with covers in order to accommodate branch circuiting as shown on the Drawings.

- B. Flush device boxes in masonry walls shall be masonry boxes listed for the purpose, or 4-inch square boxes with raised coverplates listed for masonry. Flush boxes in other walls shall have raised coverplates suitable for the wall material.
- C. Wiring device boxes for surface conduit work shall be stamped steel boxes listed for their applications.
- D. All junction boxes and pullboxes shall be 4 inch x 4 inch x 2 inch deep minimum, or sized in accordance with the National Electrical Code if a larger box is required. Junction box and pullbox coverplates shall be suitable for their intended use. Provide identification on the coverplates as described elsewhere in these Specifications.
- E. All junction boxes for dimmers shall be 4 inch x 4 inch x 2-1/2 inch deep.
- F. Exterior boxes shall be cast aluminum type. Where outdoor weatherproof receptacles are installed, weatherproof gasketing shall be provided.

2.03 CONDUITS

A. Interior Conduits

1. All conduits, unless otherwise specified herein, shall be Electrical Metallic Tubing (EMT). Conduits shall be $\frac{3}{4}$ inch trade size, minimum, unless otherwise noted on the Drawings or within these Specifications. Where sizes are not shown, conduits shall be as required to accommodate the number and type of conductors in accordance with the National Electrical Code wiring tables, but shall not be smaller than $\frac{3}{4}$ inch.
2. As part of the Base Bid, flexible metal conduit or MC type cable may be used in lieu of EMT conduit within architectural casework and low partitions (6 feet and less).
3. Conduits shall be heavy wall rigid galvanized steel or intermediate grade steel in the following areas unless otherwise noted:
 - a. In damp or wet locations
4. Conduits that are exposed shall be heavy wall rigid galvanized steel to a level of 8 feet above finished floor.
5. Conduit connections to motors, transformers, and other vibrating equipment, whether equipped with vibration isolators or not, shall be flexible metal type conduit or equivalent and shall be of the same size as the feeder conduit. Such connections shall be as short as practical. Transition to flexible conduit shall occur at a junction box or a disconnect switch.
6. Interior underground conduit shall be Schedule 40 or 80 PVC. Such

interior underground conduit shall be protected from damage during construction. All PVC conduit shall conform with NEMA Standard TC2 and UL 651.

B. Exterior Conduit and Special Conditions

1. Conduits passing from exterior to interior require foam based adhesive to protect water leakage into building to be installed after conductors are installed. Acceptable Manufacturer shall be Polywater FST-250 or approved equal.
2. Conduits that stub through the roof shall be supplied with pipe seals as manufactured by the Pate Co. or approved equal and shall be installed as recommended by the Manufacturer by a licensed Roofing Contractor. Pipe seals shall be one piece aluminum base type with five inch sloped roof surface flanges, graduated stepped PVC boots and adjustable stainless steel clamps. RPS Corporation and Thycurb Corporation are approved equivalent Manufacturers. When applicable, the Contractor shall coordinate and verify exact requirements with the Roofing Contractor prior to procurement and installation of the pipe seals.
3. Conduits that stub through the foundation walls into below grade areas shall be supplied with pipe seals as manufactured by Link-Seal, Wal-Rich, Mason-Dallas or an equivalent product or method as approved by the Engineer. Pipe seals shall be EPDM (black) with stainless steel hardware. The Contractor shall coordinate and verify exact requirements with the Architect prior to procurement and installation of the pipe seals.
4. Exterior underground conduit shall be schedule 40 PVC. Such conduit shall be encased in concrete under drives or roadways and any other locations indicated on Drawings, with a 3-inch envelope, minimum with a 2-inch separation minimum between duct bank conduits.

C. Fittings and Couplings

1. Cold-rolled steel double set screw fittings shall be used for all EMT conduits. Provide single set screw for $\frac{3}{4}$ " conduits and smaller.
2. Heavy wall rigid galvanized steel conduits shall have threaded fittings. Heavy wall rigid galvanized steel conduit couplings and hubs shall have no less than five (5) threads of conduit engaged and screwed tight.

2.04 TOGGLE SWITCHES AND LUMINAIRE CONTROL DEVICES

- A. Local toggle switches shall be 20 ampere, 120/277 Volts, AC specification grade, with grounding terminal:

Single pole - Hubbell HBL1221.

Three way - Hubbell HBL1223.

1. Pass and Seymour #PS20AC Series, Cooper #222 Series or Leviton #122 Series shall be acceptable equivalent toggle switches.
2. For other types of toggle switches specified, the equivalent series by Pass and Seymour, Cooper or Leviton shall be acceptable.

B. Dimmers shall be Lutron Maestro Series, unless noted otherwise herein.

1. LED luminaires with Lutron Hi-lume A-Series LED Drivers] shall be provided with digital fade dimmers, 120 volt (700 watts maximum), #MAF-6AM-XX; 277 volt (1600 watts maximum), #MAF-6AM-277-XX.
2. Electronic low voltage luminaires utilizing electronic transformers and LED drivers shall be provided with digital fade dimmers, 120 volt (600 watts maximum), #MAELV-600. Contractor shall coordinate with the luminaire Manufacturer regarding LED driver compatibility.
3. LED luminaires shall be provided with three-way digital dimmers, 120 volt, #MA-R-XX.
4. 0-10V LED driver dimmers shall be Lutron Diva series, 30mA maximum control current, #DVTV-XX. Control provides dimming signal only. For dimming with on/off switching, provide Lutron Power Pack #PP-120H for 120V.
5. No other Manufacturers are acceptable.

C. Control Devices

1. Luminaire Control Occupancy Sensors – Refer to Luminaire Control Occupancy Sensor Specification Section for requirements.

2.05 RECEPTACLES

A. Duplex receptacles shall be “specification grade”, 20A, 125V, 2 pole, 3 wire grounding type as follows:

1. General purpose “heavy duty” duplex receptacles: Hubbell #HBL5352.
 - a. Equivalent “heavy duty” receptacles: #5362 series as manufactured by Pass and Seymour, Cooper or Leviton.
2. Outdoor weatherproof duplex receptacles, indoor duplex receptacles where indicated on the Drawings or where required by code, shall be “heavy duty” and have integral ground fault circuit interrupter (GFCI) protection: Hubbell #GFR5362TR
 - a. Provide individual duplex GFCI receptacles as shown on the Drawings. Standard receptacles wired to “upstream” GFCI receptacle for GFCI protection shall NOT be acceptable.

3. For other types of receptacles specified, the equivalent series by Pass and Seymour, Cooper or Leviton shall be acceptable.
- B. Special purpose single receptacles, if required, shall be as indicated on the Drawings. Verify the proper NEMA configuration of such receptacles with the equipment to be served, before installation.
- C. All receptacles shall be provided with a self-grounding clip at the mounting screw.

2.06 DEVICE AND COVERPLATE COLORS AND IDENTIFICATION

- A. All toggle switches, dimmers and receptacles shall be gray unless otherwise indicated within these Specifications. Verify color with the Architect prior to procurement of the devices.
- B. Coverplates for receptacles and all types of luminaire control devices shall be as described below:
 1. All coverplates shall be smooth high impact commercial grade thermoplastic or smooth nylon finish to match the devices.
- C. The inside of all coverplates shall be permanently marked to identify panel and circuit number.
- D. In unfinished areas, use cadmium plated, round corner, steel coverplates for surface mounted outlet boxes.
- E. Weatherproof receptacle covers in damp locations shall be single gang, GFCI duplex type, flip-up/self-closing type, die cast aluminum, vertical mounting, UL Listed for wet locations while in use.
- F. Weatherproof switch covers shall be clear bubble plate type for use with AC toggle switches.
- G. The coverplates shall be by the same Manufacturer as the wiring device.

2.07 WIRE AND CABLE

- A. Wire and cable for branch circuits and for feeders, 600 volt and below shall be 90°C., 600 volt, Type THHN/THWN-2, copper only, unless otherwise indicated on the Drawings. Type XHHW shall also be acceptable for feeders. All 600 volt wiring shall be in conduit. Conduit shall be as specified elsewhere in this Section.
- B. Where wire size is not indicated on the Drawings, use ampacity ratings of 60°C for wire 100 amperes and below, and 75°C for wire above 100 amperes, as listed in Table 310.15(B)(16) of the National Electrical Code.
- C. Minimum size for power and lighting branch circuits, including lighting fixture "whips", shall be #12. Wire sizes #10 and smaller may be solid or stranded.

Wire sizes #8 and larger shall be stranded.

- D. Control wires shall be #14 stranded THWN copper. All control wiring shall be terminated with fork type "Sta-Kon" type connectors.

2.08 SURFACE MOUNTED RACEWAYS

- A. Surface mounted raceways for branch power and communication wiring shall be provided as specified on the Drawings. Both metallic and non-metallic products shall be UL Listed for their intended use and shall be provided complete with all fittings, barriers, covers and mounting accessories as recommended by the Manufacturer.

2.09 EQUIPMENT IDENTIFICATION

- A. Provide nameplates on all equipment of the type listed in the following schedule:
 1. Panelboards, including general Arc Flash Warning
 2. Safety Switches including general Arc Flash Warning
 3. Motor Starters including general Arc Flash Warning
 4. System Distribution Junction Boxes and Pullboxes
 5. System Control Panels
 6. Individual Overcurrent Protection Devices in Distribution Type Panelboards and Submittals
 7. Spare Conduits/Conduit Stubs - Identify system and/or purpose at source, if possible, and at termination end. Also at termination end, indicate location of conduit origination.
- B. Unless otherwise indicated on the Drawings, lettering shall include the name or designation of equipment, horsepower, voltage rating and service designation.
- C. Nameplates for panels and other distribution equipment shall be laminated phenolic with a black surface and white core. Nameplates may be attached to wall adjacent to equipment if area for attachment is too small. Nameplates for boxes, conduit, etc., shall be high quality adhesive tape.
- D. Cabinet and panel doors shall be marked with the identification numbers used on the Drawings. Recessed panel doors shall be marked on the inside of door. Surface panels and distribution equipment shall be marked on the exterior trim near the top of the cabinet.
- E. Junction box Identification shall comply with the following:

1. The outside of the coverplates for all junction boxes, splice boxes, pull boxes shall be permanently marked to identify the following systems:
 - a. Normal System including voltage including panel and/or system serving box.
 - b. Voice/Data
 - c. Fire Alarm
 - d. Sound/Paging
 - e. Security
 2. The identification shall be inside of the coverplate where located in finished areas.
 3. At minimum, high quality adhesive tape shall be utilized for labeling.
- F. Identification of branch circuits shall be typewritten on directory cards as described elsewhere within these Specifications.
- G. Provide new typewritten directory cards with updated schedules for all existing panels with new or modified circuits.

PART 3 - EXECUTION

3.01 CONDUITS

A. Interior Conduits

1. Conduits shall be continuous and secured to all boxes in such a manner that each conduit system shall be electrically continuous from the point of service to all device boxes. Conduits shall be supported in accordance with the National Electrical Code. Terminals of all conduits shall be furnished with locknuts and insulating bushings. Plug ends of each conduit with an approved cap to prevent the entrance of foreign materials during construction.
 - a. Actual routing of conduits shall be installed to suit the various field conditions. Any field changes necessary to conceal conduit or to avoid work of other trades shall be made without additional expense to the Owner.
2. Flexible metal conduit and flexible metallic cable assemblies shall be supported at intervals not exceeding 4½ feet and within 12 inches of every outlet box, junction box, cabinet, light fixture, or fitting, unless otherwise allowed by the National Electrical Code.
3. Conduits concealed in masonry construction shall be installed during wall construction.

4. Install exposed conduits parallel to, or at right angles to building structural members. Vertical runs shall be plumb.
5. All conduits terminating in sheet metal enclosures shall be provided with a single grounding/bonding type locknut with a set screw.
6. All exposed conduit ends within enclosures shall be provided with insulated bushings.
7. Provide expansion conduit fittings at all points where conduits cross building expansion joints.
8. Conduits shall not be installed in the ground floor slab. Under slab conduits shall be installed within the engineered fill in a manner that protects the conduit during construction.
9. Empty conduits shall have #12 pullwires installed, with labels identifying the conduit's origin and destination.
10. Contractor shall provide a minimum of three empty ¾-inch conduits stubbed into the nearest accessible ceiling space (above or below) for all recessed panelboards, fire alarm control panels, and other system control panels.
11. Conduits, boxes or other raceway systems that penetrate through fire rated floors, walls, ceilings, decks, smoke partitions, etc. shall be constructed so as to maintain the integrity of the fire or smoke rated areas. Penetrations shall not exceed an aggregate area of 1 square foot in any 100 square feet of surface area, or as dictated by local codes.
12. Conduits shall not be installed on the exterior walls or on the roof of the building, unless noted otherwise on the Drawings.
13. All interior building conduits shall be concealed in new construction, unless noted otherwise on the Drawings.
14. In remodeled areas, or where it is not possible to install concealed conduit, permission must be obtained from the Architect to run surface mounted raceways or conduit. The routing and elevation must be coordinated with the Architect before installation. Exposed raceways in finished areas shall be painted to match adjacent finishes.

B. Exterior Conduits and Special Conditions

1. Exterior underground conduits shall be installed 36 inches below grade, minimum.
2. Exterior underground conduits and conduits in wet or damp areas shall be water tight. Joints shall be sealed with weatherproof sealing compound. Contractor shall provide covers during Construction to

prevent water from entering conduits.

3. Conduits passing from the exterior to the interior of a building shall be filled with an approved material to prevent the circulation of warm air to a colder section of the raceway per Article 300.7(A) of the National Electrical Code. Provide pullbox or similar device at this location such that material is visible for inspection.
4. Conduit supporting systems shall be attached to the deck, slab, or structural framing only and not to any other appurtenances at the ceiling such as mechanical ducts, pipes and suspended ceiling hanger wires, framing members, etc.
5. A separate ground conductor shall be installed in all feeder and branch circuit exterior underground PVC conduit.
6. PVC conduit joints shall be solvent welded watertight in accordance with the Manufacturer's recommendations.
7. For exterior underground PVC conduit, vertical transitions to an above ground exposed exterior condition shall be made with rigid steel ells. The underground transition from PVC to rigid steel shall be made five feet from the ell. When such conduit transitions within a building, it shall transition immediately upon penetrating up through floor such that entrance and connection to all distribution equipment shall be made with steel conduit and fittings.

C. Fittings and Couplings

1. Contractor shall utilize boxes, fittings and mounting accessories appropriate for the specific conduit systems installed as recommended by the conduit Manufacturer.
2. All PVC fittings and joints shall be cleaned and provided with associated adhesive.

3.02 OUTLET BOXES

- A. Outlet boxes concealed in masonry construction shall be installed during wall construction.
- B. All boxes shall be rigidly supported from the building structure independent of the conduit system. Boxes cast into masonry or concrete are considered to be rigidly supported. Box stabilizers shall be utilized to properly support boxes in metal stud construction.
- C. All outlets, toggle switches and receptacles shall be centered with regard to paneling, trim equipment, etc., and shall line up with either bottom or top of masonry courses. Changes to the specified mounting heights of any device shall be approved by the Architect or Owner's representative before rough-in.

1. Changes will not be permitted where such changes conflict with ADA mounting height requirements.
2. Determine the actual direction of all door swings such that toggle switches and other control devices shall be installed at the lock side of doors unless otherwise noted or unless field conditions do not allow. Improperly located devices shall be relocated without additional expense to the Owner.

3.03 WIRE AND CABLE

- A. Wire shall be delivered to the project site in complete coils with Manufacturer's name and approval tag indicating wire size and type of insulation, fastened to each coil.
- B. Wire shall be installed in all lighting and appliance panelboards, power panelboards, switchboards and switchgear in a neat and workmanlike manner per NEC and NECA standards. No coiled, excess and draped wiring is permissible.
- C. Individual branch circuits are shown on the Drawings for clarity. Lighting and receptacle circuits may be grouped for homeruns, with a maximum of three (3) circuits per conduit.
 1. Conductors in conduits may exceed quantity indicated above provided that the Contractor derates the conductors in strict accordance with Article 310 of the National Electrical Code. Calculations shall be submitted to the Engineer for approval.
- D. Neutral conductors shall not be shared. Neutral conductors shall be provided in each outlet box containing luminaire control devices.
- E. For 120 volt branch circuits where size is not shown, conductor size #12 minimum shall be used for circuits less than 125 feet, and size #10 minimum shall be used for circuits 125 feet or greater. Ground conductors shall also be increased to #10 accordingly.
- F. Identify wire and cable for branch circuits as follows: For 208Y/120V, 3-phase, 4-wire systems, phase A/B/C shall be black/red/blue respectively with white neutral and green ground conductors.
- G. Color coding of feeders shall be by means of colored tape or colored insulation at terminals.
 1. If required, re-identify conductors at switches as required by Article 200.7(C) of the National Electrical Code.
- H. Provide all branch circuits wiring with adhesive label indicating circuit number at the phase and neutral conductor at the termination location in each panelboard.

- I. All mechanical wire and cable terminations shall be torque tightened with a torque wrench or a torque screwdriver to Manufacturer's recommended torque values.
- J. It is the Contractor's responsibility to coordinate wire sizes shown on Drawings with lugs provided on mechanical equipment during the submittal phase. Any compression cable adapters required shall be provided and shall be listed for the intended current carrying capacity of the conductors specified.
- K. Pull wire and cables into conduit using Ideal Industries "Yellow 77 or 77 plus", or equivalent product or method.
- L. Leave 6 inches free wire at all outlet boxes for wiring device connection.
- M. Mechanical means may be used to pull conductor size #4 and larger.
- N. Joints in conductor size #10 and smaller shall be made with Minnesota Mining and Manufacturing Co. (3M) insulated "Scotch Locks", Ideal Industries "Wing-Nut", Thomas and Betts (T & B) Co. "Marrette" connectors, or with mechanically crimped sleeves as manufactured by Thomas and Betts (T & B) Co. or Ideal Industries. Connector sleeves shall be insulated with pressure sensitive electrical tape equal to Minnesota Mining and Manufacturing Co. (3M) Scotch No. 33 plus.
- O. Joints and splices in conductor size #8 and larger shall be made with pressure type mechanical connectors and insulated with electrical tape to 150% of the insulating value of the conductor insulation.
- P. Splices in wireways, where indicated on Drawings, where an incoming feeder is spliced to serve multiple outgoing loads shall be provided with Multi-tap conductor kit by IlSCO or equal.
- Q. Splices and joints are not acceptable in panelboards, switchboards and switchgear.

3.04 RECEPTACLES, TOGGLE SWITCHES AND LUMINAIRE CONTROL DEVICES

- A. Install devices as indicated on the Drawings. All devices shall be flush mounted unless otherwise shown on the Drawings or indicated in these Specifications.
 - 1. GFCI receptacles shall not be through-wired.
- B. Verify device and coverplate colors with the Architect before procurement.
- C. Adjacent devices of the same voltage class shall be mounted in ganged boxes. Provide a common coverplate.
- D. Mounting heights to the center of outlet boxes shall be as indicated on the Drawings.

- E. Verify mounting heights and locations with the Architect before rough-in. Refer to details and interior wall elevations shown on the Architectural Drawings.
- F. Outlets shall not be installed back to back.
- G. As described elsewhere in this Section, receptacles shall be permanently marked to indicate the panel and circuit number of the device. Panelboard abbreviations shown on Drawings are not permitted. Indicate complete panel name and circuit number.
- H. All receptacles shall be installed with the ground opening above the phase and neutral openings. Horizontally mounted receptacles shall be installed with the neutral opening above the phase opening.
- I. All devices shall be secured with more than a single screw.

3.05 VARIABLE FREQUENCY DRIVES

- A. Variable frequency drives shall be supplied by the Mechanical Contractor installed and wired by the Electrical Contractor. Refer to variable frequency drive schedules on the Contract Documents for quantity of drives and specific data. Coordinate final requirements with the Mechanical Contractor prior to installation.
- B. Line, load and control wiring shall be installed in separate metallic conduits. Line, load and control wiring shall not share conduits or wireways.
- C. For installations where the load conductor length exceeds 100 feet, Contractor shall coordinate and provide of output LC filters in the VFD package.
- D. Where a disconnect switch is utilized downstream of a mechanical equipment as a local means of disconnect, the disconnect switch be furnished with auxiliary contact. EC shall provide control wiring from VFD to disconnect.

3.06 SURFACE MOUNTED RACEWAYS

- A. Surface mounted raceways for branch power and communication wiring shall be provided where shown on the Drawings. For other locations, permission must be obtained from the Architect as described elsewhere in this section. Conductor fill shall comply with the National Electrical Code and with the Manufacturer's guidelines.
 - 1. If possible, transitions from conduit shall occur above ceilings.
 - 2. Raceways shall be mechanically fastened to the walls or ceilings. Adhesive mounting is not permitted.
 - 3. Wiring shall be properly supported in the raceways. Sectional barriers shall be provided between power and communication wiring.

- B. All surface mounted raceways shall be installed in an orderly manner as directed by the Architect.

3.07 SUPPORTING DEVICES

- A. All hardware, supports, hangers, brackets, angle iron, channels, rods and clamps necessary to install Electrical equipment shall be provided to suit the field conditions and the applications intended as shown on the Drawings. The use of perforated straps is not permitted. Approved Manufacturers are Unistrut, Allied, Kindorf or equal.
- B. Supporting devices and hardware shall be galvanized steel or aluminum material.
- C. Design all miscellaneous steel in accordance with American Institute of Steel Construction (AISC) Steel Construction Manual and as specified under other Divisions within these Specifications.
- D. All supporting devices shall conform to latest requirements of ANSI Codes, and shall be UL Listed, where applicable.

3.08 EQUIPMENT MOUNTING

- A. All Equipment mounted on interior or exterior block or masonry walls or on interior equipment room walls where additional support is required shall be attached to $\frac{3}{4}$ inch painted plywood fire rated boards furred out one inch from wall. Boards shall be painted to match wall finishes.
- B. Disconnect switches or motor starters (including variable frequency drives) mounted on or adjacent to mechanical and building Equipment shall be located to allow the proper working clearance as defined in Article 110 of the National Electrical Code.
- C. It is the responsibility of the Electrical Contractor to provide additional mounting supports such as channel, brackets, angle iron, etc. as may be required to install equipment such as disconnect switches, motor starters (including variable frequency drives), panels and other Electrical equipment. This requirement extends to field conditions where ample wall space is not available, proper clearances cannot be maintained, or similar instances.

3.09 PAINTING

- A. Where indicated on Drawings, painting of conduits and surface raceways shall be the responsibility of this Division as performed by qualified Tradesmen to perform this work. Subcontract this work to the appropriate Trade Division.
- B. Indoor air quality during painting shall adhere to precautions specified elsewhere in these Specifications.
- C. Paint products shall be as specified in Division 9.

D. Under no circumstance shall painting of open cabling be acceptable.

3.010 EQUIPMENT CONNECTIONS

A. Install the required power and control feeds, and connect equipment being installed during the construction period. Provide facilities only for equipment that will be moved in, set and connected later by the Owner, as indicated on the Drawings.

3.011 STANDARD ELECTRICAL SYSTEM TESTING

- A. After installation, test for grounds, short circuits and proper function of each new system and related wiring. Faults in the installation shall be corrected.
1. The tester must be trained in the use of the proper equipment for each test and use test equipment that has been recalibrated to Manufacturer's recommendations at least once in the last year.
 2. The results of each test shall be presented in a typed format and list the required information on each test. For each test include the following: Date of test; name of testing company; name, make and model of testing equipment; date of last calibration; time of test; overall status of findings.
 3. All tests shall be made with an approved insulation tester/megohmmeter, and the equipment shall be used in accordance with the Manufacturer's instructions.
 4. Results of tests shall be provided in the Operating and Maintenance Manuals.
- B. Insulation resistance tests shall be made on the new electrical system with an approved megohmmeter.
1. All cables shall be inspected for physical damage before installation. After testing, proper connection of feeder cables in accordance with the one line diagram shall be verified.
 2. Cable mechanical connections at major pieces of equipment shall be tested to Manufacturer's recommended values with a calibrated torque wrench.
 3. Color-coding of all cables shall be verified per the Specifications.
 4. Perform an insulation resistance test on each feeder cable and each branch circuit cable with respect to ground, neutral and adjacent phase cables. All circuits shall be tested prior to termination. All results must be recorded, in chart form, under the headings:

LOCATION - CIRCUIT/FEEDER - WIRE SIZE - RESISTANCE

5. The insulation resistance shall be tested at 500 Volts DC.
6. The minimum acceptable insulation resistance shall be as follows:

No. 14 and No. 12 AWG	1M OHM
No. 10 AWG and above	25K OHM

C. A ground continuity test shall be made on the entire grounding system from the service to every new receptacle.

1. Inspect ground system for compliance with Drawings and Specifications.
2. Perform ground continuity tests from each receptacle to the serving panel, and from each panelboard to the service entrance equipment. All circuits and feeders must be de-energized before performing tests. All feeder results must be recorded, in chart form, under the headings:

LOCATION - DEVICE/EQUIPMENT - CIRCUIT/FEEDER - WIRE SIZE - RESISTANCE

3. All receptacles shall be verified as solidly grounded, using a receptacle tester and the Contractor shall confirm this in writing.

D. Conduct such tests and adjustments of the equipment as necessary to verify performance requirements. Submit test data with the Operating and Maintenance Manuals.

3.012 ACCESS TO EQUIPMENT AND DEVICES

- A. All electrical equipment and other devices requiring examination, adjustment, service, and maintenance shall be accessible. If located above drywall ceiling or behind finished walls, provide an access door. Coordinate all access door locations with the Architect and General Trades.
- B. To ensure accessibility during and after construction, when a device is installed, its location shall be marked with securely attached temporary signage. Signage shall indicate the amount of clearance required for the specific device. Signage shall remain in place until the ceiling or access door is installed or until substantial completion.
- C. Clearance shall include not only code required clearance but also clearance for Owner's staff to access the device. This access shall be from the floor or from the floor level using normal maintenance ladders and apparatus to meet all OSHA requirements. Consideration shall be given to accessing a device through an access door.
- D. Where a device is installed above finished ceilings, signage shall be hung below the device at the finished ceiling level. Where a device is exposed, in open ceiling areas, signage shall be hung at approximately 8' above the floor level.

- E. Electrical Contractor shall monitor these access locations until substantial completion and notify Architect, Owner and Engineer when the access area is encroached upon so that corrective action may be taken immediately.

END OF SECTION

SECTION 26 04 00 – ELECTRICAL FIRESTOPPING

PART 1 - GENERAL

1.01 WORK INCLUDES

- A. This Section includes, but is not limited to, furnishing and installing firestopping for fire rated Construction in the following areas:
 - 1. All openings in fire rated floors and wall assemblies accommodating penetrating items such as cables, conduits, raceways, etc.
 - 2. Openings at each floor level in shafts or stairwells.
 - 3. Empty openings in fire rated Construction made by the Electrical Contractor but not utilized for the above mentioned materials.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 7 – Firestopping
- B. Electrical General Provisions
- C. Electrical Basic Materials and Methods

1.03 QUALITY ASSURANCE

A. General

- 1. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings required by local building code and as tested by nationally accepted test agencies per ASTM E-814 or UL 1479 fire tests in a configuration that is representative of field conditions. The F rating must be a minimum of one (1) hour but not less than the fire resistance of the assembly being penetrated.
- 2. Manufacturer’s engineering judgments shall be accepted for non-standard applications or where no tested system exists. Drawings for Engineering judgments must indicate the UL tested system or systems upon which the judgment is based, in order to evaluate the Engineering judgment against a known performance.
- 3. Firestopping material shall be non-halogenated, lead and asbestos free and shall not incorporate nor require the use of hazardous solvents.
- 4. Firestop products which dissolve in water after curing are not acceptable.
- 5. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.
- 6. All firestopping materials shall be manufactured by one Manufacturer (to

the maximum extent possible).

7. Firestopping shall be performed by a Contractor trained or approved by the Firestop Manufacturer. (A Manufacturer's willingness to sell its products to a contractor does not itself confer qualification on the buyer.)

B. Manufacturer's Field Representative

1. The Manufacturer of the firestop material shall provide a qualified field representative at the site.

C. Codes and Standards

1. ASTM E 84
2. ASTM E 119
3. ASTM E 814
4. UL 263
5. NFPA 101 6-2.2.5 & 6-2.2.8
6. UL 1479
7. Ohio Building Code

D. Pre-Installation Conference

1. Contractor shall hold a pre-installation conference with representatives of the Architect, Contractor, Installer, Materials Manufacturer and various trades involved in the Work, to review conditions affecting the installation.

E. Conform to the Manufacturer's printed instructions for installation in accordance with a UL rated system or Manufacturer's engineering judgment.

1.04 JOB MOCK-UP

- A. Prior to installation, install one of each type of seal using the same materials that will be used on the project.
- B. Obtain Architects acceptance.
- C. Approved mock-ups may be left in place as part of the finished project and will constitute the standard for remaining Work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in original unopened packages fully identified with the

Manufacturer's name, trade name and UL label.

1. Materials shall be stored off the ground and protected from environmental conditions as required by Manufacturer.
2. All firestop materials shall be installed prior to expiration of shelf life.

1.06 PROJECT CONDITIONS

- A. Conform to the Manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature requirements.

1.07 PROJECT SUBMITTALS

- A. All submittals shall conform completely with the requirements of the Contract Documents.

- B. Product Data

1. For each type of material to be installed, literature shall indicate product characteristics, typical uses, performance, test data and Manufacturer's installation procedures.

- C. Submittals

1. Include U.L. rated system number and details for each type of penetration or configuration. Show typical installation details including:
 - a. Minimum and maximum allowable annular spacing
 - b. Base material composition
 - c. Firestop materials selected
 - d. Applied thickness required to achieve the hourly rating

1.08 WARRANTY

- A. Contractor shall provide written certification that all firestopping was installed in accordance with the Manufacturer's written instructions for UL tested assemblies and that all firestop systems installed meet the firestopping requirements as herein specified.

1.09 SEQUENCING

- A. Coordinate this Work as required with all other trades.
- B. Firestopping shall precede finishing of gypsum board.

1.010 PROTECTION

- A. Where firestopping is installed at locations which shall remain exposed in the completed Work, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and protect as necessary against damage from other Construction activities.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Firestopping materials shall meet the requirements specified herein.
- B. For applications where combustible penetrants are involved, i.e. plastic pipe, a suitable intumescent material shall be used.

2.02 ACCEPTABLE MANUFACTURERS

- A. Specified Technologies, Inc.
- B. Tremco, Inc.
- C. Nelson Firestop
- D. Hilti, Inc.
- E. 3M

2.03 MATERIALS

A. Firestop Mortar

1. STI SpecSeal Mortar
2. Tremco TREMstop-M
3. Nelson CMP Firestop Compound
4. Hilti CP637 Trowelable Firestop Compound
5. 3M Fire Barrier Mortar

B. Intumescent Firestop Sealants and Caulks

1. STI SpecSeal Sealant 100
2. Tremco TREMstop-IA
3. Nelson LBS Firestop Sealant
4. Hilti FS One High Performance Intumescent Firestop
5. 3M Fire Barrier CP25WB

C. Elastomeric Firestop Sealants and Caulks

1. STI SpecSeal Pensil 300
2. STI SpecSeal Elastomeric Sealant EC-100
3. STI SpecSeal Elastomeric Spray AS-105
4. Tremco Fyre Sil
5. Tremco TREMstop Acrylic
6. Nelson CLK Firestop Sealant
7. Hilti CP604 Self-Leveling Firestop Sealant
8. Hilti CP601S Elastomeric Firestop Sealant
9. Hilti CP606 Flexible Firestop Sealant
10. 3M Fire Barrier 1000, 1003 and 2000 Silicone Sealants
11. 3M Firedam Spray 100

D. Endothermic Firestop Sealants and Caulks

1. STI SpecSeal LC-150 or equal by Tremco, Nelson, Hilti or 3M.

E. Firestop Putty

1. STI SpecSeal Firestop Putty Bars & Pads
2. Tremco TREMstop FP Flowable Putty
3. Nelson FSP Firestop Putty
4. Hilti CP617 + CP617L Firestop Putty Pad
5. Hilti CP618 Firestop Putty Stick
6. 3M Fire Barrier Moldable Putty

F. Firestop Collars

1. STI SpecSeal Firestop Collars
2. Tremco TREMstop D Combustible Pipe Device
3. Nelson PCS Plastic Pipe Choke System
4. Hilti CP642 + CP643 Firestop Collars

5. 3M Ultra Plastic Pipe Device

G. Wrap Strips

1. STI SpecSeal Wrap Strip
2. Tremco TREMstop-WS
3. Nelson WRS Wrap Strip
4. Hilti CP645 Wrap Strip
5. 3M Fire Barrier FS-195 Wrap Strip

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the Work. Do not proceed with Work until the Contractor, in a manner acceptable to the Architect, has corrected unsatisfactory conditions.
- B. Verify that environmental conditions are safe and suitable for the installation of the firestop products.

3.02 CONDITIONS REQUIRING FIRESTOPPING

A. General

1. Provide firestopping for conditions specified elsewhere whether or not firestopping is indicated and, if indicated whether such material is designed as insulation, safing, or otherwise.
2. All firestopping shall be installed in accordance to the UL rated system designed for the application.
3. Insulation types specified in other sections shall not be installed in lieu of firestopping material specified.
4. Grout, Mortar or Gypsum based products shall not be installed in lieu of firestopping material specified.
5. All smoke walls (smoke barriers, smoke partitions, etc), rated or non-rated, shall be firestopped with systems designed to maintain a minimum 1 hour rating or that which is equal to the rating of the wall.

B. Penetrations – Provide firestopping:

1. Where penetrations including conduits, raceways, cables, [cable trays, busways] or other equipment pass through one or both surfaces of a fire

rated floor or wall.

2. Except for floor on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof.
 3. Where a penetration occurs through fire rated walls or partitions of hollow-type Construction, provide firestopping to completely fill spaces around the penetration, on each side of the wall or partition.
 4. The requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall opening.
- C. Provide firestopping to fill miscellaneous voids and blank openings in fire rated Construction where existing raceways, conduits, cables, or other equipment have been removed.

3.03 PREPARATION

- A. Surface to receive firestop shall be free of dirt, dust, grease, oil, oil from release agents, or other matter that would impair the bond of the firestop material to the substrate or penetrating items.
- B. Substrate shall be frost free.

3.04 INSTALLATIONS

A. General

1. Sleeves and core-drilled holes shall be sized at least 1-1/2" larger in diameter than penetrating items.
2. Installation of firestops shall be performed by applicators/installers qualified and trained by the Manufacturer. Installation shall be performed in strict accordance with the Manufacturer's detailed installation procedures.
3. Apply firestops in strict accordance with UL rated system designs, and Manufacturer's recommendations.
4. Coordinate with Plumbing, Mechanical, Electrical and other trades to assure that all conduits, raceways, cables, and other equipment which penetrate fire rated Construction have been permanently installed prior to installation of firestops. Schedule and sequence the Work to assure that partitions and other Construction which would conceal penetrations are not erected prior to the installation of firestop.
5. Gun grade sealants and putties shall be tooled into place to insure

proper adhesion to penetrations and surrounding surfaces.

B. Dam Construction

1. Install dams when required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating.
2. Placement of dams shall not interfere with functions or adversely affect the appearance of adjacent Construction.

C. Field Quality Control

1. Install Work in full accordance with the rules, regulations, and safety requirements of Federal, State, County and City authorities having jurisdiction over premises. Do not construe this as relieving Contractor from compliance with any requirements of the Specifications which are in excess of Code requirements and not in conflict therewith.
2. Correct unacceptable firestopping and provide additional inspection to verify compliance with this Specification at no additional cost.
3. Finish surfaces of firestopping that is to remain exposed in the completed Work to a uniform and level condition.

END OF SECTION

SECTION 26 21 00 – POWER DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDES

Lighting and Appliance Branch Circuit Panelboards
Safety Switches
Motor Starters

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Electrical General Provisions
- B. Electrical Basic Materials and Methods
- C. Grounding of Electrical Systems
- D. Overcurrent Protection Devices

PART 2 - PRODUCTS

2.01 LIGHTING AND APPLIANCE BRANCH CIRCUIT PANELBOARDS (208Y/120 RATED)

- A. Furnish and install branch circuit panelboards equipped with circuit breakers, with frame and trip ratings listed on the Drawings.
- B. Panelboard bus structure and main lugs or main circuit breaker shall have current ratings as shown on the Drawings. Such ratings shall be established by heat rise tests, conducted in accordance with UL Standard 67. Bus structure shall be insulated. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or phase sequence type and shall accept bolt-on circuit breakers. All current carrying parts of the bus structure shall be copper. Each panelboard shall be fully bussed, ready to accept future devices. Each panelboard shall contain a grounding bus. Each panelboard shall contain a 100% rated neutral bus.
- C. The panelboard bus assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel shall be as specified in UL Standard 50 for cabinets. Wiring gutter space shall be in accordance with UL Standard 67 for panelboards. The box shall be fabricated from galvanized steel or equivalent rust resistant steel. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door.
 - 1. Fronts shall have "door-within-door" trim, hinged box to front type with screws opposite outer hinge. Fronts shall have an inner door over the branch circuit disconnect area secured with one latch with lock. Doors shall be mounted with completely concealed steel hinges. Fronts shall not be removable with door in the locked position.

- D. Locks shall be flush cylinder tumbler type with catch and spring loaded door pull. All panelboard locks shall be keyed alike.
- E. Each panelboard, as a complete unit, shall have a minimum symmetrical short circuit current rating no less than that required by the overcurrent protective devices specified elsewhere. This rating shall be established by testing with the overcurrent devices mounted in the panelboard in accordance with Underwriters Laboratories Standard UL 67. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage.
 - 1. Circuit breakers shall be fully rated. Series ratings are not permitted unless otherwise indicated on the Drawings.
- F. Panelboards shall be listed by Underwriters Laboratories and bear the UL label. When required, panelboards shall be suitable for use as service equipment. Panelboards shall be as manufactured by Square D, Siemens/ITE, General Electric or Eaton Cutler Hammer.

2.02 SAFETY SWITCHES

- A. Safety switches shall be heavy duty fusible or nonfusible type as indicated on the Drawings, and shall be suitable for the voltage and current ratings as shown on the Drawings. Safety switches shall be UL Listed for their application.
- B. Switches shall have switch blades which are visible in the "Off" position when the door is open. Switches shall have removable arc suppressors, where necessary, to permit easy access to the line side lugs. All current carrying parts shall be plated.
- C. Switches shall have an integral quick-make, quick-break operating handle mechanism. Switches shall have a dual cover interlock to prevent opening of the switch door in the "ON" position or to prevent closing of the switch mechanism with the door open. Handle position shall indicate if the switch is "ON" or "OFF".
- D. Fuse holders shall accept only Class J, R or L fuses.
- E. Indoor enclosures shall be NEMA 1. Exterior enclosures shall be NEMA 3R. NEMA 1 enclosures shall be code gauge UL 98 sheet steel, treated with a rust inhibiting phosphate primer and finished in gray baked enamel. Enclosures shall be provided with padlocking provisions.
- F. Acceptable manufacturers shall be: Square D, General Electric, Eaton Cutler Hammer or Siemens/ITE.

2.03 MOTOR STARTERS

- A. All motor starters shall be combination type, unless otherwise noted on the Drawings. Starters shall include a fusible safety switch, a starter with three

overload devices, and a control circuit transformer. The enclosure shall be NEMA type 1, unless otherwise indicated on the Drawings. Combination starters shall be manufactured in accordance with the latest published NEMA standards, sizes and horsepower ratings, size 0 minimum. Combination starters shall be full voltage - non reversing, designed for across the line operation unless otherwise indicated on the Drawings.

- B. The fusible safety switch shall feature visible blade construction and shall have fuse holders. The switch handle shall control the disconnecting device with the door open or closed. The switch handle shall clearly indicate whether the disconnect device is "ON" or "OFF". The switch handle shall permit locking in the "OFF" position.
- C. The starter coil shall be of molded construction. Each starter shall have one melting alloy type overload relay per phase, sized according to NEMA Standards for the motor type, horsepower and voltage applied. The thermal elements shall be of one-piece construction and interchangeable. The starter shall be inoperative if a thermal unit is removed.
- D. Each combination starter shall include a control circuit transformer with a 120 volt secondary connection unless otherwise indicated on the Drawings. One side of the secondary winding shall be fused and the other side grounded. Both primary windings shall be fused.
- E. The enclosure door shall be closed to permit operation of the safety switch. A defearer screw shall permit opening of the door with the switch "ON".
- F. Starters shall have a green running pilot light, a hand-off-automatic selector switch and a minimum of two normally open and two normally closed auxiliary contacts, ready for control wiring connections. Verify the exact type and number of additional auxiliary contacts with the HVAC and Plumbing Contractor. Auxiliary contacts shall be supplied as indicated on the Temperature Control Drawings, or as directed by the HVAC and Plumbing Contractor.
- G. The voltage, phase, and horsepower of motors requiring motor starters are indicated on the Drawings. Verify the characteristics of each motor with the HVAC and Plumbing Contractor before installation. Fuse size shall be as indicated on the Drawings.
- H. Starters shall be as manufactured by Square D, General Electric, Siemens/ITE or Eaton Cutler Hammer.
- I. Provide single phase combination starters if indicated on the Drawings. Single phase combination starters shall have similar characteristics as specified for three phase starters, as applicable.

2.04 MATCHING EXISTING OVERCURRENT PROTECTION DEVICES

- A. New circuit breakers or fusible switches installed in existing panels shall match

the existing in type, manufacturer (if possible), and short circuit ratings.

PART 3 - EXECUTION

3.01 LIGHTING AND APPLIANCE BRANCH CIRCUIT PANELBOARDS

- A. Panels shall be mounted so that the top of the cabinet is at 6'-0" above floor.
- B. A glazed directory frame shall be provided inside each panel door and shall be of sufficient size to give a complete description of each circuit. Typed directory cards shall be provided with a detailed listing of each circuit served, including descriptions of the load and location (room numbers as applicable). Panelboard schedules included with the Contract Documents are not intended nor are they permitted to be used to meet this requirement.
- C. Panels indicated with double lugging or oversized conductors on the Drawings shall be installed with an oversized tub or a wireway or splice box (flush mounted if required).
- D. The Contractor shall balance the continuous load on each panel when the work is complete.
- E. The branch circuit numbers used on the Drawings shall be applied for the construction. However, at the completion of the work, circuit number adjustments shall be made as required to provide balanced phase loading on each panel. Balancing required shall be no greater than 15%. Any rebalancing performed shall also require relabeling of the conductors.
- F. Flush mounted panels shall be installed with a minimum of three empty 3/4" conduits stubbed up to the nearest accessible ceiling space for convenient future expansion.
- G. Spare circuit breakers shall be identified as such on the panel directory cards and shall be left in the "OFF" position.
- H. Provide engraved nameplates with information as shown on the Drawings.
- I. Where wireways are installed to serve multiple branch panelboards, the conduits entering the panelboard shall be of size and quantity to allow the panel to be filled to maximum capacity based on total available breaker space and be no more than 50% filled.

END OF SECTION

SECTION 26 21 15 – GROUNDING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDES

Grounding and Bonding Equipment

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Electrical General Provisions
- B. Electrical Basic Materials and Methods
- C. Division 27 Specifications

1.03 QUALITY ASSURANCE

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- 1. ASTM B3 – Specification for Soft or Annealed Copper Wire
- 2. ASTM B8 – Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, or Soft
- 3. ASTM B33 – Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes

B. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- 1. IEEE 81 - Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
- 2. IEEE 142 – IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems

C. UNDERWRITERS LABORATORIES INC. (UL)

- 1. UL 467 – Grounding and Bonding Equipment
- 2. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors

D. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARDS

- 1. NFPA 70 – National Electrical Code Article 250

PART 2 - PRODUCTS

2.01 GROUNDING

- A. Ground all electrical system conduits, raceways, motors, panels, cabinets,

fixtures, metal boxes, and other exposed non-current carrying metal parts of electrical equipment in accordance with all provisions of the National Electrical Code, State Building Code and local or regional codes.

- B. Grounding of the electrical system shall be by means of an insulated grounding conductor installed with feeder and branch circuit conductors in all conduits. Grounding conductors shall be sized in accordance with NEC Article 250.122 and shall run from the grounding bus of serving panel to the grounding bus of served panel, to the grounding screws of receptacles, to lighting fixture housings, to the grounding screws of light switches, to metal boxes and to the metal enclosures of service equipment.
 - 1. Install bonding jumpers across all building expansion joints, and across all conduit, busway and cable tray expansion fittings.
 - 2. Where grounding conductors are subject to mechanical damage, protect such conductors by encasement in concrete or installation in a rigid metallic raceway.

PART 3 - EXECUTION

3.01 GROUND CONNECTIONS

- A. All connections shall be made in accordance with the manufacturer's requirements.

3.02 FIELD QUALITY CONTROL

- A. Test equipment enclosures, conduits, raceways, exposed expansion joints, lighting fixtures, receptacles, etc. for ground system continuity.

END OF SECTION

SECTION 26 22 35 – OVERCURRENT PROTECTION DEVICES

PART 1 - GENERAL

1.01 WORK INCLUDES

- Fuses
- Molded Case Thermal Magnetic Circuit Breakers

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Electrical General Provisions
- B. Electrical Basic Materials and Methods
- C. Power Distribution Equipment

1.03 QUALITY ASSURANCE

- A. The overcurrent protection devices in this Specification shall be designed and manufactured according to the latest revision of the following standards (unless otherwise noted):
 - 1. NEMA AB 3: Molded Case Breakers
 - 2. UL 248: Low Voltage Fuses
 - 3. UL 489: Molded Case Circuit Breakers, Molded Case Switches and Circuit Breaker Enclosures

1.04 WARRANTY

- A. Manufacturer shall warrant overcurrent protection devices to be free from defects in materials and workmanship for one year from date of Owner's formal acceptance.

PART 2 - PRODUCTS

2.01 FUSES

- A. Approved Manufacturers:
 - 1. Bussman
 - 2. Ferraz-Shawmut
 - 3. LittleFuse
- B. The Electrical Contractor shall provide a complete set of fuses for all fusible equipment on the project.

- C. All fuses shall be UL Listed, current limiting with 200,000 RMS amperes interrupting capacity, unless otherwise indicated on the Drawings or in the Specifications.
- D. Fuses rated 600 amperes or less, 250 volts or less, serving all loads shall be UL Class RK-1: Bussmann dual element, time delay "LOW PEAK", type LPN-RK; Ferraz-Shawmut type A2DR; or Littelfuse type LLNRK.
 - 1. UL Class J fuses are also acceptable if necessary for dual switch applications only.
- E. Fuse Application for Motor Circuits and Motor Control Circuits:
 - 1. Motor protection dual element fuses installed in individual branch circuits shall be sized at 125% of motor nameplate current rating or the next higher standard fuse size.
 - 2. Where excessive ambient temperature, high inertia motor loads, or frequent "on-off" cycling require larger fuses, consult the Engineer.
 - 3. Provide fuse reducers where fuse gaps are larger than fuse dimension.
 - 4. Exact fuse type required for Variable Frequency Drive (VFD) applications shall be provided as recommended by the (VFD) manufacturer.
 - 5. For motor control circuits, provide UL Class CC fuses, sized for maximum values allowed per NEC Article 430.72.

2.02 MOLDED CASE THERMAL MAGNETIC CIRCUIT BREAKERS

- A. For approved manufacturers, refer to panelboard specifications in the Power Distribution Equipment Section.
- B. New circuit breakers installed in existing lighting and appliance or power distribution panelboards shall match the existing in type, manufacturer (if possible), and short circuit ratings.
- C. For lighting and appliance panelboards and power distribution panelboards, provide molded case thermal magnetic circuit breakers with frame and trip ratings listed on the Drawings. The molded case circuit breakers shall provide for the inverse time delay overload and instantaneous short circuit protection by means of a thermal magnetic element.
- D. The circuit breaker ampere rating shall be clearly visible without removing the panel cover.
- E. Circuit breakers shall be single pole or multi-pole with an integral crossbar to assure simultaneous opening of all poles.
- F. Circuit breakers shall have an over-center, trip-free, toggle-type operating mechanism with quick-make, quick-break action and positive handle

indication.

- G. Handles shall have "ON", "OFF" and "TRIPPED" positions.
- H. Circuit breakers shall be fully rated. Series ratings are not permitted.
- I. For nominal 208Y/120 volt systems, provide minimum symmetrical short circuit current rating of 10,000 amperes, unless otherwise noted on the Drawings.
- J. For circuit breakers provided in power distribution panelboards, minimum symmetrical short circuit current rating shall be 22,000 amperes, unless otherwise noted on the Drawings.
- K. Circuit breakers shall include factory installed mechanical lugs. Lugs shall be UL listed and rated 75 degrees C.
- L. Special Requirements:
 - 1. Circuit breakers serving HVAC loads shall be "HACR" rated.

PART 3 - EXECUTION

3.01 DELIVERY, HANDLING AND STORAGE

- A. Deliver, store, protect, and handle devices and components in accordance with recommended practices listed in manufacturer's installation manuals.
- B. Store devices and components in a clean, dry space. Maintain factory protection or cover with plastic to keep out dirt, water, construction debris, etc until time of installation.

3.02 FUSES

- A. Fuses shall not be installed until equipment is ready to be energized. All fuses shall be of the same manufacturer to assure selective coordination.
- B. Spare fuses amounting to 20% (minimum of three) of each type and rating shall be supplied by the Electrical Contractor.
- C. Field verify the exact fuse size required for all mechanical and building equipment with the nameplate data of the equipment prior to procurement. Advise the Engineer if the equipment nameplate fuse size differs from the size indicated on the Drawings.
- D. Fuses shall be turned over to the Owner upon project completion.

3.03 CIRCUIT BREAKER INSTALLATION AND TESTING

END OF SECTION

SECTION 26 51 00 – LUMINAIRES

PART 1 - GENERAL

1.01 WORK INCLUDES

- Interior Luminaires
- Exterior Luminaires

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Electrical General Provisions
- B. Electrical Basic Materials and Methods

1.03 DESCRIPTION OF WORK

- A. Luminaires shall be provided as specified in the Luminaire Schedule or as indicated on the Drawings complete with lamps, power wiring, and control for a fully operational system. Contractor is responsible for providing proper mounting accessories. Contractor shall refer to this Specification for lamp and ballast requirements. Refer to the Drawings and Specifications for control requirements. Submittals shall include product information for luminaires, lamps, and ballasts. Where a catalog number and a narrative or pictorial description are provided, the written description shall take precedence. If equal or alternate luminaire Manufacturers are not indicated, then the luminaires shall be provided as specified. The Engineer is not responsible for the performance of substituted luminaires approved by the Architect or Owner without the consent of, or review by, the Engineer.

1.04 QUALITY ASSURANCE

A. Codes and Standards

1. Luminaires shall be installed in accordance with Article 410 of the National Electrical Code and shall be grounded as required by the National Electrical Code. The Contractor is responsible for proper installation of luminaires, including verification that luminaires are installed according to their intended use. Any conflicts regarding actual architectural conditions shall be brought to the attention of the Architect and Engineer immediately.
2. All luminaires and assembled components shall be new, of good quality, and bear the label of and be approved by UL laboratories for the applicable location and conditions (wet, damp, dry, etc.).
3. All luminaires shall meet all required local, state and/or national building, electrical and energy codes and regulations.
4. Lenses shall meet ASTM E-84 – smoke developed 450 ASTM D-635, flame spread maximum 2.5 inches per minute.

B. Substitutions

1. Bidders shall follow the procedure detailed below for requesting substitute luminaire Manufacturers for project consideration.
 - a. Bidders requesting approval on Manufacturers other than those specified by series and/or catalog number on the Drawings, shall submit requests to the Architect and Engineer a minimum of ten (10) business days prior to the bid.
 - 1) Substitutions shall be submitted through local representatives.
 - 2) If the bidders do not elect to obtain prior approval during the allotted time specified, the Owner, Architect, and Engineer have no obligation to review or consider any substituted products after the Contract award.
 - b. Contractor shall pay professional fees (at current standard hourly rates) and reimburse expenses directly to all designers (Architect, Engineer, etc., as applicable.) for time spent reviewing substitutions proposed by the Contractor.
 - c. Substitutions must meet aesthetic and dimensional characteristics, and shall meet or exceed the performance of the specified luminaires. Information shall be provided to the Architect and Engineer indicating lamping, complete photometric data (including C.U., candlepower distribution, and/or luminance information), mechanical and electrical data, list of materials and finishes, and unit cost for use with product comparison and evaluation. Any deviations from the specified luminaire shall be highlighted and brought to the attention of the Architect and Engineer. If requested, the bidder shall furnish the name and location of at least one completed project where any proposed substitute has been installed, as well as the contact information of the Owner.
 - d. Luminaire samples may be required for further product consideration and shall be furnished and installed, at the bidder's expense, at the location selected by the Architect. These samples shall be in addition to those required as part of the Contract Documents.
 - e. Where needed to confirm product equivalence, the Engineer may require the manufacturer to run photometric calculations based on project conditions to confirm performance in terms of light levels and uniformity.
 - f. If the substitution is accepted, approval will be provided in the form of an addendum to the Specifications and/or Contract Documents and issued to all prospective bidders.

PART 2 - PRODUCTS

2.01 LIGHT EMITTING DIODES (LEDS):

A. General Requirements:

1. All products shall be tested by a Nationally Recognized Testing Laboratory (NRTL) in accordance with IES LM-79 testing methods and shall carry a UL or ETL label. Luminaire Manufacturer shall confirm in writing that the LEDs within the luminaire will not exceed the maximum temperature to which the LED die was tested using IES LM-80 testing methods.
2. All LEDs must be batch sorted for color and brightness visual consistency, and must be manufactured by a reputable LED Manufacturer, such as Philips Lumileds, Osram Sylvania, Nichia, Cree or approved equal. All luminaires of the same type shall be supplied at the same time and shall come from the same batch. Spare luminaires shall be provided from the same batch.
3. Color Rendering Index (CRI): Minimum CRI of 75.
4. All interior LEDs shall be 3500K.
5. All exterior LEDs shall be 4000K.
6. All LED components shall be mercury and lead-free.
7. All LED luminaires shall be subjected to the following JEDEC Reliability Tests for Lead-free Semiconductors: HTOL, RTOL, LTOL, PTMCL, TMSK, Mechanical Shock, Variable Vibration Frequency, SHR, Autoclave.

B. Thermal Management:

1. Luminaire Manufacturers shall adhere to device Manufacturer guidelines, certification programs, and test procedures for thermal management.
2. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the Luminaire over the expected useful life. The LED Manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
3. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
4. The Luminaire shall have a minimum heat sink surface such that LED Manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature. The heat sink material shall be aluminum.

- C. Special Warranty: Provide a written warranty indicating that the complete system (LED luminaires, drivers and power supplies) shall carry a minimum 5-year warranty.

D. Drivers:

1. Digital programmable dimming drivers shall be Lutron Hi-lume A-Series.
 - a. Drivers shall be compatible with dimmer control specified in the Basic Materials and Methods Specification Section.
2. Non-dimming LED drivers shall meet the following requirements:
 - a. Minimum Efficiency: 85%
 - b. Starting Temperature: -40° C
 - c. Input Voltage: 120 to 480 volts \pm 10%, single phase
 - d. Power Factor (PF): \geq 0.90
 - e. Total Harmonic Distortion (THD): \leq 20%
 - f. Sound Rating: Class A
 - g. Surge Protection: The system must survive 250 repetitive strikes of "C Low" (C Low - 6kV/1.2 x 50 μ s, 10kA/8 x 20 μ s) waveforms at 1 minute intervals with less than 10% degradation in clamping voltage. "C Low" waveforms are as defined in IEEE/ASNI C62.41.2-2002, Scenario 1 Location Category C.
 - h. Power supplies can be UL Class I or II output.
3. Drivers shall comply with FCC 47 cfr Part 18 non-consumer RFI/EMI standards.

PART 3 - EXECUTION

3.01 LUMINAIRE SUPPORTS

- A. All boxes upon which luminaires are to be installed shall be equipped with 3/8 inch luminaire studs. Luminaires which weigh over 50 lbs. shall be supported independently of the box, unless the box is listed for the weight to be supported.
- B. Boxes serving recessed luminaires in accessible ceilings shall be capable of being accessed through the ceiling opening. Install a maximum 6 feet of 1/2 inch flexible metal conduit (or MC cable) or [healthcare facilities listed HCF type AC cable] between the rigidly supported box and the luminaire housing. The box shall be located a minimum of one foot from the luminaire housing.
- C. Surface mounted luminaires mounted on ceilings other than accessible lay-in ceiling systems, or to the building structure, shall be securely supported in a manner approved by the Architect. Mounting shall also be in accordance with Article 410 of the National Electrical Code, and as recommended by the

luminaire Manufacturer.

- D. Recessed luminaires shall be provided with mounting accessories compatible with the ceiling types installed. Plaster frames shall be furnished for each recessed luminaire installed in plaster or dry wall type ceilings. Verify all ceiling types with the Division 1 Contractor and with the Architectural reflected ceiling plans prior to submitting shop Drawings.
- E. Recessed luminaires in accessible lay-in ceiling systems shall be supported as follows:
 - 1. The grid system tees shall be supported at each corner of each luminaire with a suspended ceiling support wire up to a building structural member, or up to the structural deck. It is the responsibility of the Electrical Contractor to include such supports in Bid regardless of which Division installs the supports.
 - 2. Each luminaire shall also be securely fastened to the grid system tees by mechanical means, such as bolts, screws, rivets or by clips identified for use with the type ceiling framing member installed.

3.02 CONNECTIONS AND INSTALLATION REQUIREMENTS

- A. Connections to recessed and surface luminaires installed in drywall or inaccessible ceilings shall be made utilizing 1/2" flexible metal conduit from luminaire to nearest junction box located in an accessible ceiling area or at access panel locations as approved by Architect. Manufactured wiring systems are not acceptable. Complete installation shall require ability to access connection points and replace wiring from accessible junction boxes to any luminaires.
- B. Connections to undercabinet type luminaires shall be made with 3/8" flexible metal conduit from accessible junction box to the luminaire housing. Appropriate wall patching and/or firestop material is the responsibility of the Electrical Contractor and performed by appropriate tradesmen.

3.03 MISCELLANEOUS

- A. Remote ballasts shall be grounded as recommended by the luminaire Manufacturer.

3.04 EXTERIOR LUMINAIRES

- A. Adjustable exterior luminaires shall be aimed by the Contractor at night for optimum coverage of their task, to the satisfaction of, and under the direction of the Architect.

3.05 EXISTING LUMINAIRES

- A. Existing luminaires in the remodeled areas as shown on the Drawings being

reused, or relocated, shall be refurbished as follows:

1. Luminaires shall be thoroughly cleaned.
 2. Luminaires shall be relamped with new lamps.
- B. If existing luminaires to be reused or relocated are defective or inoperable, bring this condition to the attention of the Architect before refurbishing work is done, and before relocation.

3.06 AIMING OF ADJUSTABLE LUMINAIRES

- A. All luminaires (including "Normally-Off" emergency luminaires) that are capable of being aimed shall be aimed by the Contractor for the optimum coverage of their task, to the satisfaction of, and under the direction of the Architect.

3.07 ADDITIONAL MATERIALS

- A. The Electrical Contractor shall furnish additional materials described below that match the products installed. These materials shall be packaged with protective covering for storage, and shall be clearly labeled to indicate their use. The Contractor shall coordinate the designated storage location with the Owner on site upon project completion.
1. Spare LED drivers, LED power supplies, etc., amounting to 1% (minimum of 2) of each type and rating installed.
 2. Spare diffusers and lenses amounting to 1% (minimum of 2) of each type and rating installed.

END OF SECTION

SECTION 26 52 00 – LUMINAIRE CONTROL OCCUPANCY SENSORS

PART 1 - GENERAL

1.01 WORK INCLUDES

Luminaire Control Occupancy Sensors

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Electrical General Provisions
- B. Electrical Basic Materials and Methods
- C. Luminaires

1.03 DESCRIPTION OF WORK

A. Occupancy Sensors

1. Occupancy sensors shall be provided as indicated on the Drawings. Contractor is responsible for providing proper mounting accessories. Submittals shall include product information. If alternate occupancy sensor Manufacturers are not indicated, then the devices shall be provided as specified. The Engineer is not responsible for the performance of substituted devices approved by the Architect or Owner without the consent of, or a review by, the Engineer.

1.04 QUALITY ASSURANCE

A. Codes and Standards

1. Occupancy sensors shall be installed in accordance with Article 410 and Article 411 of the National Electrical Code and shall be grounded as required by the National Electrical Code. The Contractor is responsible for proper installation, including verification that devices are installed according to their intended use. Any conflicts regarding actual architectural conditions shall be brought to the attention of the Architect and Engineer immediately.

1.05 SUBMITTALS

- A. Submittals shall include all installation drawings and wiring diagrams where applicable as required for a complete installation. Wiring diagrams shall detail all system interconnections. Provide an itemized bill of materials and product data sheets.

1.06 WARRANTY AND MAINTENANCE CONTRACT

- A. Provide Manufacturer's 5 year parts warranty.

- B. Warranties shall commence upon project closeout and final acceptance by the Owner.

1.07 OWNER TRAINING

- A. A representative of the devices shall train the Owner's personnel on operation and maintenance of the devices. Programming shall be provided as coordinated with the Owner.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Luminaire Control Occupancy Sensors (Standard Applications)

1. Devices shall be manufactured by Wattstopper, with model numbers as indicated. Alternate devices manufactured by Leviton, Hubbell or Cooper Controls are acceptable, and shall meet or exceed the performance and area of coverage of the specified sensors.
2. Sensors shall be instant on, unless otherwise noted on the Drawings or within these Specifications. Contractor shall coordinate all time delays with Owner.
3. Passive Infrared Sensors
 - a. Type PS3: Wall switch sensors where indicated on Drawings shall be 800 Watts, 120 volt with manual on/off override control, two-level detection pattern minimum, adjustable sensitivity, and 180 degree horizontal coverage for 900 square foot maximum area. Sensors shall be #WS-250.
 - b. Type PW: Wall mounted sensors where indicated on Drawings shall operate at 24 volts DC from remote power packs. Sensors shall have (1) NO/NC isolated relay rated for 1 amp at 24 volts DC, up to 2,000 sq. ft. of coverage, four-level detection pattern minimum, and wide angle lens. Sensors shall be #CX-100.
 - c. Type PWC: Wall mounted sensors where indicated on Drawings shall operate at 24 volts DC from remote power packs. Sensors shall have (1) NO/NC isolated relay rated for 1 amp at 24 volts DC, up to 120 linear feet of coverage, 2 sided aisle way lens, and a nine-level total detection pattern, minimum. Sensors shall be #CX-100-3.
4. Ultrasonic Sensors
 - a. Type UC1 and UC2: Ceiling mounted sensors where indicated on Drawings shall operate at 24 volts DC from remote power packs. Sensors shall have auxiliary pack for fan control and 360° coverage. Sensors shall be Type UC1: #WT-600 for one-sided 600 square foot

coverage, Type UC2: #WT-1100 for two-sided 1,100 square foot coverage.

5. Dual Technology Sensors

- a. Type DC: Ceiling mounted sensors where indicated on Drawings shall operate at 24 Volts DC from remote power packs. Sensors shall have (1) NO/NC isolated relay rated for 1 amp at 24 volts DC and 360°, 1,000 square foot extended range lens with a nine-level detection pattern. Sensors shall be #DT-300.

6. Remote Power Packs

- a. Power packs shall have universal voltage capabilities and have an integral transformer relay system for 24 VDC output at 225mA, auto-on or manual-on operating mode, output contact rated at 20A for incandescent loads and 20A for electronic ballast loads. Power packs shall be #BZ-150.
- b. Refer to Manufacturer's installation wiring diagrams for exact wiring and installation requirements.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Ceiling mounted sensors shall not be installed within 6 feet of an HVAC diffuser, as this may result in inaccurate detection.

3.02 MISCELLANEOUS

- A. Provide wiring of devices as recommended by the Manufacturer. Low voltage cabling shall be supported above accessible ceilings with J-hooks, and shall be kept separate from other system wiring.

END OF SECTION

SECTION 26 72 00 – TECHNOLOGY SYSTEMS ROUGH-IN

PART 1 - GENERAL

1.01 TECHNOLOGY COORDINATION

- A. The Contractor shall refer to the Technology Drawings and Specifications for additional information and system descriptions related to Technology Grounding system and device rough-in requirements required to be provided by the Electrical Contractor. If discrepancies are encountered with this Section, the Technology Contract Documents shall be followed.

1.02 WORK INCLUDES

Technology Conduits and Boxes

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Electrical General Provisions
- B. Electrical Basic Materials and Methods
- C. Electrical Firestopping
- D. All Technology Specification Sections

1.04 TELECOMMUNICATIONS SERVICE

- A. The Telecommunications Service and Cable Television Service to the existing building shall remain.

PART 2 - PRODUCTS

2.01 TECHNOLOGY CONDUITS AND BOXES

- A. The Contractor shall furnish and install Technology outlet boxes, conduit, sleeves and miscellaneous fittings and materials for each of the following low voltage technology systems:
 - 1. Voice and Data Conduits and Boxes
 - 2. Cable Television Conduits and Boxes
 - 3. Public Address System Conduits and Boxes
 - 4. Audio/Video System Conduits and Boxes
 - 5. Security System Conduits and Boxes
- B. Outlet boxes shall be 4 inches square, minimum, unless otherwise indicated in the Technology Contract Documents, with appropriately sized plaster rings.

Blank coverplates shall be provided for all unused outlet boxes.

C. Mounting heights shall be as indicated on the Drawings.

PART 3 - EXECUTION

3.01 TECHNOLOGY CONDUITS AND BOXES

- A. All conduits and boxes required for technology system rough-in as shown on the Drawings shall be installed complete with pullwires. Conduits shall be 1-¼ inch minimum, or as sized in the Technology Contract Documents.
- B. Provide conduit from each outlet box up to the nearest accessible corridor or open area ceiling space.
- C. Mounting heights shall be as indicated on the Drawings.
- D. Provide an insulated bushing at each conduit stub.
- E. All Work shall be installed in accordance with the requirements of EIA/TIA-569, BICSI's Telecommunications Distribution Methods Manual (TDMM), and as indicated on the Drawings.
- F. Conduit runs shall not contain more than two 90-degree bends prior to termination unless conduit size is increased to the next trade size of that shown on the Drawings. Conduit shall not exceed three 90-degree bends regardless of size.
- G. Conduit runs shall not exceed 100 feet without utilizing a pullbox sized per Table 4.14 of the TDMM.
- H. All conduits shall be reamed smooth to prevent accidental damage to the cables, and have a non-metallic bushing installed.
- I. All conduits stubbed into an open area (concealed ceiling space) shall extend 1-inch to 3 inches from the finished surface.
- J. The Contractor shall coordinate the type and arrangement of receptacles and outlets indicated on the Technology Drawings with the Technology system supplier prior to the installation of any Electrical Work. The Contractor shall notify the Engineer if discrepancies are found. Any Work installed that must later be relocated as a result of the Contractor's negligence in coordinating with the Technology system supplier shall be done as directed by the Engineer at no additional cost.

END OF SECTION

SECTION 26 81 20 – EXTENSION OF THE EXISTING FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDES

Extension of the Existing Fire Alarm System

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Electrical General Provisions
- B. Electrical Basic Materials and Methods

1.03 QUALITY ASSURANCE

- A. Fire Alarm System equipment shall bear the U.L. label and shall meet the requirements of the NEC, NFPA, ASME/ANSI and all State and Local Codes. All control equipment shall be listed under U.L. category UOJZ as a single control unit. All system components shall be FM approved.
- B. All control equipment shall be provided with transient protection to comply with UL864 requirements.
- C. System Controls shall be U.L. listed for Power Limited Applications.
- D. Devices shall conform to the latest requirements of the American's With Disabilities Act (ADA).
- E. State of Ohio certification for installation of Fire Alarm Systems shall be provided prior to start of installation. Contractor shall complete NFPA 72 Record of Completion form if required by the local authority.

PART 2 - PRODUCTS

2.01 EXTENSION OF THE EXISTING FIRE ALARM SYSTEM

- A. Furnish and install devices for a complete extension of the existing Fire Alarm System. Existing fire alarm control panel is a silent knight SK-5208 by Honeywell. Include sufficient wiring, conduit, terminations, electrical boxes, and all other necessary material. Contractor shall verify catalog numbers for new devices with the system supplier. New devices shall be compatible with the existing system devices. The existing system alarm operation shall be maintained.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Upon completion of the project, the Contractor shall test the system

extension in the presence of the Architect, Fire Marshall, Owner and other authorities having jurisdiction.

- B. The Owner shall be furnished by the Contractor reproducible drawings indicating the actual installation of the fire alarm system extension as constructed showing wiring fill, wire tag numbers, junction boxes and connection of devices.
- C. A representative of the system manufacturer shall provide all system reprogramming and testing, and shall instruct the Owner's personnel in the operation and maintenance of the system. The Electrical Contractor shall guarantee all equipment and wiring to be free of mechanical and electrical defects for a period of one year from the date of acceptance by the Owner. Provide a written test report.
- D. Submittals shall include a bound brochure with data sheets for all equipment specified and installation drawings. Drawings shall indicate exact wiring requirements, wire types and sizes, and shall include equipment locations shown on reproducible floor plans (1/16" scale, minimum).
- E. Drawings shall include updated battery and voltage drop calculations and shall be signed by a NICET certified fire alarm system designer employed by the fire alarm system supplier.
- F. The Contractor shall provide a copy of submittals to the local authority responsible for the permit approval.

END OF SECTION

SECTION 27 01 00 – TECHNOLOGY GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED CONTRACT DOCUMENTS

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates and Addenda are a part of this Specification. Contractors and Subcontractors shall examine these provisions as they may affect work under this Division.
- B. Contractor shall examine Division 1 Contract Documents for general project requirements.
- C. Contractor shall also examine the Contract Documents of all Divisions, which may affect work under this Division. Contractor shall be responsible for technology work required.

1.2 DESCRIPTION OF WORK

- A. The project involves work in an existing operating facility and will require close communication with Owner in regards to access and work hours. Coordinate all work schedules prior to bidding with Owner and Construction Manager.
- B. Technology, Electrical, Architectural, HVAC, Plumbing, Fire Protection, Structural and all other Drawings as well as the Specifications for all the Divisions shall be defined as the Contract Documents. Contractor shall review entire set of Contract Documents prior to bidding.
- C. Drawings and Specifications are to be considered as supplementing each other. Work specified but not shown, or shown but not specified, shall be performed or furnished as though mentioned in both the Specifications and the Drawings.
- D. Prior to submitting bid, Contractor shall examine all Drawings and Specifications to develop a complete understanding of the project scope. Contractor shall ask for clarifications during the pre-bid phase of the project. Failure to do so will not relieve the Contractor of their responsibility to perform all required work.
- E. Where the project scope involves renovations and additions, it is recommended that Contractors visit the site of the work and become familiar with the conditions affecting the installation. Submission of a proposal shall presuppose knowledge of such conditions and no additional compensation shall be allowed where extra labor or materials are required because of the lack of knowledge of these conditions.
- F. Bid shall include any special phasing requirements related to the construction work as described in the Contract Documents. Coordinate with Division 1.
- G. Extra costs which might result from deviations from the Drawings, so as to avoid interferences, shall be considered a “Job Condition”, and no additional compensation shall be considered applicable. In the event that such interferences occur in course of the Work, due to an error, omission, or oversight

by the Contractor, no additional compensation shall be allowed. Interferences that may occur during the course of construction shall be brought to the immediate attention of the Architect and Engineer, and the Architect and Engineer's decision, confirmed in writing, shall be final.

H. The following general terms as used within the context of the Technology Contract Documents shall be defined as follows:

1. "Contract Documents" The complete set of Drawings and Specifications for all Divisions included in the project.
2. "Drawings" – Drawings furnished as part of the Contract Documents.
3. "Contractors" Technology Contractor and the Technology Contractor's Subcontractors.
4. "Responsible" – To perform work provided.
5. "Furnish" To supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations.
6. "Install" - Work which includes the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
7. "Provide" - To furnish and install, complete and ready for the intended use.
8. "Equal" – To meet or exceed the standards of the specified products or listed manufacturers.
9. "Mechanical" - HVAC, Plumbing and Fire Protection Divisions as applicable.
10. "Technology" shall refer to all low voltage systems, related infrastructure and conduit/backbox rough-in work indicated on the Division 27 and 28 Contract Documents.
11. "RCDD" shall be defined as Registered Communication Distribution Designer.
12. "BICSI" shall be defined as Building Industries Consulting Services International.
13. One EIA rack space or panel height (denoted as 1U) shall be defined as being 1.75 inches in height.

1.3 WORK INCLUDES

- A. The Electrical Contractor is responsible for all work scope included in the Division 26 Contract Documents and applicable Division 26 scope indicated in the Division 27 and 28 Contract Documents. A separate Technology Contractor is responsible for all work included in the Division 27 and 28 Contract Documents unless otherwise indicated in the Division 27 and 28 Contract Documents.

- B. Include all labor, material, equipment, services, permits, coordination, supervision and administration necessary for the proper completion of all work shown. Items omitted, but necessary, to make the Technology Systems complete and workable shall be understood to form part of the work.
- C. Material for work required by the Contract Drawings and Specifications such as patching and painting shall be provided as specified in other applicable Divisions covering such work.
- D. Provide material and labor which is neither drawn nor specified but which is obviously a component part of and necessary to complete work and which is customarily a part of work of similar character.
- E. Include all testing, test reports, system programming, start-up reports and warranties for each system as outlined elsewhere in these Specifications. Refer to "Operating / Maintenance Manuals" for additional requirements.
- F. Technology system Work includes:
 - 1. All Technology Systems included in Division 27 and 28 drawings and specification.
 - 2. All Technology Systems Cable Trays, Conduits and Boxes, including pull wires, for all systems specified in Divisions 27 and 28.

1.4 ALTERNATES

- A. Include Alternates as outlined in Division 1 added to or deducted from the base bid price. Technology alternates shall be as follows:
 - 1. Alternate 8.A Technology – all Division 27 work.

1.5 ALLOWANCES

- A. No allowances have been defined for this project.

1.6 UNIT PRICING

- A. In addition to any pricing submittal requirements listed elsewhere in these Specifications, the Contractor shall provide itemized pricing to the Engineer for the individual systems. This pricing shall be broken out into materials and labor. The itemized pricing shall be formatted into an organized spreadsheet format and include, but shall not be limited to:
 - 1. Horizontal Cabling System and Technology Room Rack System
 - 2. Card Access and Surveillance Systems
 - 3. Audio Visual Systems
 - 4. Remaining systems

- B. Contractor shall provide unit pricing that shall be used as the basis for both additions and deductions to the project. The unit pricing shall include separate line items for materials and labor, and shall include all major components of each System, including, but not be limited to the following items. Unit pricing shall be valid for entire length of project. All items listed shall be based on materials and labor that is compliant with the associated Specifications herein.
 - 1. UTP drops utilizing Category 6 cabling for 100', 150', 200', 250', and 295' for each type faceplate described in the Drawings. (Note: voice jack and cable may change to data jack and cable.)

1.7 PERMITS AND FEES

- A. Secure and pay for permits and inspections required for the technology work. Turn over certificates of approval to the Owner promptly when received, and before payment is made for the work.
- B. Give proper authorities notice as required by law relative to the work in their charge. Comply with the regulations regarding temporary enclosures, obstructions or excavations and pay all legal fees involved.

1.8 QUALITY ASSURANCE

- A. Work shall be installed in accordance with all applicable provisions of the National Electrical Code, as interpreted by the local Authority Having Jurisdiction (AHJ), as well as any further modifications or regulations published by local or State Authorities.
- B. Reference to the code and standards listed shall constitute the minimum acceptable requirements. Nothing in the Specifications shall be construed to permit deviation from the requirements of the governing code. Where requirements of the Drawings and Specifications exceed those of the code listed, follow the Drawings and Specifications.
- C. Provisions of the latest revisions to the following codes and standards shall be followed where applicable:
 - 1. Ohio Building Code, 2011 with amendments
 - 2. Ohio Fire Code, 2011
 - 3. Ohio Energy Code (IECC, 2006 or ASHRAE 90.1, 2007)
- D. Applicable portions of the following codes, standards, societies and agencies shall be followed. Where a specific edition is listed, it shall be used. Where not listed, the edition recognized by the Authority Having Jurisdiction shall be used. Listing of a specific portion of a code, standard, society or agency does not preclude the Contractor from following all other applicable portions of the code, standard, society or agency.
 - 1. National Fire Protection Association (NFPA):

- a. NFPA 70 – National Electrical Code, 2011
 - b. NFPA 72 – National Fire Alarm Code, 2010
 - c. NFPA 110 – Emergency and Standby Power Systems, 2010
2. American National Standards Institute (ANSI):
 - a. ANSI – 117.1 – Specifications for Making Buildings and Facilities Accessible To, and Usable By, the Physically Handicapped
 3. American with Disabilities Act (ADA) – Americans with Disabilities Act Accessibility Guidelines (ADAAG), 2004
 4. Federal Occupational Safety and Health Act (OSHA)
 5. National Electrical Manufacturers Association (NEMA)
 6. Institute of Electrical and Electronic Engineers (IEEE)
 7. American Society of Testing and Materials (ASTM)
 8. Illuminating Engineering Society (IES)
 9. Underwriters Laboratories, Inc., Standards for Safety (UL)
 10. Building Industries Consulting Services International (BICSI)
 11. Ohio Facilities Construction Commission (OFCC)
- E. Workmanship shall be in accordance with the best NECA (National Electrical Contractors Association) practices of the trade. Journeyman Electricians under the supervision of competent foreman shall install electrical work.

1.9 ELECTRONIC MEDIA

- A. An electronic building information model is available to the Contractor, from the Engineer for coordination purposes as defined in Division 0 and Division 1.
- B. Contractor shall deliver closeout documents on a portable memory device. Portable memory device shall refer to CD, DVD, Flash Drive, external hard drive or any other portable media used for storing electronic files.

1.10 SUBMITTALS

- A. Prior to commencing work, submit product data and/or shop drawings for Technology equipment, materials and systems as described herein and as required in each individual Division 27 and 28 Specification section. Provide all submittals far enough in advance of scheduled dates for installation to provide sufficient time for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery.

- B. Conform to submittal requirements outlined in Division 1 Specifications. Provide

on-line electronic Submittals as required. All charges for on-line services shall be included in the Bid.

- C. Prepare Submittals with adequate details and dimensions as necessary to clearly show construction. Clearly identify each item on the Submittal with designation as indicated on Drawings including location and use. Include in Submittals, Manufacturer's published descriptive literature, specifications, performance data (normal operating characteristics, ratings, etc.), wiring diagrams and installation instructions. Indicate for each item the operating characteristics, design conditions, features and optional items that are intended for application on the project. Where contents of Submittal literature included data not pertinent to the Submittal, clearly indicate (highlight) which portion of content is being submitted for review.
- D. If for any reason, the submittal shows variations from the requirements of the Contract Documents, the Contractor shall make mention of such variation in the letter of transmittal. The Contractor shall note in red on the Submittal any change in design or dimension on the items submitted including changes made by the Manufacturer which may differ from the catalog information.
- E. Where additional wiring diagrams or other drawings are required, they shall be submitted at the same time with shop drawings and product data. Partial submittals are not acceptable.
- F. Contractor shall review each Submittal prior to submission and check for compliance with the Contract Documents. Corrections shall be noted. Mark with approval stamp prior to submission. Submittals that do not bear the Contractor's approval stamp will be returned without action.
- G. The submittals will be reviewed only for general compliance and not for dimensions, quantities, etc. The submittals that are returned shall be used for procurement. The responsibility of correct procurement remains solely with the Contractor. The submittal review shall not relieve the Contractor of responsibility for errors or omissions and deviations from the Contract requirements.
- H. After review of submittals by the Engineer, the Contractor shall revise and resubmit if required to establish compliance with the Contract Document requirements. Resubmittal shall include a document with a written response to each of the Engineer's previous comments.
- I. The Contractor shall notify the Engineer when all product data and/or shop drawings for electrical equipment, materials and systems have been submitted for review.
- J. The Contractor agrees that submittals, processed by the Engineer, are not change orders; that the purpose of shop drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design intent of the project. This understanding is demonstrated by indicating which equipment and material is required, and by what methods of fabrication and installation will be utilized.

- K. The Contractor further agrees that if deviations, discrepancies or conflicts between the submittals and the Contract Documents are discovered, either prior to or after submittals are processed by the Engineer, the Contract Drawings and Specifications shall take precedence over all submittals and shall be followed.
- L. Final reviewed submittals shall be included in the Operating a Submit product data for the following. Refer to specific Specification sections for additional requirements. Where Submittals are returned, "REVIEWED, EXCEPTIONS AS NOTED", the final Submittals shall be updated to include the exceptions. Upon ordering equipment, order sufficient number of sets of product data literature for the Operating and Maintenance Manuals.
- M. Submit product data for the following. Refer to specific Specification sections for additional requirements.
 - 1. Copper Cabling
 - 2. Coaxial Cabling
 - 3. Faceplates
 - 4. Modular Connectors
 - 5. Patch Panels
 - 6. All Active Electronics/Equipment
 - 7. Network Switches and Related Modules
 - 8. Firestop Details
 - 9. Uninterruptible Power Supply System (UPS)
 - 10. Wireless Access Points
 - 11. Paging Systems
 - 12. Security Card Access and Security Surveillance Systems
 - 13. Any other specified system or equipment not listed
- N. Submit shop drawings for the following. Where project floor plans are required, refer to electronic media section for requirements obtaining electronic drawing files. Refer to specific Specifications sections for additional requirements.
 - 1. Security Systems
 - 2. Audio Visual Systems
 - 3. Paging Systems

1.11 CONSTRUCTION DOCUMENTATION

A. Construction Model

1. Refer to Division 1 for additional requirements.
2. Construction Model shall include but not be limited to, locations of equipment and devices, ductwork, piping, and conduit routing and required service clearances for all trades. Show the relationship of all components as related to installation and future access for maintenance and removal. Where access doors are required, indicate locations and type. Show locations of all ductwork, piping and conduit penetrations through wall and floors. Show existing items affecting new installation in remodeled areas.
3. Before preparing Construction Model, coordinate locations of all floor, wall, and roof penetrations including sleeve requirements with General Trades. Coordinate locations and types of all access doors with the Architect and General Trades.
4. Secure approval of Construction Model from all trades affected, prior to submittal to Architect for review. Each trade must indicate acceptance of illustrated conditions by attaching their endorsement.
5. Proceed with installation only after review of Construction Model by Architect and approval from all trades affected. Architect does not approve the Construction Model.
6. The Construction Model shall be updated to include any deviations made during construction as required to create Record Drawings.

B. Coordination Drawings:

1. Refer to Division 1 for additional requirements.
2. Preparation of the Coordination Drawings shall be the responsibility of the HVAC Contractor.
3. Coordination Drawings shall include but not be limited to: locations of equipment and devices, piping, and conduit routing and required service clearances for all trades. Show the relationship of all components as related to installation and future access for maintenance and removal. Where access doors are required, indicate locations and type. Show locations of all cable tray, piping and conduit penetrations through wall and floors. Show existing items affecting new installation in remodeled areas.
4. Supply HVAC Contractor information necessary for the development of coordination drawings. Information shall include but not be limited to: locations and sizes of Technology equipment and devices; conduit routing and sizes; and required service clearances affecting the work of other trades. How this information is supplied shall be discussed and decided between all trades. Coordination meetings between all trades are recommended.
5. Before supplying information to the HVAC Contractor, coordinate locations of all floor, wall, and roof penetrations including sleeve requirements with

General Trades. Coordinate locations and types of all access doors with the Architect and General Trades.

6. Contractor shall approve Coordination Drawings prior to Submittal to Architect for review and must indicate acceptance of illustrated conditions by attaching their endorsement to each Drawing.
7. Proceed with installation only after review of Coordination Drawings by Architect and approval from other trades affected. Architect does not approve Coordination Drawings.
8. The Coordination Drawings shall be updated to include any deviations made during construction as required to create Record Drawings.

C. Tests, Start Ups and Adjustments

1. During the construction period provide the following tests:
 - a. Wireless Access Point Signal Strength Survey.

1.12 GUARANTEE AND WARRANTIES

- A. Warrant that all equipment and work is installed in accordance with good workmanship practices. All equipment shall be installed in accordance with the Manufacturer's recommendation and shall meet the requirement specified. Any equipment failing to perform or function as specified shall be replaced with complying equipment without cost to the Owner. Warranty shall commence upon acceptance of substantial completion or construction by the Owner. Sign-off of individual equipment start-up procedures shall not activate the warranty commencement.
- B. The Contractor shall review the construction schedule requirements defined in Division 1. Where necessary to accommodate the schedule and where equipment and systems are installed that are used by the project until the date of substantial completion, the Contractor shall provide an extended warranty as part of the bid to cover the equipment warranty until the date of substantial completion.
- C. Guarantee against defects in workmanship and materials: repair or replace any defective work, material or equipment within two (2) years from date of formal written acceptance by the Owner. An additional product warranty provided by individual equipment manufacturers shall supersede this two year workmanship and materials guarantee for installation of the appropriate equipment, as described in the individual section.
- D. The Contractor, within ten (10) business days of project completion shall fully complete and submit all documentation to the manufacturer as required to implement the extended warranty period. Coordinate guarantee and warranty requirements with Division 1 Specifications.

1.13 CLOSEOUT DOCUMENTS

A. Record Drawings:

1. Record Drawings shall consist of marked-up Drawings as defined elsewhere in the Specifications. Refer to Division 1 for quantities, special formatting, and additional requirements.
2. The Contractor shall keep one complete set of the Drawings on the project site on which shall be recorded any deviations or changes from such Drawings made during construction. These Drawings shall become the Record Drawings, shall be kept clean and undamaged, and shall not be used for any other purpose other than recording deviations from Drawings. At the end of the project, electronic .pdf's of these Drawings shall be made and transferred onto a portable memory device. Both hard copy drawings and the portable memory device shall be provided as Record Drawings.
3. Record Drawings shall indicate the location of all underground, under floor and concealed conduits including the location of all utility service entries.
4. Record Drawings shall indicate the location of each respective penetration made through any fire rated assembly. Include the corresponding UL system number, from the current UL Fire Resistant Directory that was used to firestop the penetration.
5. After the project is completed, the Record Drawings shall be delivered to the Architect for inclusion into Operating and Maintenance Manuals, as a permanent record of the installation as constructed.

B. Operating and Maintenance Manual (OMM)

1. Furnish complete bound sets of Operating and Maintenance Manuals. Refer to Division 1 Specifications for quantities and for additional requirements.
2. Each OMM shall be assembled into one book.
3. Bind the required material into a hard-backed binder where they can be accommodated into 8-1/2" x 11" size. Material shall be assembled as follows, unless otherwise directed in Division 1 Specifications:
 - a. First Page --- Title of Project, Owner, Address, Date of Submittal, Name of Contractor and Name of Engineer, including contact information, phone number and email addresses.
 - b. Second Page --- Index
 - c. First Section --- Written description of system contents including where actually located in building, how each part functions individually, and how system works as a whole. Conclude with a list of items requiring service and either state the service needed or refer to the Manufacturer's data in the binder that describes the proper service.
 - d. Second Section --- A copy of each shop drawing and catalog data sheet with an index at the beginning of the section.

- e. Third Section --- A copy of each Manufacturer's operating and maintenance instructions with an index at the beginning of the section, and a copy of each Manufacturer's start up report.
 - f. Fourth Section --- A copy of each wiring diagram utilized in the installation.
 - g. Fifth Section --- A copy of all test results, in chart form, performed by the Contractor.
 - h. Sixth Section --- Copies of all warranties, approvals, etc.
 - i. Seventh Section --- Owner training sign-in sheets and a copy of all digitally recorded training sessions.
 - j. Eighth Section – Record Drawings.
 - k. Ninth Section – A list of attic stock furnished for the project.
 - l. [Tenth Section – Certificates of destruction of PCB contaminated materials as identified in the Technology Demolition Section.]
 - m. An index shall be included at the beginning of each individual section.
4. Once submittals are completed, provide an OMM index to the Engineer for review. Once index is approved, submit an electronic copy of the OMM to the Engineer for acceptance. If any sections are incomplete, include section title tab and a page describing what is missing. After acceptance, submit the required quantity of final hard copies to the Architect for delivery to the Owner. If data is missing from final copies, a page shall be inserted into the front of the OMM listing what is missing and a date when the data will be available for insertion into the OMM.
 5. After acceptance, information contained within the OMM shall be transferred onto a portable memory device and delivered with the OMM. Data shall be in .pdf format and shall utilize interactive index tabs. In addition, a portable memory device shall be delivered to the Engineer.

1.14 SITE REPORTS AND PUNCHLISTS

- A. The Engineer may visit the site periodically during construction and provide written Construction Observation Reports to the Contractor identifying areas where installation does not meet the intent of the Contract Documents. The Contractor shall provide a written response to these reports within 5 business days, indicating the reason the installation is out of compliance with the Contract Documents. After review, the Engineer may or may not require the Contractor to correct the installation.
- B. Final Punch List
 1. The Engineer will visit the site to perform a scheduled Final Punch List to identify areas where the installation is incomplete or does not meet the intent

of the Contract Documents.

2. If the Engineer is requested to perform the Final Punch List, prior to the Contractor being 100% complete with their scope of work, the Contractor shall furnish a Contractor's Completion List, indicating all incomplete work. This list shall be furnished to the Engineer a minimum of 24 hours prior to the scheduled Final Punch List.
3. The Contractor shall respond to each punch list item along with a date, indicating that the item has been completed or corrected.
4. The Engineer is not responsible for visiting the site to verify that punch list items are completed or corrected.
5. A copy of the Final Punch List with the Contractor's responses shall be included on the Operation and Maintenance Manual.

1.15 CONTRACTOR QUALIFICATIONS

- A. The Contractor shall be fully qualified to perform installations as described on the Contract Drawings and within these Specifications. The following qualifications apply to all Low Voltage Systems, unless otherwise specified in the individual Specification Section.
- B. The Contractor shall have been active in bidding, being awarded, and performing work consistent with that which is indicated on the Contract Documents for a period not less than five (5) years.
- C. The Contractor shall possess current certifications by the manufacturer for the installation and maintenance of all systems being provided.
- D. The Contractor shall possess current BICSI certifications for the installation and maintenance of all Structured Cabling and associated equipment being provided.
- E. The Contractor shall maintain an installation staff whose sole function is the installation of Structured Cabling and associated equipment and shall not utilize additional personnel obtained by means of a temporary placement or staffing agency.
- F. The Contractor shall not utilize apprentice or trainee personnel for the pulling or termination of Structured Cabling. Furthermore, apprentices or trainees may only assist in the pulling of Structured Cabling. The primary laborer for the pulling of Structured Cabling must be a certified installer.
- G. All installation personnel assigned to the task of pulling or terminating cabling shall possess a current certification by BICSI and/or the manufacturer of the cabling products being installed.
- H. The Contractor's installation staff shall consist of 85% certified installation personnel. The remaining shall be either apprentice installation personnel or laborers under full time employment by the Contractor. Of the certified staff, 40% shall be Journeymen/BICSI Installers. The remainder shall be BICSI Level I or

Level II Installers. The Engineer reserves the right to wave these requirements.

- I. The Contractor shall have a dedicated RCDD assigned to the project, as Project Manager, who shall be the sole point of contact for the Engineer or Owner. The RCDD/Project Manager shall provide regular project updates to the Engineer as to percentage of job completed broken down by category of work, for example, horizontal cabling, backbone copper, backbone fiber, system A, system B, etc., the status of any unforeseen circumstances, and/or changes to the project design necessitated by field conditions.
- J. The Contractor shall, with bid qualification, submit the following information for review.
 1. An unaltered copy of the Project Manager's RCDD Certificate.
 2. An unaltered copy of the Contractor's certification by the respective structured cabling manufacturer for the installation, testing and warranty of the materials being installed.
 3. Unaltered copies of any and all other certifications required herein, including, but not limited to data network electronics, telephone system, audio/visual systems, etc.
 4. A list of sub-contractors with key contact information and all certification information as described elsewhere in these Specifications.
 5. A list of assumptions and or exceptions utilized while compiling the Bid submission.
 6. A list of projects of similar size and scope that the Contractor has completed in the last two years.

1.16 FIELD ENGINEERING AND PROJECT MANAGEMENT

- A. It shall be the responsibility of the Contractor to provide all cable path engineering required by unforeseen field conditions.
- B. The Contractor shall inform the Engineer as to changes in design required by field conditions, as soon as possible, prior to installation. Arbitrary changes in the design is unacceptable, and shall be reworked to the extent of removal and re-installation based on the original design, unless pre-approved in writing by the Engineer, or proven necessary due to the unforeseen field conditions.
- C. Other Technology Systems Contractors, whose systems will utilize the Structured Cabling System, shall certify the design of the structured cabling system according to the specifications of the equipment being installed.
- D. Prior to installation, the Contractor shall verify this certification with the Other Technology Systems Contractors, and inform the Engineer immediately of any disparity in the design. Should the installation prove unable to support a given system, and the system vendor has not signed off on the cabling design, the cost of any required rework of the cabling installation shall become the responsibility

of the Contractor and the Vendor to resolve at no additional cost to the Owner.

- E. Additional engineering, diagrams, records, and project management shall be provided as described elsewhere in the Specifications. Diagrams and records shall be coordinated to avoid duplication of efforts and to consolidate documentation.
- F. It shall be the responsibility of the Contractor to identify and notify the Engineer immediately of any issues causing the cabling and/or equipment to be installed in such a way as to cause that part of the installation to be in violation of the accepted standards and practices governing these types of installations. Failure to do so shall place the burden of the necessary repairs on to the Contractor.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL

- A. ALL equipment and materials used on this project shall be new and UL Listed for the intended application. Where possible, the same brand or manufacturer shall be used for each type of material or equipment.
- B. Equipment and materials for the construction shall be the responsibility of the Contractor and shall be protected by same until formally accepted by the Owner
- C. All manufacturers of technology infrastructure and equipment shall verify to the satisfaction of the Contractor and Engineer that their equipment will function properly under the conditions of use, as shown on the Drawings and as specified herein. Dimensions, weights, operating characteristics and all other related appurtenances, shall be verified before submittal of shop drawings.
- D. Domestic steel shall be used for all steel products as required by the (Ohio Revised Code, Chapter 153). (Pennsylvania Steel Products Procurement Act).

2.2 MATERIAL SUBSTITUTIONS

- A. Bids shall be based upon the specified products, suppliers or listed alternatives. The Drawings and Specifications are based on the products specified by type, model, size and suppliers if indicated and thus establish minimum qualities which substitutes must meet to qualify for review.
- B. Should the Contractor propose to furnish materials, equipment and/or suppliers other than those specified, submit a written request for substitutions to the Architect or Engineer in accordance with Division 1 requirements. The request shall be an alternate to the original bid and shall be accompanied with complete descriptive (manufacturer, brand name, catalog number, supplier name and references, etc.) and technical data for all items. Indicate any additions or deductions to the base bid price.
- C. Where listed alternatives, substitutions or equipment manufacturers (other than the basis of design) alter the design or space requirements indicated on the Drawings, the Contractor shall be responsible for the revised design and construction including cost of all associated trades involved.

- D. Acceptance or rejection of the proposed substitutions shall be subject to approval of the Architect or Engineer. If requested, the Contractor shall submit inspection samples of both the specified and the proposed substitute items for review.
- E. In all cases where substitutions are permitted, the Contractor shall bear any and all extra cost of evaluating the equality of the material and equipment to be installed.
- F. Where only one Manufacturer or supplier is named in the Contract Documents, the system or equipment shall be provided as specified.
- G. Verbal requests or approvals of substitutions shall not be binding on the Architect, Engineer or Owner.

PART 3 - EXECUTION

3.1 SAFETY

- A. The Contractor shall follow all safety requirements as defined herein, as described in Division 1, and as defined by Owner safety protocols.
- B. Work shall be performed on de-energized equipment in accordance with NFPA 70E.
- C. Should hazardous materials be encountered, Contractor shall adhere to procedures, methods and regulations of the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) and immediately notify Owner.

3.2 COORDINATION

- A. Consult the Contract Documents and Submittals pertaining to the work for other trades. Review the field layouts for all trades and make adjustments accordingly in laying out the Division 27 and 28 work.
- B. Examine the work of all other trades when it comes in contact with, or is covered by, work in this Division. Do not attach to, cover up, or finish against any defective work, or install work in a manner which will prevent proper installation of the work of other trades. Contractor shall be responsible for the costs of adjustments required.
- C. Take all field measurements necessary and assume responsibility for the accuracy.
- D. Install work that is to be concealed within the building construction in sufficient time to secure proper location without delay to the Work of other trades.
- E. Assume responsibility for location of chases, other openings through masonry and concrete construction. When work cannot be installed concurrent with building construction, arrange for rough-in boxes, sleeves, inserts and other items, as necessary for installation thereof at a later date.

- F. If any work is installed such that the architectural design cannot be adhered to, Contractor is responsible for cost of making such changes as Architect may require. Before installing work, report any interference between work of this Division and work of other Divisions to Architect as soon as discovered. Architect will determine which work must be relocated, or make adjustments to maintain clearances, maximum headroom and to avoid conflict with other work.
- G. Become familiar with the construction where work attaches. Review Structural Drawings for coordination of openings. Cut no structural members or slabs without Architect's written approval.
- H. Exercise caution when working in areas where concealed systems or materials may exist. Any costs for repair of damage incurred shall be the responsibility of Contractor causing the damage.

3.3 PROTECTION

- A. When setting up for fiber optic splicing or installing connectors, provide collection system glass particles.
- B. Protect finished surfaces from paint droppings, insulation adhesive, etc. by use of drop cloths.
- C. Cost of correcting any such condition will be charged against the respective Contractor.
- D. All finished surfaces shall be protected from damage and spills during construction.
 - 1. Protect finished floors with a heavy duty flexible fiber reinforced floor protection board – Ram Board or equal.
 - 2. When setting up pipe cutting and threading machines, protect area against staining and abrasion.
 - 3. Protect finished surfaces from chips and cutting oil by use of a chip receiving pan and oil proof cover.
- E. Cost of correcting any such condition will be charged against the respective Contractor.

3.4 PRODUCT HANDLING

- A. Pay all costs for transportation of materials, equipment to job site.
- B. Provide all scaffolding, tackle, hoists, rigging necessary for placing electrical materials and equipment in their proper place. Scaffolding, hoisting equipment: comply with applicable Federal, State, and Local regulations. Remove temporary work when no longer required.
- C. Arrange for packaging of equipment, which must be hoisted, so that there will be no damage or distortion caused by hoisting operation.

- D. Store Electrical equipment, etc., in a dry location and protect all Electrical equipment from dirt and moisture until the building is ready to receive them.
- E. Coordinate location of stored items with other trades. Where necessary, store materials and equipment on movable carts so they may be moved when interfering with the work of other trades.

3.5 CUTTING AND PATCHING

- A. All cutting and patching in construction as necessary for installation of this work shall be the responsibility of this Division and performed by the Tradesmen related to that specific Division of Work. Subcontract this work to the appropriate Trade Division.
- B. Do not cut any structural member, including but not limited to steel framing and structural floors, without specific permission from the Architect and Structural Engineer.
- C. Do not cut openings in roof or floor construction without specific permission from the Architect and Structural Engineer. Existing roof warranty must be maintained.
- D. Where locations of penetrations are inaccurate or where building components are improperly cut by inadequate methods, the Contractor in error shall be responsible for complete repair.
- E. The Contractor shall assume responsibility for removing and replacing existing ceiling tiles as required for installation of all work. Areas include that as outlined by the project scope and areas outside the scope where the Contractor is required to make connections to existing systems and install new work. Damaged tiles shall be replaced.

3.6 DAMAGE AND EMERGENCY REPAIRS

- A. Assume responsibility for any damage to new and existing building components caused by work provided as part of Contract Documents. Repair all damage without extra cost to Owner.
- B. Owner reserves the right to make emergency repairs as required to keep equipment in operation, without voiding Contractor's guarantee or relieving him of responsibility during warranty period.
- C. Restore building components, etc., to their original condition whenever this work causes damage.

3.7 CLEANING

- A. At all times keep premises and building in neat and orderly condition, follow explicitly any instructions in regard to storing of materials, protective measures and disposing of debris.
- B. After all tests and adjustments have been completed, clean all equipment leaving

everything in working order at the completion of this work. Clean all equipment of dirt, dust, grease, oil, debris and paint, after all other trades have completed their work.

- C. All debris created by the execution of this work shall be removed as directed by the Architect or Owner.
- D. Upon completion of work remove all tools, equipment and surplus materials.

3.8 PAINTING

- A. Finish painting is included under Division 9 - Finishes, except where specifically called for in Basic Materials and Methods.
- B. Materials and equipment installed under this Division shall be left free from dirt, grease and foreign matter, ready for painting.
- C. No equipment or conduits shall be field painted before being connected or terminated. Where in-field painting occurs, insure components required for continuation of grounding systems are protected from paint until connected and installed.
- D. Damaged surfaces of prefinished materials and equipment shall be touch-up painted to match the existing finish.
- E. Under no circumstance shall any open cabling be painted.

3.9 SERVICE SHUTDOWNS

- A. This project involves remodeling of existing areas in an operating facility. Plan work including alterations and connections to existing facilities, to permit carrying on normal building functions. When necessary to temporarily interrupt a service, shutdowns shall be scheduled through the Owner and shall be done at a time as directed by the Owner. No additional compensation shall be allowed for these shutdown periods even though premium time work may be required unless specifically defined in Division 1.
- B. Provide temporary service to equipment or systems that cannot be shut down, and as determined by Owner, or as described in the Contract Documents. Remove temporary services when permanent work is completed.
- C. Provide a minimum of one week's notice to the Owner before any service shutdown is scheduled.

3.10 INDOOR AIR QUALITY

- A. All occupied areas of building shall remain free from odors, fumes, dust and smoke generated from installation of material and equipment.
- B. Arrange with building Owner to schedule isolation of areas where paints, adhesives, solvents, etc., will be used. Areas shall remain isolated until all materials have cured sufficiently as to stop out-gassing of fumes or odors and

area has been ventilated to remove all detectable traces of odors and fumes.

- C. Provide temporary partitions and air seals to prevent the migration of airborne contaminants from unoccupied areas to occupied areas.
- D. Provide temporary ventilation and/or filtration systems of sufficient size and quantity to ensure complete removal of all odors, fumes, and airborne contaminants generated. Maintain 25 feet clearance from all temporary exhaust outlets to all active building outdoor air intakes.
- E. Arrange with Owner to override the HVAC system control of night setback functions to assist with ventilation of building.
- F. Comply with SMACNA guideline "IAQ Guidelines for Occupied Buildings Under Construction" Second Edition – 2007.

END OF SECTION

SECTION 27 02 00 – TECHNOLOGY DEMOLITION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Technology General Provisions
- B. Technology Pathway Hardware
- C. Technology Firestopping

1.2 WORK INCLUDES

- A. Technology equipment indicated on the Demolition Drawings is shown to indicate the extent of demolition only, and is not intended to be a record drawing of the existing conditions. The Drawings and Specifications establish the minimum standards for workmanship and materials.
 - 1. If additional interpretation is required regarding the scope of demolition intent, contact the Engineer prior to bid.
- B. Include all labor, materials, equipment, services, and permits necessary for completion of the demolition work.
- C. Provide protection for all adjacent areas before, during and after execution of the demolition work.
- D. “Technology equipment” as used in this section shall refer to cabinets, racks, patch panels, punch down blocks, faceplates, outlet boxes, cabling and all other technology system devices.
- E. Comply with all the rules and regulations of local and state Authorities Having Jurisdiction, including applicable OSHA safety requirements.
- F. Visit the site and become familiar with conditions affecting the demolition work. No additional compensation shall be approved on claims that arise from a lack of knowledge of the existing conditions.
- G. Normal building functions shall be maintained during the demolition work. Coordinate the day and time of any temporary building system interruptions with the Owner. Additional compensation shall not be approved for premium time effort.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide materials and equipment for completion of the demolition work as described within the Specifications and on the Drawings.

- B. Materials and equipment shall be new and U.L. labeled for the application.

PART 3 - EXECUTION

3.1 TECHNOLOGY DEMOLITION WORK

- A. The Contractor shall remove and/or relocate all of the existing technology work made necessary because of project alterations as indicated or implied on the Contract Documents of all trades. All existing technology equipment and systems not affected by these changes shall remain and shall be protected whether shown on the Drawings or not. The Contractor shall maintain existing cabling continuity as described in the Specifications and on the Drawings, or as required for continued operation of the technology equipment and systems.
- B. Demolition Work under this Contract shall be accomplished by the Contractor in complete accordance with the Construction Procedure and Progress Schedule specified under Division 1. Proposal shall include any special phasing requirements related to demolition work as described in the Division 1 Specifications.
- C. Where required, re-support existing cabling above ceilings being removed. Remove cabling from equipment to be removed complete to the source. All rework of this nature shall be completed in compliance to current standards and practices.
- D. Where systems are interrupted because of the demolition work, Contractor shall reroute or relocate, modify and reconnect to provide a continuous system.
- E. All cutting, patching, finishing, etc., for removed and relocated technology equipment shall be included as part of the Technology Work. All holes and damage caused by the demolition work shall be properly patched with suitable materials to match existing construction. Patching shall be performed by the qualified trade.
- F. Where devices or conduits are removed from fire or smoke rated construction, penetrations shall be patched to match existing ratings with suitable materials to match existing construction. Patching shall be performed by the qualified trade.
- G. Existing technology equipment shown as being reused or relocated shall be carefully removed, stored on the premises, and refurbished before reinstallation.
- H. All equipment to be salvaged by the Owner shall be carefully removed and stored on site by the Contractor for salvage by the Owner. All other materials, equipment and debris shall become the property of the Contractor and shall be removed from the site.
- I. Where existing technology equipment is indicated on the Drawings to remain, the existing cabling shall be removed and replaced with new remain, unless otherwise shown or noted on the Drawings.
- J. The Contractor shall be responsible for the complete removal of all abandoned

cabling as required by the National Electrical Code.

- K. The Contractor shall remove and reinstall existing ceiling tiles in areas outside the scope of demolition work as required to complete the demolition work outlined within these Specifications or indicated on the Demolition Drawings. Damaged tiles shall be replaced.
- L. Consult the Drawings covering the work of all other trades, as well as the respective Contractors field layouts, and tick trace or utilize ground penetrating radar technology all concrete slabs being removed to identify the exact location of concealed electrical conduits. All conflicts shall be brought to the attention of the Architect and Engineer prior to the beginning of slab removal. Rework or reroute existing conduits and feeders as directed by the Engineer.

3.2 SERVICE DEMOLITION WORK

- A. Coordinate service outages with the Service Provider(s).
- B. Maintain existing technology systems in service until the new systems are complete and ready for service. Disable the systems only to make cut overs and connections. All shutdowns shall be performed as premium time work and all shutdowns shall be scheduled with the Owner. A minimum of a one week notice shall be given prior to any service shutdown. No additional compensation shall be allowed for these shutdown periods.

END OF SECTION

SECTION 27 03 00 – CABLING SYSTEMS ADMINISTRATION

PART 1 - GENERAL

1.1 WORK INCLUDES

Cabling and Equipment Labeling
Installation Documentation

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Technology General Provisions
- B. Technology Pathway Hardware
- C. Structured Cabling System

1.3 DESCRIPTION OF WORK

- A. All work shall be in compliance to TIA/EIA 606.
- B. The Contractor shall compile all documentation required under this Section, both hard copy and electronic, and include the information in the Operating / Maintenance Manuals.
- C. All electronic documentation shall be recorded onto a MS Windows readable CD. All files contained on the CD shall be in the native format of the software in which it was generated, as well as a plain text format. A copy of any viewing software shall be made available at no additional cost to the Owner and shall also be recorded onto the CD, or be recorded onto additional CD's as required.
- D. Review and coordinate cabling and equipment labeling system with Owner.

PART 2 - PRODUCTS

2.1 TAPE BASED LABELS

- A. All tape-based products shall be manufactured for the purpose of identifying flexible communications cabling.

2.2 PLACARDS

- A. All placards shall be constructed of a laminated polyvinyl process, and shall be engraved. All placards shall be black with white letters unless otherwise noted.

PART 3 - EXECUTION

3.1 LABELING

- A. Work Area Floor Plans
 - 1. Each Technology Room shall contain a lexan covered copy of the floor plan(s) associated with the work area outlets serviced by the Technology

Room.

2. The size of the plans shall be equal to the size of the Contract Drawings, unless Contract Drawings exceed 30" x 42", in which case half size prints are to be utilized.
3. The plans shall be affixed by means of compression between the lexan cover and the backboard to which it is mounted. The Contractor shall make provisions to assure that the plans cannot accidentally fall from behind the lexan.
4. For cross connect locations that are smaller than TIA standard locations, half size plans shall be permitted.
5. The Contractor shall utilize the final set of Record Drawings when providing these plans.

B. Backbone Risers

1. Each Technology Room shall contain a lexan covered copy of the riser diagram(s) associated with the backbone cabling serviced by the Technology Room.
2. The size of the plans shall be equal to the size of the Contract Drawings, unless Contract Drawings exceed 30" x 42", in which case half size prints are to be utilized.
3. The plans shall be affixed by means of compression between the lexan cover and the backboard to which it is mounted. The Contractor shall make provisions to assure that the plans cannot accidentally fall from behind the lexan.
4. For cross-connect locations that are smaller than TIA standard locations, half-size plans shall be permitted.
5. For locations that are serviced by wall mounted enclosures in shared spaces with other trades, the Contractor shall provide a laminated 8 ½" x 11" plan of only the riser diagram and basic title block information. The laminated copy shall be attached in a semi-permanent fashion to the enclosure.
6. The Contractor shall utilize the final set of Record Drawings when providing these plans.

C. General Labeling Requirements

1. The Contractor shall label all cables, faceplates, cabling enclosures, patch panels, termination blocks, equipment enclosures, racks and related hardware.
2. All labels shall be permanently attached, and shall be constructed of materials so as to assure the lifespan of the identification marker to be equal or greater than that of the device being identified.

3. The identification tag or placard shall be self-adhering or attached by means of a permanent adhesive listed for the application, or other permanent mechanical means.
4. All means of identification shall be visible and clearly identifiable by personnel in charge of maintaining the cabling infrastructure.
5. All labels shall be machine generated onto adhesive labels or tags, or engraved on plastic laminated placards. Use of "P Touch" tape or other domestic/light duty type of label is unacceptable.
6. All laminated placards shall have a black field with white letters, unless otherwise noted.

D. Faceplate Labeling

1. All faceplates shall be labeled with the Technology Room and Faceplate Number.
2. The faceplate number shall be derived based on the room in which the faceplate is located and a sequential number. For example, TR01-138-01, where TR01 is the Telecommunications Room, 138 is the room number of the location of the faceplate and 01 indicates that this is the first faceplate in the room.
3. The label shall be permanently affixed to the faceplate in a location specifically engineered by the manufacturer to contain such information, or shall be neatly engraved directly on the faceplate and painted to facilitate easy recognition of the information.
4. The individual jack positions shall be identified with sequential letters, either by means of a pre-manufactured engraving or molding, or by installation of a machine generated label installed in a location specifically designed to hold such a label.

E. 110 Block Labeling

1. All 110 blocks shall be labeled as to the identity of the punch down block.
2. The punch down block identification shall be derived based on the Telecommunications Space in which it is mounted and a sequential letter. For example, TR01-PDB03, where TR01 is the Telecommunications Room and PDB03 indicates that this is the third punch down block in the TR.
3. Should the punch down block be rack mounted, the label shall include the rack number and punch down block sequential number? For example, TR01A-PB03, where TR01A is the Rack ID and PB03 indicates that this is the third punch down block in the rack.
4. The label shall be installed in a space provided by the manufacturer for this purpose. If no space is provisioned, the Contractor shall provide a plastic laminate placard to be installed immediately to the side of the block. All

placards shall be installed in a consistent fashion on the same side of the block in a location that is easily viewed, but in close enough proximity so as to be easily associated with the appropriate device.

5. All ports shall be labeled with the ID of the faceplate terminated at that port, and the associated jack letter from the faceplate.

F. Patch Panel Labeling

1. All patch panels shall be labeled as to the identity of the patch panel.
2. The patch panel identification shall be derived based on the rack in which it is mounted and a sequential letter. For example, TR01A-PP03, where TR01A is the rack ID and PP03 indicates that this is the third patch panel in the rack.
3. The label shall be installed in the space provided by the manufacturer for this purpose. If no space is provisioned, the Contractor shall provide a laminated placard that shall be engraved with the identification of the patch panel, and shall be mounted in the upper right corner of the patch panel, but shall not block the proper installation of the patch panel.
4. All ports shall be labeled with the ID of the faceplate terminated at that port, and the associated jack letter from the faceplate.

G. Fiber Patch Panel Labeling

1. All fiber patch panels shall be labeled as to the identity of the fiber patch panel. The label shall be made of plastic laminate and attached at the lowest right corner visible from eye level.
2. The fiber patch panel identification shall be derived based on the rack in which it is mounted and a sequential letter. For example, TR01A-FP01, where TR01A is the rack ID and FP01 indicates that this is the first fiber patch panel in the rack.
3. All directory labeling shall be machine generated.
4. All panel directories shall be completed and/or updated.
5. All panel directories shall indicate the source and destination of the cable route.

H. Rack Labeling

1. All racks shall be labeled as to the identity indicated on the Drawings. The label shall be made of plastic laminate and attached at the center of the front top rail of the rack and shall be visible from eye level.

I. UTP Cable Labeling

1. All UTP cables shall be marked at both ends of the cable jacket, at approximately 2" from the end of the sheath, with a self adhesive label.

2. The label shall have the exact location of the point of service (the TR, rack or block ID and port) as well as the exact work area identification (faceplate ID and port letter), at both the work area and cross-connect locations.

J. Fiber Optic Cable Labeling

1. All Fiber Optic cabling and innerduct that is exposed shall be identified with a pre-printed tag stating "WARNING FIBER OPTIC CABLE". At least one label shall be utilized in all equipment rooms, cross-connect locations, closets, pull boxes, etc. All labels shall be readily visible by any personnel working in the area.
2. All fiber Optic cabling shall be labeled at both ends at approximately 2" from end of sheath, with a self adhesive label.
3. The label shall have the exact location of the point of service (the TR and fiber enclosure ID), for both the source and destination.

K. UTP Backbone Cable Labeling

1. All UTP Backbone cabling shall be marked, at both ends, with the exact source and destination information (Telecommunications Space ID, rack, patch panel and ports, or punch down block ID and ports). Each label shall be approximately 2" from the end of the sheath.

L. Pullboxes

1. All Pullboxes shall be labeled by the Contractor both internal to the pullbox, and visibly on the cover plate with laminated placards.
2. The identification shall be derived from the room or corridor number and a sequential letter, and shall be identified with the word "TECHNOLOGY". For example: PB113-02, where 113 is the corridor number and 02 indicates that it is the second pullbox in that corridor.

M. Conduits and boxes

1. All Conduits, with the exception of work area outlet conduits, shall be tagged by means of a brass tag permanently affixed to the conduit at each end. The tag shall indicate the source Telecommunications Space on the first line, and the final destination Telecommunications Space on the last line. If the conduit route utilizes pullboxes the tag shall also include the ID of the next pullbox in the route, engraved on the second line of the tag.
2. Backboxes used for work area outlets shall have the locations of the stub legibly written in permanent magic marker inside the backbox.
3. Conduit stubs for work area outlets not contained within the same room as the backbox it serves, shall be legibly marked by means of a permanent marker on the exterior of the stub as to the location of the backbox.

N. Grounding System Labeling

1. Each Busbar shall be labeled with the following information:
 - a. Busbar name
 - b. Source of ground
 - c. Room being serviced
 - d. Standard warning
2. Refer to Specification Section 27 07 00 for details.

3.2 DOCUMENTATION

- A. As stated elsewhere in these Specifications, it is the responsibility of the Contractor to maintain as set of Record Drawings and to provide Operating and Maintenance Manuals. In addition, all electronic design documentation shall be corrected to reflect "as-built" conditions, including all spreadsheets and/or databases utilized for labeling and testing. Such documentation shall be turned over to the Owner in the original format without additional compensation to the Contractor, including, but not limited to, all spreadsheets, databases, text files and proprietary file formats from the various testing instruments.

END OF SECTION

SECTION 27 04 00 – TECHNOLOGY PATHWAY HARDWARE

PART 1 - GENERAL

1.1 WORK INCLUDES

Technology Conduits and Boxes

Telecommunications Backboards

Surface Mounted Raceways

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Technology General Provisions

B. Cabling Systems Administration

C. Structured Cabling System

1.3 DESCRIPTION OF WORK

A. Technology Conduits and Boxes shall refer to all Low Voltage Systems specified within the Technology Specifications. All requirements of this Section shall apply unless specifically noted otherwise in the individual Specification Sections.

B. Pathways shall be installed as indicated on the Drawings and shall meet applicable local and national codes and regulations.

C. Grounding and bonding of pathways shall comply with applicable codes and regulations, in addition to any requirements indicated in these Specifications.

D. Pathways shall not have exposed sharp edges or other surfaces that could cause damage or otherwise cause substandard installation that may come into contact with the Structured Cabling System.

E. The number of cables placed in a pathway has been designed specifically for the installation documented on the Drawings. Deviation from this design is unacceptable. If unforeseen circumstances arise, requiring the redistribution or addition of cabling not previously accounted for in the design, the Contractor shall either contact the Engineer for written approval of this modification or have the RCDD managing the Contractor's efforts implement a solution based on documented standards, and governing local codes and regulations. If the RCDD managing the Contractor's efforts deviates from the designed installation, the RCDD must inform the Engineer immediately. The Engineer shall retain final dispensation as to the appropriateness of the modification. The Contractor shall not exceed the manufacturer's specifications, nor shall the geometric shape of a cable be affected.

F. Elevator shafts shall not be used as pathways.

G. All cabling routed in an open architecture or in a non-continuous pathway shall

utilize appropriately sized J-hooks, or other approved means. The maximum spacing between two consecutive J-hooks shall be 60". The maximum fill capacity of any J-hook regardless of size is fifty 4 pair UTP cables.

- H. Bridle rings are not permitted.
- I. All pathways installed under the scope of this Contract, whether for routing of cable, future use or spare, shall have an appropriately sized pull string, rope or wire installed. Each end of the string, rope or wire shall be fastened in such a fashion so as to assure its availability in the future, and shall be tagged with the location of the other end.
- J. Technology cable trays, cable runways and other communications pathways are for the exclusive use of the low voltage communications cabling, including voice, data, video, security, paging, nurse call and telemetry. Fire alarm, lighting control and building automation cabling is prohibited in Technology Pathways.

PART 2 - PRODUCTS

2.1 TECHNOLOGY CONDUITS AND BOXES

- A. The Electrical Contractor shall furnish and install all conduit, boxes, miscellaneous fittings and materials for a complete raceway system installation. All work shall be installed in accordance with the requirements of EIA/TIA-569, BICSI's Telecommunications Distribution Methods Manual (TDMM) when applicable, and as indicated on the Drawings.
- B. All conduits shall be a minimum of 1" and shall utilize UL Listed hardware designed for use with the conduit and boxes provided. Conduit runs shall not contain more than (2) 90 degree turns prior to termination unless conduit size is increased to the next grade size. Conduit shall not exceed (3) 90 degree turns regardless of size.
- C. Conduit runs shall not exceed 100 feet without utilizing a pullbox sized per table 4.14 of the TDMM.
- D. All conduits shall be reamed smooth to prevent accidental damage to the cables, and have a non-metallic bushing installed.
- E. All conduits stubbed into an open area shall extend 3" from the finished surface.
- F. The Contractor shall coordinate the type and arrangement of receptacles and outlets prior to the installation of any electrical work. The Contractor shall notify the Engineer if discrepancies are found.
- G. Any work installed that must later be relocated as a result of the Contractor's negligence in coordinating such requirements shall be done as directed by the Engineer at no additional cost to the Owner.
- H. Outlet boxes shall be 4 inches square with single gang plaster rings, unless otherwise noted. Blank coverplates shall be provided for boxes as indicated on the Drawings as being for rough-in only.

- I. Mounting heights shall be as indicated on the Drawings.
- J. Support systems for cable trays and cable runways shall not be center hung, unless otherwise noted on the Contract Documents.

2.2 TELECOMMUNICATIONS BACKBOARDS

- A. Telecommunications Backboards shall be provided as shown on the Drawings, and shall be 4' wide x 8' high x 3/4 " thick AC plywood, painted with (2) coats of fire retardant gray paint on both sides prior to installation.
- B. Backboards shall be mounted flush with the finished floor with the blemish free side facing the user, unless otherwise noted on the Drawings.
- C. The receptacles shown on the boards shall be mounted at 18 inches above the finished floor, unless otherwise noted, and shall be installed in surface mounted outlet boxes with stamped, sheet metal cover plates.
- D. Connecting hardware, including splice connectors and support components, shall be furnished by the manufacturer. Hardware required to maintain a continuous ground along the entire length of the tray shall be supplied by the manufacturer, and installed by the Electrical Contractor.

2.3 SURFACE MOUNTED RACEWAYS

- A. Surface Mounted Raceways for technology cabling shall be provided as specified on the Drawings. Both the metallic and non-metallic products shall be UL Listed for their intended use and shall be provided complete with all fittings, barriers, covers and mounting accessories as recommended by the manufacturer.
- B. Raceways shall be sized to provide space for technology cabling in accordance with the National Electrical Code and the manufacturer's recommended fill capacity.

PART 3 - EXECUTION

3.1 TECHNOLOGY CONDUITS AND BOXES

- A. All conduits required for Technology outlets as shown on the Drawings shall be installed complete with pullwires.
- B. Provide conduit from each outlet up to the nearest accessible corridor ceiling space, cable tray or other area as indicated on the Drawings, and provide an insulated bushing at each stub.
- C. Contractor shall protect cabling from all sharp or rough edges or points.

3.2 CABLE TRAYS AND RUNWAYS

- A. Provide straight sections, curved sections, hangers, support rods, clamps, related fittings and mounting accessories as recommended by the system supplier. Conflicts shall be brought to the attention of the Architect and Engineer for resolution.

- B. Standard support systems shall consist of wall mounting, trapeze mounting, and under floor mounting hardware – as described on the Drawings. Trapeze systems must be supported from each side of the cable tray or runway. Center support systems are prohibited.
- C. The Drawings indicate intended routings. Contractor shall provide horizontal and vertical transitions as required to suit field conditions in order to meet routing requirements. Any deviation from the indicated route, either due to field conditions or coordination issues, must be brought to the attention of the Technology Engineer immediately, as these may affect the design of the pathway and the subsequent cable routing. Any unapproved routing of cable tray and runways not brought to the attention of the Engineer, causing such an outcome shall be corrected, and the responsibility for this correction shall be borne by the Contractor.
- D. Provide a minimum of 12” clearance above and both sides of all cable tray sections from the finished structure of any device or equipment installed or routed above the cable tray.
- E. The Contractor shall coordinate these clearances and the routing of the cable tray with all other trades prior to installation, and monitor the installation of the other trades during the progress of the project. The Contractor shall hold all other trades accountable to this coordination. Any deviation by other trades to this coordination effort shall be brought to the immediate attention of the GC or CM for immediate resolution.
- F. Installation shall comply with Article 392 of the National Electrical Code. Ground cable trays that support electrical conductors as required for conductor enclosures in Article 250 of the National Electrical Code. Cable tray and runway used as equipment grounding conductors shall be provided with bonding jumpers between sections, raceways, and equipment. Support of cable trays and runways shall meet NEMA Class 10A, at 6 foot support spans to support 50 pounds/foot (safety factor 1.5). The required method of mounting shall be trapeze with strut, using two 1/2” threaded rods with sections directly supported by and clamped to the strut.
- G. Shop Drawings shall include product data, and layout drawings (1/16" scale minimum) indicating intended routings.
- H. Contractor shall protect cabling from all sharp or rough edges or points.

3.3 SURFACE MOUNTED RACEWAYS

- A. Surface Mounted Raceways for technology cabling shall be provided where shown on the Drawings. For other locations, permission must be obtained for the Architect as described elsewhere in the section. Conductor fill shall comply with the National Electrical Code, the latest published revisions of the TDMM and with the manufacturer’s guidelines.
 - 1. If possible, transitions from conduit shall occur above ceilings.
 - 2. Raceways shall be mechanically fastened to the walls or ceilings. Adhesive

mounting is not permitted.

3. Cabling shall be properly supported in the raceways. Sectional barriers shall be provided between power and communication wiring.
- B. All Surface Mounted Raceways shall be installed in an orderly manner as directed by the Architect.
- C. Contractor shall protect cabling from all sharp or rough edges or points.

END OF SECTION

SECTION 27 06 00 – TECHNOLOGY FIRESTOPPING

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. This Section includes, but is not limited to, furnishing and installing firestopping for fire rated construction in the following areas:
 - 1. All openings in fire rated floors and wall assemblies accommodating penetrating items such as cables, conduits, raceways, cable trays, etc.
 - 2. Openings at each floor level in shafts or stairwells.
 - 3. Empty openings in fire rated construction made by the Contractor but not utilized for the above mentioned materials.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Technology General Provisions
- B. Cabling Systems Administration
- C. Technology Pathway Hardware
- D. Structured Cabling System

1.3 QUALITY ASSURANCE

- A. General
 - 1. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings required by local building code and as tested by nationally accepted test agencies per ASTM E-184 or UL 1479 fire tests in a configuration that is representative of field conditions. The F rating must be a minimum of one (1) hour but not less than the fire resistance of the assembly being penetrated.
 - 2. Manufacturer's engineering judgments shall be accepted for non-standard applications or where no tested system exists. Drawings for engineering judgments must indicate the UL tested system or systems upon which the judgment is based, in order to evaluate the engineering judgment against a known performance.
 - 3. Firestopping material shall be non-halogenated, lead and asbestos free and shall not incorporate nor require the use of hazardous solvents.
 - 4. Firestop products that dissolve in water after curing are not acceptable.
 - 5. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.
 - 6. All firestopping materials shall be manufactured by one manufacturer (to the maximum extent possible).

7. Firestopping shall be performed by a Contractor trained or approved by the Firestop Manufacturer. (A manufacturer's willingness to sell its products to a contractor does not itself confer qualification on the buyer.)
8. The Contractor shall be responsible to properly replace firestop material in all existing wall and floor penetrations used as pathways for any cabling installed.

B. Manufacturer's Field Representative

1. The Manufacturer of the firestop material shall provide a qualified field representative at the site.

C. Codes and Standards

1. ASTM E 84
2. ASTM E 119
3. ASTM E 814
4. UL 263
5. NFPA 101 6-2.2.5 & 6-2.2.8
6. UL 1479
7. Ohio Building Code

D. Pre-Installation Conference

1. Contractor shall hold a pre-installation conference with representatives of the Architect, Contractor, Installer, Materials Manufacturer and various trades involved in the Work, to review conditions affecting the installation.

E. Conform to the manufacturer's printed instructions for installation in accordance with a U.L rated system or manufacturer's engineering judgment.

1.4 JOB MOCK-UP

- A. Prior to installation, install one of each type of seal using the same materials that will be used on the project.
- B. Obtain Architects acceptance.
- C. Approved mock-ups may be left in place as part of the finished project and will constitute the standard for remaining work.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in original unopened packages fully identified with the manufacturer's name, trade name and UL label.

1. Materials shall be stored off the ground and protected from environmental conditions as required by manufacturer.
2. All firestop materials shall be installed prior to expiration of shelf life.

1.6 PROJECT CONDITIONS

- A. Conform to the manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature requirements.

1.7 WARRANTY

- A. Contractor shall provide written certification that all firestopping was installed in accordance with the manufacturer's written instructions for UL tested assemblies and that all firestop systems installed meet the firestopping requirements as herein specified.

1.8 SEQUENCING

- A. Coordinate this Work as required with all other trades.
- B. Firestopping shall precede finishing of gypsum board.

1.9 PROTECTION

- A. Where firestopping is installed at locations which shall remain exposed in the completed work, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and protect as necessary against damage from other construction activities.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Firestopping materials shall meet the requirements specified herein.
- B. For applications where combustible penetrants are involved, i.e. plastic pipe, a suitable intumescent material shall be used.

2.2 ACCEPTABLE MANUFACTURERS

- A. Specified Technologies, Inc.
- B. Tremco, Inc.
- C. Nelson Firestop
- D. Hilti, Inc.
- E. 3M

2.3 MATERIALS

- A. Firestop Mortar

1. STI SpecSeal Mortar
 2. Tremco TREMstop-M
 3. Nelson CMP Firestop Compound
 4. Hilti CP637 Trowelable Firestop Compound
 5. 3M Fire Barrier Mortar
- B. Intumescent Firestop Sealants and Caulks
1. STI SpecSeal Sealant 100
 2. Tremco TREMstop-IA
 3. Nelson LBS Firestop Sealant
 4. Hilti FS One High Performance Intumescent Firestop
 5. 3M Fire Barrier CP25WB
- C. Elastomeric Firestop Sealants and Caulks
1. STI SpecSeal Pensil 300
 2. STI SpecSeal Elastomeric Sealant EC-100
 3. STI SpecSeal Elastomeric Spray AS-105
 4. Tremco Fyre Sil
 5. Tremco TREMstop Acrylic
 6. Nelson CLK Firestop Sealant
 7. Hilti CP604 Self-Leveling Firestop Sealant
 8. Hilti CP601S Elastomeric Firestop Sealant
 9. Hilti CP606 Flexible Firestop Sealant
 10. 3M Fire Barrier 1000, 1003 and 2000 Silicone Sealants
 11. 3M Firedam Spray 100
- D. Endothermic Firestop Sealants and Caulks
1. STI SpecSeal LC-150 or equal by Tremco, Nelson, Hilti or 3M.
- E. Firestop Putty
1. STI SpecSeal Firestop Putty Bars & Pads

2. Tremco TREMstop FP Flowable Putty
 3. Nelson FSP Firestop Putty
 4. Hilti CP617 + CP617L Firestop Putty Pad
 5. Hilti CP618 Firestop Putty Stick
 6. 3M Fire Barrier Moldable Putty
- F. Firestop Pillows/Blocks
1. STI SpecSeal Firestop Pillows
 2. Tremco TREMstop Firestop Pillows
 3. Nelson PLW Firestop Pillows
 4. Hilti FS657 Fire Block
 5. 3M Fire Barrier Pillows
- G. Firestop Collars
1. STI SpecSeal Firestop Collars
 2. Tremco TREMstop D Combustible Pipe Device
 3. Nelson PCS Plastic Pipe Choke System
 4. Hilti CP642 + CP643 Firestop Collars
 5. 3M Ultra Plastic Pipe Device
- H. Wrap Strips
1. STI SpecSeal Wrap Strip
 2. Tremco TREMstop-WS
 3. Nelson WRS Wrap Strip
 4. Hilti CP645 Wrap Strip
 5. 3M Fire Barrier FS-195 Wrap Strip
- I. Cast-in Place Devices
1. Hilti CP680 Cast-in Place Firestop device, or equal by STI, Tremco, Nelson or 3M.
- J. Firestop Foams
1. Hilti CP620 Fire Foam, or equal by STI, Tremco, Nelson or 3M.

K. Composite Sheets

1. 3M Fire Barrier CS-195 Composite Sheet or equal by STI, Tremco, Nelson or Hilti.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until the Contractor, in a manner acceptable to the Architect, has corrected unsatisfactory conditions.
- B. Verify that environmental conditions are safe and suitable for the installation of the firestop products.

3.2 CONDITIONS REQUIRING FIRESTOPPING

A. General

1. Provide firestopping for conditions specified elsewhere whether or not firestopping is indicated and, if indicated whether such material is designed as insulation, safing, or otherwise.
2. All firestopping shall be installed in accordance to the UL rated system designed for the application.
3. Insulation types specified in other sections shall not be installed in lieu of firestopping material specified.
4. Grout, Mortar or Gypsum based products shall not be installed in lieu of firestopping material specified.
5. All smoke walls (smoke barriers, smoke partitions, etc), rated or non-rated, shall be firestopped with systems designed to maintain a minimum 1 hour rating or that which is equal to the rating of the wall.

B. Penetrations – Provide firestopping:

1. Where penetrations including conduits, raceways, cables, cable trays or other equipment pass through one or both surfaces of a fire rated floor or wall.
2. Except for floor on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof.
3. Where a penetration occurs through fire rated walls or partitions of hollow-type construction, provide firestopping to completely fill spaces around the penetration, on each side of the wall or partition.
4. The requirements for penetrations shall apply whether or not sleeves have

been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall opening.

- C. Provide firestopping to fill miscellaneous voids and blank openings in fire rated construction where existing raceways, conduits, cables, cable trays or other equipment have been removed.

3.3 PREPARATION

- A. Surface to receive firestop shall be free of dirt, dust, grease, oil, oil from release agents, or other matter that would impair the bond of the firestop material to the substrate or penetrating items.
- B. Substrate shall be frost-free.

3.4 INSTALLATIONS

A. General

1. Sleeves and core-drilled holes shall be sized at least 1-1/2" larger in diameter than penetrating items.
2. Installation of firestops shall be performed by applicators/installers qualified and trained by the Manufacturer. Installation shall be performed in strict accordance with the Manufacturer's detailed installation procedures.
3. Apply firestops in strict accordance with UL rated system designs, and Manufacturer's recommendations.
4. Coordinate with plumbing, mechanical, electrical and other trades to assure that all conduits, raceways, cables, cable trays, and other equipment that penetrate fire rated construction have been permanently installed prior to installation of firestops. Schedule and sequence the work to assure that partitions and other construction that would conceal penetrations are not erected prior to the installation of firestop.
5. Gun grade sealants and putties shall be tooled into place to insure proper adhesion to penetrations and surrounding surfaces.

B. Dam Construction

1. Install dams when required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating.
2. Placement of dams shall not interfere with functions or adversely affect the appearance of adjacent construction.

C. Field Quality Control

1. Install work in full accordance with the rules, regulations, and safety requirements of Federal, State, County and City authorities having jurisdiction over premises. Do not construe this as relieving Contractor from

compliance with any requirements of the Specifications that are in excess of Code requirements and not in conflict therewith.

2. Correct unacceptable firestopping and provide additional inspection to verify compliance with this Specification at no additional cost.
3. Finish surfaces of firestopping that is to remain exposed in the completed work to a uniform and level condition.

3.5 SUBMITTALS

A. All submittals shall conform completely to the requirements of the Contract Documents.

B. Product Data

1. For each type of material to be installed, literature shall indicate product characteristics, typical uses, performance, test data and manufacturer's installation procedures.

C. Shop Drawings

1. Include U.L. rated system number and details for each type of penetration or configuration. Show typical installation details including:
 - a. Minimum and maximum allowable annular spacing
 - b. Base material composition
 - c. Firestop materials selected
 - d. Applied thickness required to achieve the hourly rating

END OF SECTION

SECTION 27 11 00 – STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDES

Copper Cabling
Work Area Outlets
Patch Panels

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Technology General Provisions
- B. Cabling Systems Administration
- C. Technology Pathway Hardware

1.3 QUALITY ASSURANCE

- A. All equipment shall be UL listed.
- B. All equipment and Installation Practices shall comply with the latest ASNI/NFPA-70 National Electric Code.
- C. All equipment Installation Practices shall comply with the Local Electric Code.
- D. All equipment shall comply with the latest ANSI-J-STD-607 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Standard.
- E. All equipment and Installation Practices shall comply with the latest BICSI Telecommunications Distribution Methods Manual (TDMM).
- F. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607, 862 standard.
- G. All connecting equipment shall be from the same manufacturer.

1.4 DESCRIPTION OF WORK

- A. The Structured Cabling System shall utilize a network of various cable types and configurations to support systems including, but not limited to, data and voice. Additional cable types may be required to meet various system requirements and shall be specified elsewhere. Changes in the quantity and/or types of cables required shall be documented and submitted to the Engineer for approval prior to installation.
- B. Cables and terminations shall be provided and located as shown, and in the quantities indicated on the Drawings.
- C. Fiber optic cables shall terminate on modular patch panels and/or in fiber

termination enclosures designed specifically for this purpose, and located in all demarcation and termination points shown on the Drawings.

- D. All cables and terminations shall be identified at all accessible locations, and at both ends. All cables shall terminate in an alphanumeric sequence at all termination locations as indicated in these Specifications.
- E. All copper cable terminations shall comply with and be tested to the latest revisions of TIA/EIA 568 standards for Category 3, Category 5e and/or Category 6 installations.
- F. Available and unused pairs between the Equipment Room (ER) and Horizontal Cross Connect(s) (HC) shall terminate and shall be identified as spare at each location and shall carry a unique sequentially numeric identifier at both ends. Station cables shall terminate on one, two or three gang wall plates equipped as shown on the Drawings.
- G. All cables installed through pathways that are installed underground or in concrete slabs in direct contact with soil shall be cables rated suitable for use in wet locations.
- H. Structured Cabling System
 - 1. The Structured Cabling System shall be installed as indicated on the Drawings. The system shall consist of the cabling and hardware required to extend an existing horizontal distribution system for Voice, Data, Card Access, Surveillance, etc., as indicated on the Drawings.
 - 2. The Structured Cabling System shall consist of the following components:
 - a. Work Area
 - 1) The Work Area consists of the Telecommunications Outlet (TO) terminated on the end of the horizontal cable and provides modular connectivity to a single point device.
 - 2) The Contractor shall provide any cabling required between devices to create a branch or bus for systems not utilizing the UTP horizontal distribution system.
 - 3) Unless otherwise indicated on the Drawings, it shall be the responsibility of the Contractor to properly terminate cabling to their respective devices. All cabling shall be 100% tested by the Contractor to assure specified performance.
 - 3. Horizontal Cabling
 - a. The Horizontal Cabling connects the Work Area to the HC. Any exceptions to the design of this cabling as detailed on the Drawings must be stated in writing and proven incompatible, or in violation of local codes or standards. It is imperative that the Structured Cabling System be installed as designed to create a fully operational system without any

restrictions, and to provide maximum flexibility for future use.

- b. All continuous pathways, such as conduit, cable tray, raceway, etc., required to support the cabling shall be provided by the Electrical Contractor.
- c. All non-continuous, or non-rigid pathways, such as J-hooks, inner-duct, etc., required to support the cabling shall be provided by the Technology Contractor.

4. Cross Connect Hardware

- a. The Cross Connect Hardware shall link all of the subsystems together at the HC, Intermediate Cross Connect (IC), and/or the Main Cross Connect (MC) locations. The Cross Connect Hardware shall consist of termination blocks, patch panels, racks, labeling hardware, cross connect wire, and patch and equipment cables for providing circuit connections and identification. All components required for the cross connects and identification of this equipment shall be provided by the Contractor, and shall be electrically and performance compatible with the horizontal and backbone cabling to assure signal quality.

5. Administrative Documentation and Record Keeping

- a. All cable path and cross connect field-engineering changes and records required shall be provided by the Contractor and shall be subject to approval by the Engineer. In addition, all labeling for the cables, cross connect blocks, patch panels, outlets, etc. shall be provided and installed by the Contractor. Other Technology Systems Contractors shall be responsible for placing labels on the cables and equipment they provide.

PART 2 - PRODUCTS

2.1 EQUIVALENT PRODUCTS

- A. Only products listed as approved shall be utilized. Substitutions, under normal circumstances, shall not be allowed. However, in unusual cases, substitutions may be unavoidable. All requests for product substitutions must be approved by the Engineer prior to the bid submission. Loss of certification by the Contractor, or unavailability of product to the Contractor that is not of a market wide nature, shall not be construed as an unavoidable circumstance. The request for product substitution and supporting documentation must be submitted, in writing, along with any samples requested by the Engineer. Written approval for product substitution must be submitted with the bid.

2.2 OUTLETS

A. Faceplates

- 1. Contractor shall provide all faceplates, including blank faceplates.
- 2. All Faceplates shall be available in single, duplex, triplex, quadplex, or

sixplex arrangements in a single gang configuration.

3. Faceplates shall be available in eightplex arrangements in a two-gang configuration.
4. Surface mount boxes shall be available in single, dual, quad, sixplex and twelveplex configuration.
5. Contractor shall coordinate faceplate type and color with the Architect and/or Owner. Coordinate with color of other electrical devices in area, if possible.

B. Outlets for Voice and Data

1. Technology outlets shall consist of one, two or three gang outlet box faceplates equipped with 8-pin modular jacks, utilizing EIA/TIA-T568B wiring. All outlet cabling shall terminate on IDC type termination blocks at their associated HC, unless otherwise indicated in the Contract Documents.

C. Category 6 Outlets

1. All Category 6 Outlets shall meet or exceed Category 6 transmission requirements for connecting hardware, as specified in the most recent revisions of TIA/EIA 568, and related addenda, regarding the Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section, and have readily available numeric test results from ETL for passive model testing and TOLLY for active model testing.
2. The Category 6 outlets shall be capable of being installed on a modular patching faceplate, or as a modular Telecommunication Outlet (TO), supporting all current and future applications designed to run on Category 6 outlets.
3. The Category 6 outlets shall be capable of being installed at either a 45° or a 90° angle in any modular faceplate, frame, or surface mounted box provided by the approved manufacturer, avoiding the need for special faceplates.
4. The Category 6 outlets shall be capable of greater than 750 insertions and 200 terminations.
5. Approved manufacturers:
 - a. Panduit
 - b. Ortronics
 - c. Leviton

2.3 HORIZONTAL DISTRIBUTION CABLE

A. Category 6 UTP, 4 Pair

1. Category 6 UTP, 4 Pair Horizontal Distribution Cables shall extend between the TO and the associated HC, shall consist of 4 pair, 24 gauge, UTP, and

shall terminate all conductors onto an 8 pin modular jack provided at each outlet.

2. Cable jacket shall comply with Article 800 of the NEC for use as a plenum or non-plenum cable as required by these Specifications and by the local authority having jurisdiction. The 4 pair UTP cable shall be UL Listed Type CMP (plenum) or CM (non-plenum).
3. For environments requiring CMP (plenum) rated cable, the cable jacket and the insulation of all individual conductors shall be of plenum rated materials.
4. The Category 6 UTP cable shall be a round cable design with fluting to maintain the appropriate pair spacing relationship. The cable shall support all current future applications designed to run on Category 6 cabling. Use of a bonded pair cable is expressly prohibited.
5. The Category 6 cable shall be specified to a minimum of 250 MHz.
6. Approved manufacturers
 - a. CommScope
 - b. BerkTek
 - c. Mohawk
 - d. General

2.4 UTP PATCH CABLES AND WORK AREA CABLES

1. The same company manufacturing the connectors supplied for the horizontal connectivity shall manufacture all UTP jumper cables.
2. The Contractor shall supply a quantity of patch cables equal to 150% of the horizontal cables terminated in each TR.
3. The Contractor shall supply a quantity of work area cables equal to 75% of the horizontal cables terminated at the work area TO.
4. Both patch cables and work area cables shall be divided evenly at 50% (1) meter, and 50% (3) meter, unless otherwise noted.

2.5 CROSS-CONNECTS

- A. For horizontal to backbone cross-connects, provide one cross-connect for every voice jack in the system.
- B. For intra-building to inter-building backbone cross connects, provide one cross-connect for each pair of inter-building cabling entering the building.
- C. For intermediate inter-building backbone points, provide one cross-connect for each pair of inter-building cabling.

- D. Contractor shall coordinate cross-connect color code requirements with Owner.
- E. Provide at one full spool of cross-connect wire for each color used as spare.
- F. Cross connect wire shall meet the following specifications:
 - 1. Conductors: 1-pair, 24 AWG solid bare annealed copper
 - 2. Insulation: Flame-retardant semi-rigid PVC
 - 3. Pairing: Four twists per foot minimum
 - 4. Compliances: UL and c(UL) Type CM, Category 3 compatible
- G. Approved manufacturers
 - 1. Superior Essex
 - 2. General
 - 3. Systimax
 - 4. Siemon

2.6 MODULAR PATCH PANELS

- A. The modular patch panels shall support the appropriate Category 5e and Category 6 applications, both current and future, designed for the associated connectivity solution.
- B. All modular patch panels shall be wired to EIA/TIA 568B.
- C. All modular patch panels shall have rear cable management support bar.
- D. Modular patch panels shall utilize IDC type connections for terminating horizontal cables, and be able to accommodate 23 AWG and/or 24 AWG cable conductors.
- E. Modular patch panels shall be capable of greater than 750 insertions and 200 terminations.
- F. Modular patch panels are limited to 24-port and/or 48-port configurations. 96-port patch panels are not permitted.
- G. Provide (1) 2U Horizontal Cable Manager for each patch panel. Horizontal cable manager shall have (5) 3.5 inch distribution rings.
- H. The modular patch panel shall be Underwriter's Laboratories (UL) listed, and ETL certified. All modular patch panels shall be UL listed Category 6.
- I. Approved manufacturers:
 - 1. Siemon
 - 2. Ortronics

3. Panduit
4. CommScope
5. Leviton

PART 3 - EXECUTION

3.1 INSTALLATION

A. Cable Routing

1. Where the Contractor is required to install non-continuous pathways for the Structured Cabling System, the Contractor shall keep hallway crossover to a minimum. Furthermore, non-continuous pathways shall be routed so as to follow logical paths parallel and perpendicular to the building structure. Diagonal pathways are prohibited, unless absolutely unavoidable, and approved by the Engineer.
2. Where duct, cable trays or conduit are not available, the Contractor shall bundle, in bundles of 50 or less, horizontal distribution wiring with Mille-ties or Velcro snug, but not deforming the cable geometry. Where cable bundles are to be supported by J-hooks, the J-hooks shall be attached to the building structure and framework per local codes and regulations at a maximum of five (5) foot intervals.
3. Cable support methods of binding cabling shall not be installed in such a fashion to as to bend, crimp or deform the cabling in any way so as to alter the electrical or transmission characteristics of the cabling.
4. Plenum rated Mille-ties or Velcro shall be used in all cable pathways and technology equipment rooms. Tywraps shall not be used.
5. All horizontal cables, regardless of media type, shall not exceed 90 m (295 ft) from the Telecommunications Outlets in the Work Area to the Horizontal Cross Connect.
6. The combined length of jumpers, or patch cords and equipment cables in the Telecommunications Space and the Work Area shall not exceed 10m (33 ft) unless used in conjunction with a multi-user Telecommunications Outlet.
7. A minimum of two horizontal cables shall be routed to each Work Area, unless otherwise noted on the Drawings. The exact compliment of cabling and terminations in any given Work Area is detailed on the Drawings.
8. Horizontal pathways shall be installed such that the minimum bending radius of the horizontal cables is kept within manufacturer specifications both during and after installation.
9. Telecommunications Pathways, spaces and metallic raceways, which run parallel with electric power or lighting cables or conduits, which is less than or equal to 480 Vrms, shall be installed with a minimum clearance of 50 mm (2 inches).

10. The installation of cabling shall maintain a minimum clearance of 3 m (10 ft) from power cables or conduits in excess of 480 Vrms.
11. No telecommunications cross connects shall be physically located within 6 m (20 ft) of electrical distribution panels, or step down transformers, which carry voltages in excess of 480 Vrms.
12. Each run of UTP/ScTP cable between the cross connect in the Telecommunications Room and the Telecommunications Outlet shall be continuous. Splicing of any cable is prohibited.
13. The Contractor shall provide all devices for routing the cabling as indicated on the Drawings, and as required by the manufacturer of the Structured Cabling System, so as to maintain the long-term health and operability of the Structured Cabling System.
14. Continuous conduit runs shall not exceed 30.5 m (100 ft) or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes, unless otherwise indicated in these Specifications or on the Drawings.
15. The Contractor shall verify the proper installation technique and sizing of the raceway system prior to installation of the cabling.
16. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national codes.
17. The number of horizontal cables placed in a cable support or pathway shall be limited to a number of cables that will not affect the geometric shape of the cables.
18. Maximum conduit pathway capacity shall not exceed a 40% fill with the exception of perimeter and furniture fill, which is limited to 60% fill for moves, adds and changes, unless otherwise noted on Drawings.
19. Horizontal distribution cables shall not be exposed in the Work Area or other locations with public access, unless otherwise noted on Drawings.
20. Cables routed in a suspended ceiling shall not be draped across the ceiling tiles. Cable supports shall be mounted a minimum of 75 mm (3 inches) above the ceiling grid supporting the tiles.
21. Each cable shall be run in a homerun configuration, and shall contain no bridges, taps or splices, except where required specifically by the manufacturer of a technology system, utilizing a dedicated cable run.
22. Cabling shall not be attached to any mechanical, electrical or technology system other than those specifically noted in the Contract Documents.
23. Cabling shall maintain clearance from Line Voltage cabling and devices at all times, and shall be spaced from these devices so as to comply with the TDMM, the NEC, and any other local codes or regulations.

B. Pulling Tension

1. The maximum pulling tension for all cables shall not exceed the respective manufacturer's specifications, or the limits as published in current edition of the TDMM.

C. Bending Radius

1. The Contractor shall adhere to the manufacturer's requirements and as indicated in the BICSI Telecommunications Distribution Methods Manual (TDMM) for bending radius and pulling tension of all data and voice cables. Where the manufacturer's specifications differ from those cited in the TDMM, the Contractor shall abide by the greater bending radius and the lesser pulling tension.
2. The minimum bending radius for any cable shall not exceed the respective manufacturer's specifications.
3. In spaces with UTP/ScTP cable terminations, the bending radius for all 4-pair cables shall not exceed four times (4x) the outside diameter of the cable and ten times (10x) the outside diameter of a multi-pair cable, unless this violates the manufacturer's specifications.
4. During the actual installation, the bending radius of a 4 pair cable shall not exceed eight times (8x) the outside diameter of the cable and ten times (10x) the outside diameter of a multi-pair cable, unless this violates the manufacturer's specifications.

D. Slack

1. In the Work Area, a minimum of 300 mm (12 inches) shall be left for UTP/ScTP, while 1 m (3 ft) shall be left for fiber cables.
2. In Telecommunications Spaces a minimum of 3 m (10 ft) of slack shall be left for all copper and fiber cable types. This slack shall be neatly managed on trays or other support types.

E. Special Requirements for Cable Routing and Installation

1. All cabling used throughout this project shall comply with the requirements as outlined in the National Electrical Code Articles 725, 760, 770, and 800 and the appropriate local codes. All copper cabling shall bear CMP (plenum rated), CM/CMR (riser rated) and/or appropriate markings for the environment in which they are installed. All fiber optic cabling shall bear OFNP (plenum rated), OFNR (riser rated) and/or appropriate markings for the environment in which they are installed.
2. The Contractor shall be responsible for the determination of the necessity of limited combustible, plenum, and/or non-plenum rated cabling, and shall be aware of any local codes regarding the use of these cable types.
3. Cables shall not be attached to or supported by fire sprinkler heads or delivery systems or any environmental sensor located in the ceiling space.

4. All outdoor rated inter-building fiber optic and copper cables shall transition to an indoor rated cable within fifty-feet (50') of entering a building. All indoor rated cabling shall meet the restrictions of the environment in which they are installed.

3.2 STRUCTURED CABLING SYSTEM TESTING

A. General

1. The Engineer retains the right to be present at any or all cable certification. The Contractor shall provide written notice 48 hours prior to the beginning of the certification process.
2. The Contractor shall provide a copy of the unaltered certification test reports to the Engineer in both hardcopy and electronic format. The Contractor shall also provide a copy of the associated Cable Tester's Database Management Software with unedited soft copy.
3. Independent System Certified testing may be required, at the discretion of the Engineer, provided at the expense of the Contractor, in the event of non-performance of the specified testing procedures, submittals and/or installation procedures. The extent and logistics of the independent testing shall be arranged by the Engineer.
4. The Engineer reserves the right to mandate re-termination or other reasonable rework to improve the performance of any cabling indicated as being a "marginal pass".

B. Copper Cabling

1. Upon completion of the cable installation, the Contractor shall perform complete copper cable certification tests on every cable, including but not limited to:
 - a. For Category 3 Cabling and higher:
 - 1) Wire Map
 - 2) Length
 - 3) Attenuation
 - 4) Near End Cross Talk (NEXT)
 - b. For Category 5 and higher, additional tests shall be:
 - 1) Equal Level Far End Cross Talk (ELFEXT)
 - 2) Propagation Delay and Delay Skew
 - 3) Return Loss
 - c. For Category 5e and higher, additional tests shall be:

- 1) Power Sum Cross Talk (PSNEXT and PSELFEXT)
- 2) Insertion Loss
2. Test shall be performed to published standards, including but not limited to, the latest revisions of EIA/TIA 568, ISO/IEC 11802 and other applicable standards at the time of installation.
3. All tests shall be performed with a certified Level IIe or III UTP/ScTP test device.
4. All UTP/ScTP field tester shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided to the Engineer for review prior to the start of testing.
5. New test leads and/or calibration of testing instruments shall be provided at the beginning of each project.
6. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.
7. Test settings from options provided in the field testers shall be compatible with the installed cable under test.
8. All proposed Category 5e channels are qualified for linear transmission performance up to 100 MHz to ensure that high frequency voltage phase and magnitude contributions do not prove cumulative or adversely affect channel performance.
9. All proposed Category 6 channels are qualified for linear transmission performance up to 250 MHz to ensure that high frequency voltage phase and magnitude contributions do not prove cumulative or adversely affect channel performance.
10. Category 3, UTP/ScTP horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the permanent link, and 100 m (328 ft) for the channel shall be 100 percent tested according to the latest revisions of ANSI/TIA/EIA-568, and all appropriate addenda. Test parameters include wire map plus ScTP shield continuity (when present), attenuation, length, NEXT (Near end crosstalk loss). NEXT testing shall be done in both directions.
11. All UTP/ScTP backbone cables exceeding 90 m (295 ft) or 100 m (328 ft) shall be 100 percent tested for continuity if applications assurance is not required.
12. Category 5e or higher, UTP/ScTP horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the basic link, and 100 m (328 ft) for the channel shall be 100 percent tested according to the latest revisions of ANSI/TIA/EIA-568, and all appropriate addenda. Test parameters include wire map plus ScTP shield continuity (when present), length, NEXT loss

(pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return Loss, attenuation, propagation delay, and delay skew. All UTP/ScTP backbone cables exceeding 90 m (295 ft) or 100 m (328 ft) shall be 100 percent tested for continuity if applications assurance is not required.

13. Category 3 and 5e or higher category backbone cables, that exceed 90 m (295 ft) or 100 m (328 ft), but less than 800 m (2, 624 ft) or 815 m (2, 674 ft), and applications warranty is desired, shall have 100 percent of the cables tested according to ISO/IEC Class A, B, or C.

3.3 SUBMITTALS

- A. Submittals shall include instructions for installation and maintenance, suitable for inclusion in the Operating and Maintenance Manuals.
- B. Submittals shall include descriptive literature for all cabling system components, connections, connectors and a comprehensive bill of materials. Highlight the specific part numbers/descriptive text of the materials to be provided.

3.4 PERFORMANCE AND WARRANTY

- A. The Contractor shall furnish and install all system cabling and components as required for a complete system as described elsewhere in these Specifications and as shown on the Drawings.
- B. The Contractor shall guarantee all material and installation labor to be free from defects for a period of two (2) years from the date of formal written acceptance by the Owner.
- C. System shall carry an industry standard, performance based warranty, by the manufacturer and contractor, for a period of at least 20 years on the horizontal cabling; including patch panels, patch cables, terminations and labor. The remaining portions of the system shall be warranted for a period of one (1) year from date of substantial completion.

3.5 RECORD DRAWINGS

- A. The Contractor shall submit to the Owner as a condition of final payment and acceptance a single reproducible set of Record Drawings exactly as the System was installed with all cable numbers designated on the Drawings.

END OF SECTION

1 SECTION 321314 - PERVIOUS CONCRETE PAVEMENT WITH DETENTION

2
3
4 PART 1 - GENERAL

5
6 RELATED DOCUMENTS:

7
8 Drawings and general provisions of the Contract, including AIA General Conditions and
9 Divisions 0 and 1 Specifications Sections, apply to this Section.

10
11 SCOPE OF WORK:

12
13 The Work described by this guide addresses the labor, materials and equipment necessary for
14 construction of pervious concrete, including subgrade testing and preparation for a stormwater
15 storage layer for temporary detention or groundwater recharge in conformance with the plans,
16 specifications and other contract documents, sidewalks and other pedestrian areas.

17
18 REFERENCES:

19
20 American Concrete Institute (ACI)

21
22 ACI 211.3R "Guide for Selecting Proportions for No- Slump Concrete"

23
24 ACI 305 "Hot Weather Concreting"

25
26 ACI 306 "Cold Weather Concreting"

27
28 ACI 522 "Report on Pervious Concrete"

29
30 ACI 522.1-13 "Specification for Pervious Concrete Pavement"

31
32 ACI Flatwork Finisher Certification Program

33
34 ACI Field Technician Certification Program

35
36 American Society for Testing and Materials (ASTM)

37
38 ASTM C 29 "Test for Bulk Density (Unit Weight) and Voids in Aggregate"

39
40 ASTM C 33 "Specification for Concrete Aggregates"

41
42 ASTM C 42 "Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of
43 Concrete"

44
45 ASTM C 94 "Specification for Ready-Mixed Concrete"

46
47 ASTM C 117 "Test Method for Material Finer than 75- μ m (No. 200) Sieve in Mineral
48 Aggregates by Washing"

49
50 ASTM C 150 "Specification for Portland Cement"

1 ASTM C 172 "Practice for Sampling Freshly Mixed Concrete"
2
3 ASTM C 260 "Specification for Air-Entraining Admixtures for Concrete"
4
5 ASTM C 494 "Specification for Chemical Admixtures for Concrete"
6
7 ASTM C 595 "Specification for Blended Hydraulic Cements"
8
9 ASTM C 618 "Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for
10 Use as a Mineral Admixture in Portland Cement Concrete"
11
12 ASTM C 979 "Specification for Pigments for Integrally Colored Concrete"
13
14 ASTM C 989 "Specification for Ground Granulated Blast-Furnace Slag for Use in
15 Concrete and Mortars"
16
17 ASTM C 1077 "Practice for Laboratories Testing Concrete and Concrete Aggregates for
18 Use in Construction and Criteria for Laboratory Evaluation."
19
20 ASTM C 1116 "Specification for Fiber-Reinforced Concrete"
21
22 ASTM C 1542 "Standard Test Method for Measuring Length of Concrete Cores"
23
24 ASTM C 1602 "Specification for Mixing Water Used in the Production of Hydraulic
25 Cement Concrete"
26
27 ASTM C 1688 "Test Method for Density and Void Content of Freshly Mixed Pervious
28 Concrete"
29
30 ASTM C 1701 "Test Method for Infiltration Rate of In Place Pervious Concrete"
31
32 ASTM C 1754 "Standard Test Method for Density and Void Content of Hardened
33 Pervious Concrete"
34
35 ASTM D 448 "Classification for Sizes of Aggregate for Road and Bridge Construction"
36
37 ASTM D 1557 "Test Methods for Laboratory Compaction Characteristics of Soil Using
38 Modified Effort (56,000 ft-lbf/ft³)"
39
40 ASTM D 1751 "Specification for Preformed Expansion Joint Filler for Concrete Paving
41 and Structural Construction (Nonextruding and Resilient Bituminous Types)"
42
43 ASTM D 1752 "Specification for Preformed Sponge Rubber Cork and Recycled PVC
44 Expansion Joint Fillers for Concrete Paving and Structural Construction"
45
46 ASTM D 2434 "Test Method for Permeability of Granular Soils (Constant Head)"
47
48 ASTM D 3385 "Test Method for Infiltration Rate of Soils in Field Using Double-Ring
49 Infiltrometer"

1
2 ASTM D 3665 "Standard Practice for Random Sampling of Construction Materials"

3
4 ASTM D 5084 "Test Methods for Measurement of Hydraulic Conductivity of Saturated
5 Porous Materials Using a Flexible Wall Permeameter (Falling Head, Method C)"

6
7 ASTM D 5093 "Test Method for Field Measurement of Infiltration Rate Using a Double-
8 Ring Infiltrometer with a Sealed-Inner Ring"

9
10 ASTM D 6391 "Test Method for Field Measurement of Hydraulic Conductivity Limits of
11 Porous Materials Using Two Stages of Infiltration from a Borehole"

12
13 ASTM D7357 "Specification for Cellulose Fibers for Fiber-Reinforced Concrete"

14
15 ASTM E 329 "Specification for Agencies Engaged in the Testing and/or Inspection of
16 Materials Used in Construction"

17
18 National Ready Mixed Concrete Association (NRMCA)

19
20 NRMCA Pervious Concrete Contractor Certification

21
22 Ohio Aggregate & Industrial Minerals Association (OAIMA)

23
24 "Going Green with Rocks" Technical Guide for Void Percentages

25
26 State of Ohio Department of Transportation (ODOT) Construction and Material Specifications

27
28 Item 703.02 Aggregate for Portland Cement Concrete

29
30 Ohio Department of Natural Resources (ODNR), Division of Soil and Water Resources

31
32 Rainwater and Land Development Manual

33
34 Chapter 2 – Post Construction Stormwater Management Practices

35
36 QUALITY ASSURANCE:

37
38 Prospective Bidder/Contractors shall attend a pre-bid meeting where the pervious concrete
39 construction process will be described (see Section 1.08) by industry representatives from the
40 Ohio Ready Mixed Concrete Association/Ohio Concrete or other comparable entity.

41
42 Prior to award, the Bidder/Contractor shall submit evidence of two successful pervious concrete
43 projects, each greater than 1,000 ft², including but not limited to the following:

44
45 Project name and address, owner name and contact information

46
47 Fresh density (unit weight) and void content test results per ASTM C 1688 and, if
48 determined, in-place hardened density (unit weight) and void content of pervious
49 concrete mixture per ASTM C 1754.

1
2 This requirement may be waived by the Architect/Engineer provided the Bidder/Contractor
3 demonstrates successful experience in the concrete industry and constructs test panel(s) for
4 inspection and testing, per this section.

5
6 The Bidder/Contractor shall employ no less than one NRMCA certified Pervious Concrete
7 Craftsman who must be on site, overseeing each placement crew during all concrete
8 placement, or employ no less than three NRMCA certified Pervious Concrete Installers, who
9 shall be on site as members of each placement crew during all concrete placement, or employ
10 no less than five NRMCA certified Pervious Concrete Technicians, who shall be on site working
11 as members of each placement crew during all concrete placement unless otherwise specified.
12 The minimum number of certified individuals listed above must be present on each pervious
13 concrete placement including any test panel placements, and a certified individual must be in
14 charge of the placement crew and procedures.

15
16 If the placing contractor and concrete producer have insufficient experience with pervious
17 concrete (less than two successful projects), the placing contractor shall retain an experienced
18 consultant to monitor production, handling, and placement operations at the Contractor's
19 expense.

20
21 Qualifications of testing laboratories -The testing laboratory shall have its laboratory equipment
22 and procedures inspected at intervals not to exceed two (2) years by a qualified national
23 authority as evidence of its competence to perform the required tests and material designs.
24 Acceptable national authority will include the AASHTO Materials Reference Laboratory (AMRL)
25 and/or the Cement and Concrete Reference Laboratory (CCRL) as appropriate. In addition,
26 testing machines and equipment must be calibrated annually or more frequently by impartial
27 means using devices of accuracy traceable to the National Bureau of Standards.

28
29 Field tests of pervious concrete shall be performed by individuals certified as both an NRMCA
30 Certified Pervious Concrete Technician or equivalent and as an ACI Concrete Field Testing
31 Technician - Grade I. In fields other than those covered by the referenced ASTM standards, the
32 testing laboratory shall accept only those assignments which it is able to perform competently
33 by use of its own personnel and equipment. Any work to be subcontracted must be to
34 laboratories meeting the same criteria.

35
36 The testing laboratory shall have demonstrated its competence in the applicable fields for a
37 period of not less than three (3) years.

38
39 The inspection and testing services of the testing laboratory shall be under the direction of a full-
40 time employee registered as a professional engineer in the State of Ohio. He shall have a
41 minimum of five (5) years of professional engineering experience in inspection and testing of
42 concrete construction.

43
44 **SPECIAL EQUIPMENT:**

45
46 Pervious concrete requires specific equipment for compaction and jointing. The pervious
47 concrete pavement shall be jointed and compacted using the methods listed, or alternatives as
48 demonstrated and approved by the Architect/Engineer. For example, large installations may
49 warrant mechanized placement techniques.

1
2 Rolling compaction shall be achieved using a steel pipe roller or a motorized or
3 hydraulically actuated rotating tube screed that spans the width of the section placed
4 and exerts a vertical pressure of 10 psi to 30 psi on the concrete.

5
6 Plate compaction (for small areas) shall be achieved using a standard soil plate
7 compactor that has a base area of at least two square feet and exerts a minimum of 10
8 psi vertical pressure on the pavement surface (through a temporary cover of ¾ inch
9 plywood).

10
11 When contraction joints are created in pervious pavements, they may be constructed by
12 rolling, forming or sawing. Rolled joints shall be formed using a "pizza cutter roller" to
13 which a beveled fin with a minimum depth of ¼ the thickness of the slab has been
14 welded around the circumference of a steel roller.

15
16 **SUBMITTALS: ADMINISTRATIVE REQUIREMENTS FOR SUBMITTAL PROCEDURES**

17
18 Prior to commencement of the work the Contractor shall submit the following:

19
20 Concrete materials:

21
22 Proposed pervious concrete mixture proportions including all material weights, water-
23 cementitious ratio, absolute volumes including density (unit weight) and void content of
24 freshly mixed pervious concrete mixture as per ASTM C 1688. (The fresh density and
25 void content calculated from this procedure will differ from in-place density and void
26 content and is only used to check mixture proportion consistency.)

27
28 Aggregate type, source, grading, dry-rodded unit weight, percent passing number 4
29 sieve and void content.

30
31 Cement, supplementary cementitious materials, synthetic (polypropylene) fibers and
32 chemical admixture manufacturer certifications.

33
34 In-place hardened density (unit weight) and void content of proposed pervious concrete
35 mixture per ASTM C 1754 from previous work completed in the last 24 months, if tested,
36 when required by the Architect/Engineer. (The in-place density and void content
37 calculated from this procedure will differ from the fresh density and void content and is
38 only used for quality assurance.)

39
40 Aggregate base materials: Washed aggregate type, source, grading and void content (percent
41 porosity).

42
43 Qualifications: Evidence of qualifications listed under Quality Assurance.

44
45 Project details: Specific plans including a jointing plan, details, schedule, construction
46 procedures and quality control plan.

47
48 Subcontractors: List all materials suppliers, subcontractors and testing laboratories to be used
49 on the project.

1
2 TEST PANELS:
3

4 Prior to construction, test panel(s) shall be placed with the crew meeting the requirement of
5 NRMCA certified personnel per section 1.03 C. and approved by the Architect/Engineer. The
6 Architect/Engineer may waive this requirement based on Contractor qualifications. At
7 Contractor's option, test panels may be constructed on approved sections of project aggregate
8 detention (or groundwater recharge) layer.
9

10 Test panel(s) shall be constructed in accordance with the plans and specifications. Regardless
11 of qualification, the contractor is to place two (2) test panels, each approximately 225 ft² at the
12 required project thickness, consolidated, jointed and cured using materials, equipment, and
13 personnel proposed for the project, and on the same aggregate base proposed. This is to
14 demonstrate to the Architect/Engineer's satisfaction that the pervious concrete mixture as
15 submitted is validated and also to confirm that the Contractor's ability to place the mixture under
16 anticipated project conditions produces a satisfactory pavement intended for the site location
17 which can be quantitatively and qualitatively evaluated .
18

19 Test panel(s) cost and removal, if necessary, shall be included as a line item in the contract
20 proposal and contract. Test panels may be placed at any of the specified pervious concrete
21 pavement locations on the project or at another test site.
22

23 Quality: Test panels shall have acceptable surface finish, joint details, thickness, porosity and
24 curing procedures and shall comply with the testing and acceptance standards listed in the
25 Quality Control section of this specification. Test density and void content of fresh concrete for
26 the test panels in accordance with ASTM C 1688. Select three core locations per ASTM D 3665,
27 obtain hardened 4 inch diameter concrete cores from the test panels in accordance with ASTM
28 C 42 and determine individual core thicknesses in accordance with ASTM C 1542. Determine
29 the hardened densities (unit weights) and void contents in accordance with ASTM C 1754 when
30 the test panel is found satisfactory per below:
31

32 Satisfactory performance of the test panels shall be determined by:
33

34 Fresh concrete results:
35

36 Density (unit weight) plus or minus 5 lb/ft³ of the submitted fresh density (unit
37 weight) using ASTM C 1688 procedures.
38

39 Hardened concrete tolerances:
40

41 Average length of three (3) cores not less than 3/8 in. and not greater than 1.5 in.
42 of specified pavement thickness.
43

44 Length of any individual core not less than 3/4 in. of specified pavement thickness.
45

46 If test panels are found to be unsatisfactory, they shall be removed at the Contractor's expense
47 and disposed of in an approved landfill or recycling facility. If test panels are found to be
48 satisfactory, they may be left in-place and included in the completed work, at no additional cost
49 to the project. If accepted, use the average hardened density (unit weight) from the accepted

1 test panel(s) as a basis for acceptance of the remainder pavement when required by the
2 Architect/Engineer.

3
4 PROJECT CONDITIONS

5
6 Weather Limitations
7

8 The Contractor shall not place pervious concrete for pavement when the ambient
9 temperature is predicted by the National Weather Service Point Forecast for the jobsite
10 to be 40 °F (4 °C) or lower during the seven days following placement, unless otherwise
11 permitted in writing by the Architect/Engineer. Note: In cold weather the pervious
12 concrete is more susceptible to freezing because its porous nature prevents pervious
13 concrete from generating and retaining heat of hydration. Any freezing of the pavement
14 will likely result in damage. Construction should not be scheduled when there is a
15 chance for liquid precipitation or when a cold front with freezing temperatures is
16 expected. Due to rapid evaporation causing insufficient water for cement hydration, hot
17 water should not be used in batching pervious concrete mixtures. Besides protecting the
18 freshly placed concrete from freezing, the concrete must be maintained at a reasonably
19 warm temperature for the first 7 days to sustain hydration of cementitious materials.
20 Curing duration before opening to traffic may need to be extended in cold weather.)
21

22 The contractor shall not place pervious concrete for pavement when the ambient
23 temperature is predicted by the National Weather Service Point Forecast for the jobsite
24 to rise above 90 °F (32 °C) during placement, unless otherwise permitted in writing by
25 the Architect/Engineer. Extra measures may be required to assure that concrete
26 receives proper moist curing following placement.
27

28 Pervious concrete pavement shall not be placed on frozen coarse aggregate or
29 subgrade.
30

31 Evaporation control measures shall be applied from the time of discharge until the
32 pavement is covered with polyethylene sheeting to prevent moisture loss during
33 placement operations.
34

35 PRE-PAVING CONFERENCE
36

37 A pre-paving conference with the Architect/Engineer shall be held within one week prior to
38 beginning placing the pervious concrete. The Contractor shall have the pervious concrete
39 supplier, contracted testing agency, the foreman and the entire concrete crew that will form and
40 place the concrete in attendance at this meeting. A qualified representative from ORMCA/Ohio
41 Concrete shall also be in attendance for assistance.
42

43 As a guide for the meeting, the document Checklist for the Concrete Pre-Construction
44 Conference (available from the National Ready Mixed Concrete Association or the American
45 Society of Concrete Contractors) shall be used to review all requirements of the contract during
46 the meeting. Meeting emphasis shall be on how paving with pervious concrete differs from
47 paving with conventional concrete, maintaining moisture retention of fresh mixture, timing and
48 proper placement of cure sheeting, and securing of sheet throughout curing period (minimum
49 seven days).

1
2
3 PART 2 - PRODUCTS
4

5 STORMWATER DETENTION LAYER/GROUNDWATER RECHARGE LAYER
6

7 Testing to determine the subgrade soil infiltration rate shall be conducted by a qualified testing
8 laboratory, by either the field or laboratory methods listed below:
9

10 Field methods - ASTM D 3385, ASTM D 5093 or ASTM D 6391
11

12 Laboratory methods - ASTM D 5084 or ASTM D 2434.
13

14 The drawings have been prepared assuming the stormwater detention layer will be collected by
15 an underdrain system and discharged to the site's storm sewer system. A thin layer of
16 aggregate below the underdrain system will act as storage for the water quality volume. The
17 water quality volume will infiltrate the subgrade, assuming the infiltration rate is equal to or
18 greater than 0.1 in/hr. If the infiltration rate is less than 0.1 in/hr based on the subgrade testing,
19 the design will be revised and submitted to the contractor for review and any additional costs will
20 be negotiated and the contract price adjusted accordingly.
21

22 Coarse Aggregate for Stormwater Detention Layer shall be an open graded, clean coarse
23 aggregate, with a wash loss of no more than 5%, per ODOT Item 703.02, Table 703.02A.2, or
24 approved equal. A choker base course of aggregate meeting the same requirements above
25 shall be used also as the top layer to facilitate construction operations. Crushed, angular No. 57
26 stone is required to allow ready mix transit vehicle access and minimize rutting.
27

28 Impervious Liner: shall be 15 mil Stego Wrap or Permalon, PLY-X 150, or approved equal (for
29 stormwater detention).
30

31 Filter Fabric: shall be a nonwoven geotextile, Marafi 140N or Typar fabric, Style 3341, or
32 approved equal.
33

34 Under-drain Piping: Shall be perforated PVC plastic pipe, SDR 35, located per the plans.
35

36 Isolation (Expansion) Joint Material: Isolation joint material shall be full depth of pavement, ¼
37 inch or ½ inch Proflex Vinyl (Isolation) Expansion Joint by Oscoda Plastics, or equal, in
38 compliance with ASTM D 1751 or ASTM D 1752.
39

40 Curing Materials:
41

42 Polyethylene sheeting - The primary method of curing pervious concrete shall be the placement
43 of a waterproof covering, consisting of a minimum of 6 mil thick clear polyethylene sheeting.
44

45 Other moisture loss control - For prevention of moisture loss prior to the primary method of
46 curing:
47

48 Monomolecular film (evaporation retardant), SikaFilm by Sika Corporation, EucoBar by
49 Euclid Chemical Co., Confilm by BASF (Master Builders Technologies) or Catexol

1 Cimfilm by Axim Concrete Technologies, or approved equal, applied per manufacturer's
2 instructions.

3
4 Soybean oil sealer. Note: Soybean oil is recommended for added protection. It
5 reportedly reduces surface color markings from plastic sheeting, may enhance strength
6 and does not reduce porosity.

7
8 Fogging equipment designed to raise the relative humidity of the ambient air over the
9 slab and reduce evaporation to include fog nozzles that atomize water using air pressure
10 to create a fog blanket over the slab. Note: garden hose nozzles are not sufficient to
11 create fog and may wash paste off the aggregate.

12 13 PERVIOUS CONCRETE

14
15 Cement: Portland cement Type I, Type II or V conforming to ASTM C 150 or Portland cement
16 Type IP or IS conforming to ASTM C 595.

17 18 Supplementary Cementitious Materials:

19
20 Fly ash conforming to ASTM C 618

21
22 Ground Granulated Blast-Furnace Slag conforming to ASTM C 989

23 24 Admixtures:

25
26 Air entraining admixtures with ASTM C 260.

27
28 Chemical admixtures shall comply with ASTM C 494.

29
30 Mid-range water reducing admixtures (water reducers) Type A or High Range water
31 reducing admixtures Type F or G are permitted due to low water-cementitious ratios
32 specified for pervious concrete.

33
34 Extended set control admixtures (hydration stabilizers) meeting requirements of ASTM C
35 494 Type B Retarding or Type D Water Reducing/Retarding admixtures are
36 recommended to increase concrete placement time or to improve finishing operations.
37 Note: this stabilizer suspends cement hydration by forming a protective barrier around
38 the cementitious particles, which delays the particles initial set. If this mix heats up in the
39 truck a standard retarder will not prevent premature hydration where the stabilizer will.
40 Viscosity modifying admixtures (VMA's) are permitted to facilitate discharge of the
41 concrete from the truck and placement in the forms.

42
43 Superabsorbent Polymer (SAP). SAP is a crushed crystalline partial sodium salt of cross-linked
44 polypromancic acid rated at 2,000 times absorption for pure water.

45
46 Fiber Reinforcement: Synthetic fiber shall be in accordance to ASTM C 1116 Type III made of
47 polypropylene.

48 49 Aggregates for Pervious Concrete:

1
2 Coarse aggregate shall meet the size and grading requirements as defined in ASTM D 448 (or
3 Standard Sizes of Coarse Aggregate, Table 4, AASHTO Specifications, Part I, 13th Ed., 1982 or
4 later) and shall comply with ASTM C 33 and ODOT Item 703.02. Use No.67, No. 7, No. 8, No.
5 89 or No. 9 unless an alternate size is approved for use based on meeting the project
6 requirements. Data for proposed alternate material shall be submitted for approval per Section
7 1.05A of this guide. Fine aggregate complying with ASTM C33, if used, shall not exceed 3 ft³
8 per yd³.

9
10 Larger aggregate sizes may increase porosity but can decrease workability. No. 8 (3/8 in. or 9.5
11 mm) size coarse aggregate is the common size used in pervious concrete pavements. Well
12 graded aggregates shall be avoided as they may reduce porosity, and may not provide
13 adequate void content. Note: Suggested maximum limit when using a No. 8 coarse aggregate
14 pervious mix is 15% passing No. 4 sieve.

15
16 Suggested maximum limit for coarse aggregate of 15% passing No. 4 sieve.

17
18 For 5 to 10% passing No. 4 sieve, add 125 lb/yd³ fine aggregate.

19
20 For 0 to 5% passing No. 4 sieve, add 200 lb/yd³ fine aggregate.

21
22 Water: Water shall be potable and comply with ASTM C 1602.

23
24 Mixture Proportions: The Contractor shall furnish a proposed mix design with all proportions of
25 materials prior to commencement of work. The data shall include densities (unit weights) and
26 void contents determined in accordance with ASTM C 1688 for fresh mixed properties and,
27 when required by the Architect/Engineer, ASTM C 1754 for hardened concrete properties of the
28 same proposed mixture. The composition of the proposed concrete mixture shall be submitted
29 to the Architect/Engineer for review and/or approval and shall comply with the following
30 provisions unless an alternative composition is demonstrated to comply with the project
31 requirements. Mixture performance will be affected by properties of the particular materials
32 used. Trial mixtures must be tested to establish proper proportions and determine expected
33 behavior. Concrete producers may have mixture proportions for pervious concrete optimized for
34 performance with local materials by use of available software programs. Appendix 6 of ACI
35 211.3R provides a guide for pervious concrete mixture proportioning. General mixture
36 proportions are as follows:

37
38 Aggregate/cementitious ratio: Range of 4:1 to 5:1.

39
40 Concrete mixture unit weight: Range of 115 lb/ft³ to 135 lb/ft³

41
42 Concrete mixture void content: Range of 13% to 30%.

43
44 Cementitious content: range of 450 lbs/yd³ to 600 lb/yd³, total cementitious content.

45
46 Supplementary cementitious content: Fly ash: 25 % maximum; Slag: 25 % maximum, or
47 Combined supplementary cementitious content: 35 % maximum.

48
49 Water - cementitious ratio: range from 0.28 to 0.35.

1
2 Fiber Reinforcement is recommended for added performance:

3
4 Synthetic polypropylene, target 0.1% volume of mixture or range 1 lb/yd³ to 1.5
5 lb/yd³

6
7 Cellulose, range 1.5 lb/yd³ to 3 lb/yd³.

8
9 Macrosynthetic fibers, range per manufacturer's recommendation.

10
11 Aggregate content: The bulk volume of aggregate per cubic yard shall be 27 ft³ when
12 calculated from the dry rodded density (unit weight) determined in accordance with
13 ASTM C29 jigging or rodding procedure.

14
15 Admixtures: Admixtures shall be used in accordance with the manufacturer's instructions
16 and recommendations.

17
18 Air-entraining admixture is required and the recommended dosage shall be a
19 minimum of 2 oz/cwt (130 mL/100kg) of cementitious material.

20
21 Hydration stabilizing admixture suggested dosage range: 7 - 18 oz/cwt

22
23 Viscosity modifying admixture suggested dosage range: 0.5 – 1.0 gal/cy

24
25 Mix Water: The quantity of mixing water shall be established to produce a pervious
26 concrete mixture of the desirable workability to facilitate placing, compaction and
27 finishing to the desired surface characteristics. Note: Mix water shall be such that the
28 cement paste displays a wet metallic sheen without causing the paste to flow from the
29 aggregate. (A cement paste with a dull-dry appearance has insufficient mix water for
30 hydration.) Insufficient mix water results in inconsistency in the mix and poor bond
31 strength. Jobsite addition of mix water is permitted to adjust for dry mixtures in concrete
32 transit mixers; add water at 0.5 gal/cy and remix for two minutes. Note: High water
33 content results in the paste sealing the void system primarily at the bottom and poor
34 surface bond. Use of hot water is not permitted as mix water.

35
36
37 PART 3 - EXECUTION

38
39 The Architect/Engineer shall be notified at least 24 hours prior to all detention layer (or recharge
40 bed) placement and pervious concrete paving work. Careful consideration for the construction
41 sequence is prudent and, to the greatest extent possible, the surrounding earthwork/landscape
42 operations should be completed and stabilized prior to stormwater storage and pervious
43 concrete placements.

44
45 INSTALLATION

46
47 Stormwater Detention and Recharge Layer:

48
49 Subgrade Preparation (a flat subgrade is required for a recharge bed)

1
2 Existing subgrade under recharge bed areas shall NOT be compacted or subject
3 to excessive construction equipment traffic prior to coarse aggregate bed
4 placement.

5
6 Where erosion of subgrade has caused accumulation of fine materials and/or
7 surface ponding, this material shall be removed with light equipment and the
8 underlying soils scarified to a minimum depth of 8 in. with a York rake or
9 equivalent and light tractor.

10
11 Bring subgrade of coarse aggregate recharge bed to line, grade, and elevations
12 required.

13
14 Fill and lightly regrade any areas damaged by erosion, ponding, or traffic
15 compaction before the placing of coarse aggregate.

16
17 Recharge Bed Installation

18
19 Upon completion of subgrade preparation, the Architect/Engineer shall be
20 notified and shall inspect at his discretion before the contractor may proceed with
21 recharge bed installation.

22
23 Protect adjacent footings and foundations from stored stormwater by installation
24 of an impermeable membrane wall.

25
26 Filter fabric, with pipe or any other storage devices, and recharge bed aggregate
27 shall be placed immediately after approval of subgrade preparation. Any
28 accumulation of debris or sediment which has taken place after approval of
29 subgrade shall be removed prior to installation of filter fabric at the Contractor's
30 expense.

31
32 Place filter fabric in accordance with manufacturer's standards and
33 recommendations. Adjacent strips of filter fabric shall overlap a minimum of 16
34 inch. The contractor shall secure fabric at least 2 ft outside of bed and take steps
35 necessary to prevent any runoff or sediment from entering the storage bed. For
36 protection of existing adjacent building foundations, the contractor shall place
37 impervious liner over filter fabric extending 10 ft beyond toe of slope face at
38 building face, and secure as recommended by manufacturer.

39
40 Install coarse aggregate in 6 inch maximum lifts. Lightly compact each layer with
41 equipment, keeping equipment movement over storage bed subgrades to a
42 minimum. Install aggregate to grades required on the drawings.

43
44 If required, install a minimum 6 inch nominal thickness choker base course size
45 No. 57 (ODOT 703.01) aggregate evenly over surface of larger sized aggregate
46 bed, sufficient to allow placement of pavement, and notify the Architect/Engineer
47 for approval.

48
49 Following placement of bed aggregate, the filter fabric shall be folded back along

1 all bed edges to protect from sediment washout along bed edges. At least a 2 ft
2 strip shall be used to protect beds from adjacent bare soil. This edge strip shall
3 remain in place until all bare soils contiguous to beds are stabilized and
4 vegetated. In addition, hay bales shall be placed at the toe of slopes which may
5 be adjacent to beds to further prevent sediment from washing into beds during
6 site development. As the site is fully stabilized, excess filter fabric along the bed
7 edges can be cut back to coarse aggregate edge.
8

9 Pervious Concrete

10
11 Pervious Concrete Thickness: Pervious concrete thickness for all applications (excluding
12 heavy traffic loads) shall be single-course placement 4 inch thick unless otherwise
13 specified in the plans.
14

15 Formwork:

16
17 Form materials are permitted to be of wood or steel and shall be the full depth of
18 the pavement. Caution: protect impermeable membranes from puncture or tear
19 when placing forms and form pins. Forms shall be of sufficient strength and
20 stability to support mechanical equipment without deformation of plan profiles
21 following spreading, strike-off and compaction operations. Forms may have a
22 removable spacer of ½ in. to ¾ inch thickness placed above the depth of
23 pavement. The spacers shall be removed following placement and vibratory
24 strike-off to allow roller compaction. (Removable spacers may not be necessary if
25 other means of strike-off and consolidation are used, such as a hydraulically
26 actuated pipe roller screed.)
27

28 The Contractor will be restricted to pavement placement widths of a maximum of
29 20 ft., unless the Contractor can demonstrate competence to provide pavement
30 placement widths greater than the maximum specified to the satisfaction of the
31 Architect/Engineer. Large scale mechanized placement of pervious concrete with
32 slip-form concrete paving machines, laser screeds or asphalt paving machines
33 may preclude use of fixed forms.
34

35 Mixing and Hauling:

36
37 Production: Pervious concrete shall be manufactured and delivered in
38 accordance with ASTM C 94.
39

40 Mixing: Mixtures shall be produced in central mixers or in transit (truck) mixers.
41 When concrete is delivered in agitating or non-agitating units, the concrete shall
42 be mixed in the central mixer for a minimum of 1.0 minute or until a homogenous
43 mix is achieved. Concrete mixed in transit mixers shall be mixed at the speed
44 designated as mixing speed by the manufacturer for 75 - 100 revolutions.
45

46 Transportation: The pervious concrete mixture may be transported or mixed on
47 site and discharge of individual loads shall be completed within one (1) hour of
48 the introduction of mix water to the cement. Delivery times may be extended to
49 90 minutes when a hydration stabilizer is used.

1
2 Discharge: Each truckload shall be visually inspected for consistency of concrete
3 mixture. Water addition shall be permitted at the point of discharge to obtain the
4 required mix consistency, provided a measurable quantity is discharged, and
5 provided no more than half of the batch amount has been discharged. A
6 minimum of 30 revolutions at the manufacturer's designated mixing speed shall
7 be counted following the addition of any water to the mix, prior to further
8 discharge. Discharge shall be a continuous operation and shall be completed as
9 quickly as possible. Concrete shall be deposited as close to its final position as
10 practical and such that discharged concrete is incorporated into previously
11 placed plastic concrete. If consolidation occurs during concrete discharge,
12 placement shall be halted and wet concrete removed (this may happen towards
13 the end of some loads).

14
15 Placing and Finishing:

16
17 Prior to placing concrete, the surface of the aggregate detention layer (or
18 recharge bed) shall be soaked and in a wet condition at time of placement.
19 Failure to moisten the aggregate surface will result in a reduction in strength of
20 the pavement.

21
22 Concrete may be deposited into the forms by mixer truck chute, conveyor or
23 buggy.

24
25 Unless otherwise permitted, the Contractor shall utilize a mechanical vibratory
26 screed to strike off the concrete $\frac{1}{2}$ in. to $\frac{3}{4}$ inch above final height, utilizing the
27 form spacers described in Formwork. An alternative method to strike off and
28 compact the concrete is to use a hydraulically actuated pipe roller screed as
29 described under in this section. If approved by the Architect/Engineer in writing,
30 the Contractor may place the pervious concrete with either slip form or vibratory
31 form riding equipment with a following compactive unit that will provide a
32 minimum of 10 psi vertical force to the concrete. Similarly, strike off by hand
33 straightedge may be permitted for sidewalks and other small areas followed by
34 compaction.

35
36 Care must be taken to prevent closing the void structure of pervious concrete.
37 After mechanical or other approved strike-off and compaction operation, no other
38 finishing operation will be allowed. Internal vibration shall not be permitted. If
39 vibration, internal or surface applied, is used, it shall be shut off immediately
40 when forward progress is halted for any reason.

41
42 Placed concrete shall not be disturbed while in the plastic state. Low spots after
43 the screeding operation shall be over-filled for surface repair and either tamped
44 to desired elevation with hand tampers or passing the screed a second time to
45 correct the elevation.

46
47 Following strike-off, remove spacers and compact the concrete to the form level,
48 utilizing a steel roller, a plate compactor on plywood or other method approved
49 by the Architect/Engineer. Longitudinal rolling shall be followed immediately by

1 cross rolling and joint rolling (if specified). Care shall be taken during compaction
2 that sufficient compactive force is achieved without excessively working the
3 concrete surface that might result in sealing off the surface porosity. Rollers may
4 require cleaning and treatment to prevent aggregate pick-up during rolling
5 operations.
6

7 Hand tampers and an edging tool with ¼ inch radius shall be used to compact
8 the concrete along the slab edges immediately adjacent to the forms. After
9 compaction, inspection and surface repair, no further finishing shall be performed
10 on the concrete. Surface curing shall begin immediately.

11
12 The pervious concrete pavement shall be compacted to the required cross-
13 section and shall not deviate more than +/- 3/8 in. in 10 ft from profile grade.
14

15 Jointing
16

17 Joints in pervious pavements can be precluded at the option of the owner, who
18 may, instead, choose to accept or prefer the appearance of random cracking.
19

20 Although longer joint spacing's may control cracking, for conservative design,
21 contraction (control) joints shall be installed at regular intervals not to exceed 20
22 ft. slab length shall not exceed 1.25 times the width of the slab. Transverse
23 contraction joints shall be installed at ¼ the depth of the thickness of the
24 pavement. These joints can be installed in the plastic concrete or saw cut after
25 the concrete has hardened; in either case, careful attention is necessary to
26 prevent raveling.
27

28 Jointing plastic concrete: Joints installed in the plastic concrete may be
29 constructed utilizing a small rolling groover as described in the Special
30 Equipment section of this specification. When this option is used it shall be
31 performed immediately after roller compaction with one single pass and prior to
32 curing. Note: Improper use of the rolling groover may cause "de-consolidation" of
33 material within a 2-inch band along either side of the groove joint, and result in
34 raveling under traffic. Rollers may require cleaning and treatment to prevent
35 aggregate pick-up during rolling operations.
36

37 Jointing hardened concrete: Saw-cuts shall be made as soon as the pavement
38 has hardened sufficiently to prevent raveling and uncontrolled cracking. Note:
39 jointing of hardened concrete has successfully occurred after the seven day
40 minimum curing period with minimal to no uncontrolled cracks. Early entry
41 sawing occurs later with pervious concrete than with conventional concrete. For
42 either method, the curing cover shall be temporarily removed and the surface
43 kept misted to prevent moisture loss during sawing. Sawdust or slurry shall be
44 promptly removed to protect the pervious concrete pores. After sawing, the
45 curing cover shall be securely replaced for the remainder of the curing cycle.
46

47 Transverse construction joints: Transverse construction joints shall be installed
48 whenever placing is suspended for 30 minutes or whenever concrete is no longer
49 workable.

1
2 Isolation joints: Isolation joints shall be used when abutting fixed vertical
3 structures such as light pole bases, building foundations, etc.
4

5 Edging, using a tool with ¼ inch radius, and additional compaction with hand
6 tamping tools shall be performed along all form lines and along all isolation joints
7 and construction joints to reduce potential for raveling under traffic.
8

9 Curing:

10
11 Curing procedures shall begin immediately, no later than 10 minutes, from the
12 time the pervious concrete is discharged from the truck. Placing, finishing and
13 tooled jointing and edging must be completed within the 10-minute window from
14 discharge. The pavement surface shall be covered with a minimum of 6 mil thick
15 clear polyethylene sheet or other approved covering material. Prior to covering,
16 an evaporative reducer shall be sprayed above the surface when required due to
17 ambient conditions (high temperature, high wind, and low humidity). The cover
18 shall overlap all exposed edges and shall be secured (without using dirt or stone)
19 to prevent dislocation due to winds or adjacent traffic conditions. For additional
20 guidance on hot weather concreting, see ACI 305, and for cold weather
21 concreting see ACI 306.
22

23 Immediately after screeding, the surface shall be kept moist and evaporation
24 prevented using a spray applied curing compound and/or evaporation retarder
25 immediately after screeding. Note: The low water/cementitious ratio and high
26 amount of exposed surface of pervious concrete makes it especially susceptible
27 to drying out. Immediately after each transverse jointing the polyethylene sheet
28 curing shall be applied then cross rolling shall be performed.
29

30 The curing cover shall remain securely in place for a minimum of 7 days,
31 uninterrupted. No vehicular traffic shall be permitted on the pavement until curing
32 is complete (7 days) and no truck traffic shall be permitted for at least 14 days.
33 Pedestrian traffic may be permitted on the curing concrete after 24 hours. The
34 Architect/Engineer may permit earlier traffic opening times.
35

36 Sealing: When pervious concrete is produced with an integral color pigment, a UV
37 resistant, non-yellowing acrylic based sealer per ASTM C 309 shall be lightly broadcast
38 onto the cured pavement surface to brighten and highlight the color pigment without
39 clogging the surface pores of the pervious matrix and disrupting its permeability. Some
40 surface preparation may have to be conducted to prepare the sealer. Subsequent
41 applications of the sealer shall be a part of the maintenance plan and not included in this
42 contract.
43

44 Quality Control - Concrete:

45
46 The Owner shall employ a testing laboratory that conforms to the requirements of
47 ASTM E329 and ASTM C1077. All personnel engaged in concrete testing shall
48 be certified by the American Concrete Institute as ACI Concrete Field
49 Technicians or equivalent.

1
2 Traditional concrete testing procedures for strength and slump control are not
3 applicable to this type of pavement material. Procedures to be used per this
4 guide specification include: ASTM C 172, ASTM C 29, ASTM C 42, ASTM C
5 1688, and ASTM C 1754.

6
7 Concrete tests shall be performed for each 50 yd³ or fraction thereof with a
8 minimum of one set of tests for each day's placement.

9
10 Sampling - Plastic concrete shall be sampled in accordance with ASTM C 172.

11
12 Density (unit weight) - Density (unit weight) of the fresh concrete shall be
13 measured in accordance with ASTM C 1688. The density (unit weight) of the
14 delivered concrete shall be +/- 5 lb/ft³ of the submitted fresh density (unit weight).

15
16 When required by the Architect/Engineer, after a minimum of seven (7) days,
17 hardened concrete shall be tested at a rate of one set of three cores per 50 yd³ of
18 concrete placed on one day or fraction thereof. Select core locations per ASTM
19 D 3665, obtain hardened 4 inch diameter concrete cores in accordance with
20 ASTM C 42 and determine individual core thicknesses in accordance with ASTM
21 C 1542. Cores shall be taken at minimum 2 ft away from the edge of placement
22 to ensure a representative sample.

23
24 Thickness – Untrimmed hardened core samples shall be used to determine
25 placement thickness. The average length of three cores shall not be less than 3/8
26 inch and not greater than 1.5 inch of specified pavement thickness. Length of any
27 individual core shall not be less than 3/4 inch of specified pavement thickness.

28
29 Core density (unit weight) - The average hardened density (unit weight) of cores
30 trimmed from a lot and tested in the saturated condition, per ASTM C 1754 shall
31 be +/- 5% of the approved hardened density from the test panels.

32
33 Performance and Inspection/Maintenance:

34
35 Excessive raveling - At or before 28 days after placement, any areas of
36 excessive surface raveling, as determined by the Architect/Engineer, shall be
37 removed and replaced or repaired by the Contractor, at no additional cost to the
38 Owner.

39
40 Surface drainage - At or before 28 days after placement either the average
41 infiltration rate of multiple locations or the infiltration rate of a determined
42 localized area of the in-place pervious concrete shall be determined per ASTM C
43 1701. Any areas of insufficient surface porosity, as determined by the
44 Architect/Engineer, shall be removed and replaced by the Contractor at no
45 additional cost to the Owner.

46
47 Inspection/Maintenance - At or before 28 days after placement, the contractor
48 shall submit to the Architect/Engineer a written inspection/maintenance plan to
49 prevent the clogging of the pervious concrete pavement. The plan shall include

1 periodic testing of the infiltration rate per ASTM C1701 and methods to restore
2 porosity if the rate drops below 75% of the original determined rate. Acceptable
3 methods to restore levels of porosity are either to vacuum or vacuum with
4 simultaneous power wash the pervious concrete sections. Fee for preparation of
5 the inspection/maintenance plan shall be at no additional cost to the Owner.
6
7

8
9 END OF SECTION

