



East Windsor
CONNECTICUT

East Windsor Town Hall
11 Rye Street
Broad Brook, CT 06016

EAST WINDSOR COMMUNITY CENTER

Alterations & Additions Former
Scout Hall Youth Center
28 Abbe Road
East Windsor, Connecticut 06088

Project Manual

Revised 2 August 2023
20 September 2022
SJA Project No. 2021.33
Issued for Contract Documents

Stephen Jager, AIA

JAGER
ASSOCIATES LLC

4 Grand View Drive
Enfield, CT 06082
860.803.1265

**Town of East Windsor
EAST WINDSOR COMMUNITY CENTER ALTERATIONS
AND ADDITIONS**

28 Abbe Road
East Windsor, Connecticut 06088

Stephen Jager Associates, LLC

Architect No.: 2021.33

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EW COMMUNITY CENTER ALTERATIONS AND ADDITIONS | East Windsor, Connecticut
 Stephen Jager Associates | Project No.:
 2021.33 20 September 2022

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**EastWindsor
Community Center
Alterations and Additions
28 Abbe Road
East Windsor , Connecticut**

Jason Bowsza
First Selectman

Joseph Sauerhoefer
Deputy Director of Public Works

September 20, 2022

East Windsor
Community Center
Alterations and Additions
28 Abbe Road
East Windsor , Connecticut

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**East Windsor
Community Center
Alterations and Additions
28 Abbe Road
East Windsor, Connecticut**
Project Directory

OWNER:

Town of East Windsor

Jason Bowsza, First Selectman
11 Rye Street
Broad Brook, CT 06016
Phone: (860) 623-8122

Department of Public Works

Joe Sauerhofer, Deputy Director of Public Works
6 Woolam Road
East Windsor, CT 06088
Phone: (860) 883-4987

CONSULTANTS:

Civil Engineering and Land Surveying

J R Russo & Associates
1 Shoham Road
East Windsor, CT 06088
Phone: (860) 623-0569

Architect

Stephen Jager Associates LLC
4 Grand View Drive Enfield, CT
06082
Phone: (860) 803-1265

Structural Engineering

PVE - LLC
160 Trumbull Street, 3rd Floor
Hartford, CT 06103

Phone: (860) 522-3970

MEP Engineering

Acorn Consulting Engineers
244 Farms Village Road West
Simsbury, CT 06092 Phone:
(860) 651-1949

**INVITATION TO BID
Town of East Windsor
Community Center
Alterations and Additions**

28 Abbe Road East Windsor, Connecticut Sealed bids are invited and will be received by the Town of East Windsor, until 11:00 a.m., Thursday, November 16, 2023, at the Town Hall, 11 Rye Street, Broad Brook, Connecticut 06016 at which time and place the bids will be publicly opened and read aloud.

Proposals must be submitted on the forms provided and in a sealed envelope plainly marked with the appropriate title.

A mandatory pre-bid conference to review the project will be held at the Scott Hall Youth Center 28 Abbe Road, East Windsor, Connecticut, Thursday, October 19, 2023, at 10:00 a.m. All prospective bidders must attend.

A satisfactory Bid Bond or Certified Check, in an amount equal to five percent (5%) of the base bid, shall be submitted with each bid. The Bid Bond shall be made payable to the Town of East Windsor and shall be properly executed by the Bidder. A 100% Performance, Labor and Material Bond is also required. All sureties must be listed on the most recent IRS circular 570.

A Connecticut DOT permit is required for the work within the state ROW for Route 5.

The Information for Bidders, Form of Bid, Specifications, and other contract documents may be obtained or examined at the Town Hall, First Selectman Office, 11 Rye Street Broad Brook, Connecticut Monday through Wednesday 8:30 a.m. – 4:30 p.m., Thursday 8:30 a.m.- 7:00 p.m., Friday 8:30 a.m.- 1:00 p.m., Phone (860) 623-8122.

Bids, to receive consideration, must be in the hands of the authorized representative, no later than the day and hour mentioned above.

The Town of East Windsor reserves the right to accept or reject any or all bids; to waive any informalities, or to accept any bid deemed in the best interests of the Town of East Windsor.

All bids will be considered valid for a period of sixty (60) days.

AN AFFIRMATIVE ACTION/EQUAL OPPORTUNITY EMPLOYER
MBE's, WBE's, SBE's and SECTION 3 DESIGNATED ENTERPRISES
ARE ENCOURAGED TO APPLY

**Town of East Windsor
Community Center
Alterations and Additions
28 Abbe Road
East Windsor, Connecticut
Instructions to Bidders**

1. RECEIPT OF OPENING BIDS

Sealed bids are invited and will be received by the Town of East Windsor, until 11:00 a.m., Thursday, November 16, 2023 at the Town Hall, 11 Rye Street, Broad Brook, Connecticut 06016 at which time and place the bids will be publicly opened and read aloud.

Copies of contract documents may be obtained at Town Hall First Selectman office 11 Rye Street Broad Brook, CT Monday – Wednesday 8:30am – 4:30pm Thursday 8:30am-7:00pm, Friday 8:30am-1:00pm Phone (860) 623-8122.

Proposals must be made on the forms furnished herein. Prior to the time and date designated for receipt of bids, a bid submitted may be modified or withdrawn by notice to the party receiving bids at the place designated for receipt of bids. A change shall be so worded as not to reveal the amount of the original bid.

Withdrawn bids may be resubmitted up to the date and time designated for the receipt of bids provided that they are then fully in conformance with these instructions to bidders.

Unless stated otherwise in the Advertisement or Invitation to Bid, the properly identified bids received on time will be opened publically and will be read aloud. The owner shall have the right to reject any or all bids, reject a bid not accompanied by a required bid security or by any data required by these Contract Documents, or reject a bid, which is in any way incomplete or irregular.

2. ADDENDA & INTERPRETATIONS

Any request from prospective bidders for interpretation of meaning of Contract Drawings, specifications or other Contract Documents shall be made in writing to Stephen Jager Associates LLC, Stephen Jager, Architect, 4 Grand View Drive Enfield, CT 06082 Phone: (860) 803-1265 or email to sjager@stephenjager.com and to be given consideration must be received at least seven (7) days prior to date fixed for opening of proposals. Interpretations will be made in the form of written addenda to the Contract Documents, which addenda shall become a part of Contract. Not later than three (3) days prior to date fixed for opening of proposal, addenda will be mailed to all persons who obtained Contract Documents and provided information to be included on the list of Bidders. Failure of any bidder to receive any such addenda shall not relieve bidder from any obligation under his proposal as submitted.

**Town of East Windsor
Community Center
Alterations and Additions
28 Abbe Road
East Windsor, Connecticut**
Instructions to Bidders
(continued)

3. METHOD OF AWARD

The contract will be awarded to the responsible bidder submitting the lowest bid complying with conditions of these Contract Documents. The bidder to whom the award is made will be notified at the Owner's convenience. The successful bidder shall execute and deliver to the Owner, within ten (10) days after receiving the Notice of Award, and Agreement in the form provided by the Owner, in such number as the Owner shall require.

The Owner also reserves the right to reject any or all bids, for any reason the Owner deems advisable, and to award the contract or contracts to any Contractors bidding on the work regardless of the amount of bid. It is intended that the contract or contracts will be awarded to the lowest responsible and eligible bidder possessing skill, ability and integrity necessary to provide faithful performance of the work.

4. BID SECURITY

The bid must be accompanied by a Bid Bond, in an amount equal to five (5) percent of the amount of the bid. The Bid Bond shall be duly executed by the Bidder as principal and having a surety thereon, which shall be acceptable to the Owner.

No bidder may withdraw his bid within thirty (30) calendar days after the actual date of bid opening.

5. SUBCONTRACTORS

The bidder is advised that any person, firm or other party to whom it is proposed to award a subcontract under this contract must be acceptable to and approved by the Owner. A list of intended subcontractors must be included on the submitted Bid Form.

6. QUALIFICATIONS OF BIDDER

The Town of East Windsor may make such investigation as deemed necessary to determine the ability of the bidders to discharge his contract. The bidder shall furnish the Owner with all such information and data as may be required for that purpose. The Owner reserves the right to reject any bid if the bidder fails to satisfactorily convince the Owner that he is properly qualified by experience and facilities to carry out the obligation of the Contract and to satisfactorily complete the work called for herein. Conditional bids will not be accepted.

**Town of East Windsor
Community Center
Alterations and Additions
28 Abbe Road
East Windsor, Connecticut**
Instructions to Bidders
(continued)

7. EXECUTION OF CONTRACT & NOTICE TO PROCEED

Upon receipt of acceptable signed Agreement, the Owner will, within ten (10) days, enter into and sign the Agreement unless it deems it not in the best interest of the Town.

The notice to proceed shall be issued within ten (10) days of the execution of the Agreement by the Owner. Should there be reasons why the notice to proceed cannot be issued within such period, the time may be extended by mutual agreement.

8. PAYMENT

The Owner shall pay the Contractor 100% of the Contract value upon completion of the work, minus any penalties for delay of completion of work

9. DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The bidder to whom the contract is awarded will be required to execute the Agreement within ten (10) calendar days from the date when the Notice of Award is delivered to the Bidder. In case of failure of the Bidder to execute the Agreement, the Owner may, at its option, consider the Bidder in default, in which case the bid security accompanying the proposal shall be called.

10. TIME OF COMPLETION

The Bidder must agree to commence work on or before the date specified in the Notice to Proceed and to faithfully complete the project within sixty (60) calendar days. The Owner may deduct \$100 per day from payment due to the contractor for everyday beyond this time limit.

11. CONDITIONS OF WORK

At the date fixed for opening of bids, it will be presumed that each Bidder has made an examination of location and site work to be done under contract; has satisfied himself as to actual condition, requirements and quantities of work; and has read and become thoroughly familiar with Contract Documents, including Contract Drawings and addenda.

**Town of East Windsor
Community Center
Alterations and Additions
28 Abbe Road
East Windsor, Connecticut**
Instructions to Bidders
(continued)

12. INTERPRETATION OF ACCEPTABLE WORK

The specifications, bidding and contract documents are to be interpreted as meaning those acceptable to the Town of East Windsor. Any substantive changes or interpretations will be issue by the town in writing as an addendum.

13. TAX EXEMPTIONS

The Town of East Windsor is exempt from federal excise taxes and Connecticut's sales-tax and use taxes. Bidders shall avail themselves of these exceptions.

14. INSURANCE

The bidder awarded this bid must provide a current certificate of insurance to the Office of the Chief of Police prior to the commencement of work with the following requirements:

- A. liability limits for bodily injury and persona injury \$1,000,000 per occurrence
- B. liability limits for property damage including that caused by motor vehicle \$1,000,000 per occurrence
- C. contractual liability \$1,000,000 per occurrence
- D. owner's protective liability and property damage
- E. Workers compensation as required by Connecticut state statute
- F. The Town of East Windsor is to appear as an additional insured on all certificate of insurance
- G. All insurance is to be provided by a company authorized to issue such insurance in the State of Connecticut
- H. Insurance may not be canceled or modified without sixty (60) days written notice by registered US mail to Office of the First Selectman, Town of East Windsor, 11 Rye Street Broad Brook, CT 06016.
- I. The insurance company rating should be no less than A-VII by A.M. Best.

**Town of East Windsor
Community Center
Alterations and Additions
28 Abbe Road East
Windsor, Connecticut**
Instructions to Bidders
(continued)

15. LAWS AND REGULATIONS

The Bidder's attention is directed to the fact that all applicable federal and state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

Contracts for work under this proposal will obligate the Contractors and sub-contractors not to discriminate in employment practice.

16. RIGHTS-OF-WAY

The Owner shall provide, upon request, any available information, which is pertinent to and delineates and describes the land owned and rights-of-way acquired or to be acquired.

17. SURVEY

If any existing East Windsor highway bounds, Department of Transportation bounds, or private property bounds are disturbed during construction, they will be carefully and exactly replaced, at the Contractor's expense, by a Land Surveyor licensed in the State of Connecticut.

18. SIGNS AND FENCES

Any street or advisory signs, fences or other appurtenances disturbed or removed by the contractor, whether shown in the plans or not, shall be reset or replaced at the Contractor's expense and as directed by the Engineer.

**East Windsor Department of Public Works
Community Center
Alterations & Additions
28 Abbe Road
East Windsor, Connecticut**

Available Project Information

The project includes alterations and addition to the existing building. One story addition w/partial basement, alterations and additions to existing site parking and driveways. Install new water main w/hydrants from Route 5 to east side of property. The Bidder is responsible for visiting the site and familiarize himself with existing conditions. Items needed to complete this project shall include, but are not limited to, the following:

1. Call Before You Dig: 1-800-922-4455. Notify the Town Engineer immediately if any utility conflicts are encountered.
2. Obtain a Connecticut DOT encroachment permit for working within the State ROW for Route 5.
3. Provide traffic and pedestrian barricades and construction warning signs as required by applicable laws and regulations. Provide at least one (1) dedicated flagman to direct traffic around work. Notify the First Selectman's Office and the East Windsor Police Department 24 hours prior to obstructing roadway. Maintain at least one (1) lane of travel on each street. Provide emergency access to all buildings as required.
4. Remove all excess material from site and dispose of it in accordance with applicable laws and regulations.
5. Keep roadways clean and clear of obstructions after each workday.
6. Loam and seed all disturbed areas.
7. Restore, replace, or reconstruct any features disturbed during construction.
8. Coordinate work with local utility companies as required. The Contractor is responsible to protect and replace any utilities disturbed during construction. This includes but is not limited to working around overhead wires and water curb boxes.
9. Replace any signage.
10. The Contractor shall provide and maintain in a neat and sanitary condition such accommodation for the use of its employees as may be necessary to comply with the regulations and requirements of the State Department of Public Health.

Bid Form

East Windsor
Community Center
Alterations and Additions
28 Abbe Road
East Windsor, Connecticut

T0: Town of East Windsor First Selectman Attention: Jason
Bowsza 11 Rye Street, East Windsor, Connecticut 06088

From: Name of Bidder: _____

Address of Bidder: _____

1. The undersigned, having examined the Contract Documents, including the Contract Drawings, Project Description, and Instructions to Bidders, and having visited the site and examined the conditions affecting the work, hereby proposes and agrees to furnish all labor, material, equipment, and appliances, and to perform operations necessary to complete the work as required by said proposed Contract Documents, for the stipulated sum of:
 - A. The undersigned understands that there may be changes, omissions, or modification in the work, and that appropriate adjustments will be made to the Contract price in accordance with the Contract Documents. The undersigned understands that the Owner reserves the right to accept or reject any or all bids, and to waive all formalities, any irregularities, and accept the Bid deemed to be in the Owner's best interest.
 - B. Bid prices shall not include any sales, excise, or other taxes for which the Owner is not liable. Town of East Windsor is the awarding authority. The Bidder agrees to hold the above pricing for sixty (60) days.
 - C. The Bid security in the sum of 5% OF TOTAL BID is to become the property of the Town in the event the above forms are not executed within the time set forth above, as liquidated damages, and not as a penalty for the delay and additional expense to the Town caused thereby.
 - D. The undersigned acknowledges receipt of addendum numbers:

 - E. The undersigned understands and agrees to comply with and be bounded by the Instructions to the Bidders used for this work.
 - F. This Bidder hereby agrees to begin work immediately upon receipt of the official Notice to Proceed and to substantially complete the work within sixty (60) days thereafter. In submitting this bid, it is agreed that this bid may not be withdrawn for a period of thirty (30) days from the date of bid opening.

Respectfully Submitted By: (Signature) _____

Name (Please Print): _____

Title: _____

SEAL Company: _____

(If Bid is by a corporation)

Business Address: _____

Business Phone: () _____

Business Fax: () _____

Email Address: _____

License No.: _____

License Type: _____

Type of Business Entity: _____

(Corporation, co-partnership, individual, etc.)

Individual members of firm:

A. List subcontractors to be used and identify the work they will perform, or attach a separate list:

President of
Corporation: _____ Secretary of
Corporation: _____ Corporation
is organized under law of the State of: _____ Bid dated
this _____ day of _____, 2013.

END OF BID FORM

East Windsor Community
Alterations & Additions
28 Abbe Road
East Windsor, Connecticut 06088
Bid Form
(continued)

TOTAL BID = \$ _____

WRITTEN _____ DOLLARS

AND _____ CENTS

It is understood that the unit prices will control any contract awarded based on this proposal that the estimated quantities above are approximate and used only for the comparison of proposals, and that the products obtained by multiplying the above unit prices by estimated quantities and the total thereof have been inserted for the convenience of the proposer in order to facilitate consideration of this and other proposals.

The above prices include the cost of all work to complete the project whether specifically stated or not. Cost of mobilization and demobilization, miscellaneous clearing and grubbing, protection of items and any other work required to complete the project shall be included in the price stated above.

The undersigned certifies that he has not colluded with any individual or firm that has a competitive interest in responding to this BID.

Name of Firm: _____

Mailing Address: _____

Phone Number: _____

Signature of Proposer: _____ Title: _____

Name and Title (typewritten): _____

Agreement

This Agreement is made as of the date last signed below, by and between the Town of East Windsor, a municipality located within the County of Hartford in the State of Connecticut, acting through its First Selectman (hereinafter called "Town") and [REDACTED] (hereinafter termed the "Company" or "Contractor"). The Town and Company may be referred to collectively as the "Parties" or individually as a "Party."

The Parties to this Agreement each in consideration of the Agreements on the part of the other herein contained have agreed, and by these presents do hereby agree, as follows:

1. Project: The Project is as follows, as noted on the Request for Bids – East Windsor Community Center Bid/Proposal received Wednesday, October 18, 2023, both of which are attached hereto and incorporated by reference herein:

Town of East Windsor
Request for Bids
East Windsor Community Center
October 18, 2023

2. The Contract Documents consist of this Contract, together with all attachments including but not limited to, the Bid/Proposal, Drawings, Exhibits and Addenda issued before execution of the Contract, all of which are included as if fully set forth herein. If there is any conflict between this Contract and any of the attachments, this Contract controls.

3. Scope of the Work: The Company will perform alterations and additions on the former Scout Hall Youth Center, per the plans provided in the bid documents and project manual. The Contractor shall furnish all labor, materials, supplies, tools, equipment and other facilities and things necessary for or incidental to properly perform the work.

4. Place of Installation:

Town:	<u>Town of East Windsor</u>
Street Location:	<u>28 Abbe Road</u>

5. Schedule and Time is of the essence. Because the Work is for carpentry services on an on-call basis Contractor hereby agrees to commence the work under this Contract when specified to Proceed from the Town. Time is of the essence for the Contractor to complete and perform all of its obligations under this Agreement.

6. Payment. Town shall pay, and the Contractor shall receive, as full compensation for fulfilling everything required of the Contractor under this Contract at the time of the final acceptance of the Work by the Town after final inspection by the Town, the unit costs for the work performed as stated in the Proposal, a copy of which is appended to and is made a part of this Contract.

7. Equal Employment Opportunity and Labor Compliance: The contractor will not willfully discriminate against any employee or applicant for employment because of race, color, religion, ancestry, sex, age, national origin, sexual orientation, or physical handicap. The contractor will take affirmative action to ensure that applicants are employed, and that

employees are treated during employment, without regard to their race, color, religion, ancestry, sex, age, national origin, sexual orientation, or physical handicap. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

8. Wage Rates. Contractor acknowledges that it has conducted its own independent investigation of the wage rates to be paid and that it has not relied upon any statements or representations by Town with respect to such matters. Contractor agrees to comply with all applicable Connecticut prevailing wage laws.

9. Certified Payrolls. If this Project is a Prevailing Wage Project under Connecticut or federal law, Contractor, as requested by Town, shall furnish certified copies of all payrolls in the manner prescribed by Town. Certified Payroll Reports must be made available upon request no later than ten (10) calendar days after the week that Contractor's work force performed work at the job site and must conform with the actual hours of work performed at the job site as stated/certified on Contractor's daily reports.

10. Audits. All invoiced items should have timesheets, direct costs or other back-up documentation available if requested by Town. Contractor shall cooperate fully and timely by providing back-up documentation to Town if requested.

11. Non-Assignment of Agreement without Consent. Due to the unique services required by this Agreement this Agreement and the Work may not be assigned in whole or in-part without expressed written permission from Town by a "Letter of Consent to Assign." Should Town agree to the assignment Contractor shall remain fully responsible for all work performed, quality of such work and meeting schedule requirements, unless specifically waived in the Letter of Consent. The assignment shall not cause in an increase in costs as a result of the assignment.

12. Independent Contractor. It is recognized that Contractor is not an employee of Town and shall pay all taxes, insurance, withholdings, workers' compensation or other fees associated with performance of this Agreement. Contractor shall set their own working hours to be scheduled/coordinated with Contractor and retain their own office locations.

13. Standard of Care. Contractor will perform all services with the highest standard of care common within their industry and disclose any significant schedule, costs or performance impacts to Contractor in a timely manner in order to avoid delays, liability, or cost increases. Contractor will at a minimum provide to Town weekly updates, by the Tuesday following the week in which the Work occurred, on the progress of the work items contained in the Scope of Work. These updates shall be in writing in a format agreed to by both parties prior to the start of Work

14. Indemnity. To the fullest extent permitted by law, Contractor shall defend, indemnify, and hold harmless the Town and its agents, officers, officials, employees, consultants, and employees ("Indemnitees") from and against all injuries, claims (including property damage, personal injury and death, as well as any claims relating to use of Contractor equipment or vessels), damages, losses, fines, penalties, and expenses (including reasonable attorneys' fees and costs), of whatever kind or nature, that may arise from or relate to, directly or indirectly, in whole or in part, from or out of, any act, claim, error, omission or willful

misconduct relating to the performance of the Work by Contractor or anyone directly or indirectly employed by Contractor for whose acts Contractor may be liable. Any acceptance of Contractor services by Town shall not operate as a waiver of the right to indemnification. Contractor's obligation to indemnify and hold harmless shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity that would otherwise exist as to any party or person.

15. Insurance.

- a. General Requirements: Contractor shall procure and maintain in effect, at its sole expense, not less than the insurance coverage's and limits of insurance as specified within the "Required Coverage" indicated below which is an integral part of this agreement. Such insurance shall be maintained with insurers, policy forms and deductibles satisfactory to Town. If Contractor uses existing coverage to comply with these requirements and that coverage does not meet the requirements set forth within Contractor agrees to amend, supplement and/or endorse the existing coverage.

Contractor will keep all policies and endorsements in force as long as may be necessary to protect Town's interests. Any acceptance of insurance certificates or endorsements by Town shall in no way limit or relieve Contractor of its duties and the responsibilities assumed by this Agreement.

Prior to commencing the performance of the services referenced herein, Contractor shall procure, and thereafter maintain, at its own expense, for as long as this Agreement is in effect, the insurance coverage as set forth below in a form and from insurers acceptable to Town; and shall provide Town with certificates evidencing such coverage. Each certificate shall state that the insurer will give Town thirty (30) days prior written notice of any cancellation or material change in the policy(ies):

- b. Required Coverage:
- Workers' Compensation insurance, including Occupational Disease insurance, meeting Connecticut's statutory requirements, in an amount of at least \$1,000,000;
 - Employer's Liability Insurance in an amount of at least \$1,000,000;
 - Commercial General Liability Coverage under ISO form #CG0001 1188 or its equivalent with Liability Limits for Bodily Injury and Property Damage of not less than:
 - \$1,000,000 Each Occurrence;
 - \$1,000,000 Personal & ADV Injury
 - \$2,000,000 General Aggregate
 - \$2,000,000 Products/Completed Operations Aggregate;
 - \$1,000,000 General Aggregate if applicable separately to this project and Defense Costs are in addition to the Aggregate limit.
 - \$2,000,000 General Aggregate if not applicable separately to this project or if Defense Costs are included in the Aggregate limit.
 - \$1,000,000 Professional Liability Insurance or if the Consultant has a policy

limited in a greater amount currently in effect that greater amount shall apply.

- Automobile insurance with limits of liability for bodily injury and property damage of \$1,000,000 per accident. Such insurance shall apply on an “any auto” basis.
 - Payment and/or satisfaction of any deductible shall be the sole and exclusive responsibility of Contractor. No portion of Contractor obligation to provide general liability and excess/umbrella insurance shall be satisfied by self-insurance or a self-insured retention absent the expressed written consent of the Contractor.
- c. Subrogation, Waiver of Subrogation. Contractor will waive coverage to the benefit of Town’s employees, officers, board members, and agents for damages caused and by all perils created to the extent covered by the proceeds of the insurance provided pursuant to this Agreement.
- d. Additional Insureds. All said commercial general liability insurance policies shall name, or be endorsed to the Town, its officers, and officials and employees as additional insureds and protect the Town against all liabilities, costs, damages, expenses and provide for the legal defense of claims and attorney’s fees and the cost thereof, state, or be endorsed to state that Contractor’s insurance is primary and not excess or contributing to any insurance issued in the name of the Town, and (3) contain a severability of interest or cross-liability clause.
- e. Proof of Insurance; Condition to Performance of Work and Payment. Contractor shall provide Certificates of Insurance for the required insurance policies prior to commencing the Scope of Work. Certificates of Insurance shall be a condition precedent to Contractors work.
16. Reliance on Information Provided by Contractor. Town shall be entitled to rely on the accuracy and completeness of all drawings, data, technical specifications and all other information provided by the Contractor. Town will use such information as identified in the Submittal and Quote to make critical short and long term decisions regarding the project. Town bears no responsibility to independently verify Contractor's Work. Contractor is liable for any errors or emissions contained or represented in its work product as defined by its scope of work.
17. Binding Arbitration and Other Methods of Resolving Disputes. Disputes between Contractor and Town arising from or relating to this Agreement, shall first be resolved informally, in good faith and with fairness to both parties; failing those efforts after no less than thirty (30) days of mediation efforts, the Parties agree to binding arbitration. Such arbitration shall be administered by the American Arbitration Association and conducted pursuant to its Construction Industry Rules, except that in all cases, there shall be a single arbitrator rather than a multi-arbitrator panel, and arbitration shall take place in Hartford County Connecticut.
18. Contractual Interpretation. Town’s interpretation of requirements set forth in the project documents or specifications shall be binding upon Contractor.
19. Governing Law. This Agreement shall be governed by the laws of the State of Connecticut.
20. Termination. Town may terminate this Agreement for cause after seven (7) days’ notice to

Contractor to cure the defects. Contractor's failure to cure defects in performance will then result in immediate termination.

21. Severability. If any portion of this agreement is found to be illegal, voidable, or void then all other provisions of this agreement remain in effect.

22. Ownership of Work Product. Contractor shall own and have all rights to all documents and all work products produced as a result of this Agreement and may use such at its discretion.

23. Records Retention Policy: All information used for this Project is subject to the municipal public records retention policy set by Connecticut law and must be retained by Contractor for seven (7) years.

24. Limitation of Liability: Town shall have no liability or responsibility of any kind to Contractor or any other person or entity for any loss or damage directly or indirectly caused by, or resulting from Contractor's performance of the Work, including without limitation, any injuries to persons or property, interruption of service, loss of business or anticipatory profits or consequential or incidental damages.

25. Remedies: No remedy referred to in this Agreement is intended to be exclusive, but each shall be cumulative and in addition to any other remedy referred to herein or otherwise available at law or in equity. No delay by Town or Contractor in exercising any of its rights or remedies hereunder upon a breach by the other party shall be deemed to be a waiver of such rights or remedies. No express or implied waiver by either party of any breach by the other party hereunder shall in any way be, or construed to be, a waiver of future or subsequent breach.

26. Notices: All notices required or permitted to be given or delivered to any party hereunder shall be in writing, and shall be deemed to be given when delivered by hand, or when deposited in the United States Mail, certified or postage prepaid or when delivered to any reputable overnight mail or package delivery service, to the parties at the following addresses, or such other address as either party shall hereafter furnish to the other in writing:

Attention:

Email: _____

Town:

First Selectman

East Windsor Town Hall

11 Rye St.

Broad Brook, Connecticut 06016

IN WITNESS WHEREOF, the parties to these present have executed this CONTRACT in the year and day first above mentioned.

By: _____
President and Authorized Agent

Date: _____

TOWN OF EAST WINDSOR

By: _____
Name: Jason Bowsza
Title : First Selectman
Duly authorized

Date: _____

 **AIA[®] Document A701[®] – 2018****Instructions to Bidders**

for the following Project:

(Name, location, and detailed description)

E. Windsor Community Center
28 Abbe Road
E. Windsor, CT 06088

THE OWNER:

(Name, legal status, address, and other information)

Town of E. Windsor, CT
11 Rye Street
E. Windsor, CT 06088

THE ARCHITECT:

(Name, legal status, address, and other information)

Stephen Jager Associates LLC
4 Grand View Drive
Enfield, CT 06082
860-803-1265
sjager@stephenjager.com

TABLE OF ARTICLES

1	DEFINITIONS
2	BIDDER'S REPRESENTATIONS
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6	POST-BID INFORMATION
7	PERFORMANCE BOND AND PAYMENT BOND
8	ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:

(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

A101-2017

- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

A101-2017 Exhibit A

- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

A201-2017 General Conditions of the Contract for Construction

- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

NA

- .5 Drawings

Number	Title	Date	
.6	Specifications		
Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages
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.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

The Sustainability Plan:

Title	Date	Pages
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Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
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.9 Other documents listed below:

(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

ATTACHMENT TO AIA DOCUMENT A201-2017, *General Conditions of the Contract for Construction*

The provisions of this attachment shall delete, modify and supplement the provisions contained in the "*General Conditions of the Contract for Construction*," AIA Document A201-2017 Edition. The provisions contained in this attachment will supersede any conflicting provisions of the AIA Document. The term "Agency," as used in this Attachment, shall mean the United States of America, acting through the United States Department of Agriculture.

ARTICLE 1, GENERAL PROVISIONS

Add the following subparagraph:

1.2.4 Concurrence of the Contract by the Agency is required before it is effective.

ARTICLE 2, OWNER

Delete subparagraph 2.3.6 and substitute the following:

2.3.6 The Contractor will be furnished, free of charge, _____ copies of the Drawings and Projects Manuals necessary for execution of the Work. Additional copies will be available from the Architect at the cost of reproduction and handling.

ARTICLE 4, ARCHITECT

Add the following to subparagraph 4.1.1:

The term "Architect" means the Architect, or the Engineer when the nature of the work is within the authority granted engineers by the State licensure law, or an authorized representative of the Architect or Engineer.

ARTICLE 5, SUBCONTRACTORS

Add the following to subparagraph 5.2.2:

The Contractor shall not contract with any party who is suspended or debarred by any Federal government agency from participating in Federally assisted construction projects.

ARTICLE 7, CHANGES IN THE WORK

Delete the words ", Construction Change Directive" from subparagraph 7.1.1.

Insert the words ", Agency " after the word "Owner," and delete the words "A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor" in subparagraph 7.1.2.

Delete the words "Construction Change Directive" from subparagraph 7.1.3.

Delete subparagraph 7.2.1 and substitute the following:

7.2.1 A Change Order is a written order to the Contractor utilizing Form RD 1924-7, "Contract Change Order," or AIA G-701 signed by the Owner, Architect, Contractor, and the Agency representative. It is issued after the execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. The Contractor's signing of a Change Order indicates complete agreement therein.

Add subparagraph 7.2.2:

7.2.2 Methods used in determining adjustments to the Contract Sum may include any of the following:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluating.
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon.

Add the following sentence to paragraph 7.3.1: "A Construction Change Directive may be used only for a change in response to an emergency as described in paragraph 10.4.

Delete subparagraph 7.3.2.

Add the following, where appropriate, to 7.3.3 through 7.3.10: "When the use of a Construction Change Directive is justified"

ARTICLE 8, TIME

Add the following subparagraphs:

8.2.4 The Notice to Proceed shall be issued within twenty (20) calendar days of the execution of the Agreement by the Owner. Should there be reasons why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement of the Owner and Contractor, with the concurrence of the Agency. If the Notice to Proceed has not been issued within the twenty (20) calendar day period or within the period mutually agreed, the Contractor may terminate the Agreement without further liability on the part of either party.

8.3.4 As outlined in Article 3 of the Agreement, the Contractor agrees to pay liquidated damages to the Owner for each calendar day the Contractor shall be in default.

ARTICLE 9, PAYMENTS AND COMPLETION

Delete clause 9.3.1.1 and substitute the following:

9.3.1.1 Work performed and materials supplied under a Change Order may be included for payment only after the Change Order has been approved by all appropriate parties, including the Agency.

Add the words ", using AIA Document 702, 'Application and Certificate for Payment' or Form RD 1924-18, 'Partial Payment Estimate'," after "Certificate for Payment" in subparagraph 9.4.1.

Add the following subparagraph:

9.6.9 No progress payments will be made that deplete the retainage, nor place in escrow any funds that are required for retainage, nor invest the retainage for the benefit of the Contractor. Retainage will not be adjusted until after construction is substantially complete.

Replace the word "seven" with the words "fifteen (15)" in the first sentence, second line of subparagraph 9.7.

Delete subparagraph 9.8.5, after the first sentence, and substitute the following:

9.8.5 When the Work has been substantially completed, except for Work which cannot be completed because of weather conditions, lack of materials or other reasons, which, in the judgment of the Owner, are valid reasons for non-completion, the Owner may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the Work still to be completed. Provide a copy of the Certificate to the Agency.

Delete subparagraphs 9.9.1 and add the following:

9.9.1 The Contractor agrees to the use and occupancy of a portion or unit of the Project before formal acceptance by the Owner under the following conditions:

- .1 A "Certificate of Substantial Completion" shall be prepared and executed as provided in subparagraph 9.8.4, except that when, in the opinion of the Architect, the Contractor is chargeable with unwarranted delay in completing the Work or other Contract requirements, the signature of the Contractor will not be required. The Certificate of Substantial Completion shall be accompanied by a written endorsement of the Contractor's insurance carrier and surety permitting occupancy by the Owner during the remaining period of the Project Work. Occupancy and use by the Owner shall not commence until authorized by public authorities having jurisdiction over the Work.
- .2 Occupancy by the Owner shall not be construed by the Contractor as being an acceptance of that part of the Project to be occupied.
- .3 The Contractor shall not be held responsible for any damage to the occupied part of the Project resulting from the Owner's occupancy.
- .4 Occupancy by the Owner shall not be deemed to constitute a waiver of existing claims in behalf of the Owner or Contractor against each other.
- .5 If the Project consists of more than one building, and one of the buildings is to be

occupied, the Owner, prior to occupancy of that building, shall secure permanent property insurance on the building to be occupied and necessary permits which may be required for use and occupancy.

Add to subparagraph 9.9.3: Use and occupancy by the Owner prior to Project acceptance does not relieve the Contractor of responsibility to maintain all insurance and bonds required of the Contractor under the Contract Documents until the Project is completed and accepted by the Owner.

ARTICLE 11, INSURANCE AND BONDS

Replace the words "the Contract Documents" with the words "subparagraph 11.1.1" in the first sentence of subparagraph 11.1.2.

Add the following subparagraph:

11.1.1. Insurance shall be:

- .1 Written with a limit of liability of not less than \$500,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident; and a limit of liability of not less than \$500,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than \$200,000 for all property damage sustained by any one person in any one accident; and a limit of liability of not less than \$200,000 aggregate for any such damage sustained by two or more persons in any one accident, or
- .2 Written with a combined bodily injury and damage liability of not less than \$700,000 per occurrence; and with an aggregate of not less than \$700,000 per occurrence.

Add the following sentence to the end of subparagraph 11.3.1:

The provisions of this subparagraph shall apply to the Contractor if the Contractor purchases and maintains said insurance coverage.

Delete subparagraph 11.1.2 and substitute the following:

11.1.2 The Contractor shall furnish the Owner bonds covering faithful performance of the Contract and payment of obligations arising thereunder within ten (10) calendar days after receipt of the Notice of Award. The surety company executing the bonds must hold a certificate of authority as an acceptable surety on Federal bonds as listed in Treasury Circular 570, and be authorized to transact business in the State where the Project is located. The bonds (using the forms included in the Bidding Documents) shall each be equal to the amount of the Contract Sum. The cost of these bonds shall be included in the Contract Sum

Add the following subparagraphs:

11.1.3.1 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current power of attorney.

11.1.3.2 If at any time a surety on any such bond is declared bankrupt or loses its right to do business in the State in which the work is to be performed or is removed from the list of surety companies accepted on Federal Bonds, the Contractor shall within ten (10) calendar days after notice from the Owner to do so, substitute an acceptable bond in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums of such bond shall be paid by any Contractor. No further payment shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond to the Owner.

ARTICLE 13, MISCELLANEOUS PROVISIONS

Add the following paragraphs:

13.6 LANDS AND RIGHTS-OF WAY

13.6.1 Prior to the start of construction, the Owner shall obtain all lands and rights-of-way necessary for the execution and completion of work to be performed under this contract.

13.7 EQUAL OPPORTUNITY REQUIREMENTS

Non-discrimination in Employment by Federally Assisted Construction Contractors, by Executive Order 11246.

13.7.1 This section summarizes Executive Order 11246, which prohibits employment discrimination and requires employers holding non-exempt Federal contracts and subcontracts and federally-assisted construction contracts and subcontracts in excess of \$10,000 to take affirmative action to ensure equal employment opportunity without regard to race, color, religion, sex, or national origin. The Executive Order requires, as a condition for the approval of any federally assisted construction contract, that the applicant incorporate nondiscrimination and affirmative action clauses into its non-exempt federally assisted construction contracts.

13.7.2 Executive Order 11246, is administered and enforced by the Office of Federal Contract Compliance Programs (OFCCP), an agency in the U.S. Department of Labor's Employment Standards Administration. OFCCP has issued regulations at 41 CFR chapter 60 implementing the Executive Order. The regulations at 41 CFR part 60-4 establish the procedures which the Agency, as an administering agency, must follow when making grants, contracts, loans, insurance or guarantees involving federally assisted construction which is not exempt from the requirements of Executive Order 11246. The regulations which apply to Federal or federally assisted construction contractors also are published at 41 CFR part 60-4.

13.7.3 OFCCP has established numerical goals for minority and female utilization in construction work. The goals are expressed in percentage terms for the contractor's aggregate workforce in each trade. OFCCP has set goals for minority utilization based on the percentage of minorities in the civilian labor force in the relevant area. There is

a single nationwide goal of 6.9 percent for utilization of women. The goals apply to all construction work in the covered geographic area, whether or not it is federal, federally assisted or non-federal. A notice advises bidders of the applicable goals for the area where the project is to be located.

13.7.4 Application. This section applies to all of a construction contractor's or subcontractor's employees who are engaged in on-site construction including those construction employees who work on a non-Federal or non-Federally assisted construction site.

13.7.4.1 Agency officials will notify the appropriate Regional Director of OFCCP that an Agency financed construction contract has been awarded, and that the equal opportunity clauses are included in the contract documents.

13.7.4.2 The Regional Director, OFCCP-DOL, will enforce the non-discrimination requirements of Executive Order 11246.

13.7.5 The prospective contractor or subcontractor must comply with the Immigration Reform and Control Act of 1986, by completing and retaining Form I-9, "Employment Eligibility Verification," for employees hired. This form is available from the Immigration and Naturalization Service, and Department of Justice.

13.7.6 The prospective contractor or subcontractor must submit Form RD 400-6, "Compliance Statement," to the applicant and an Agency official as part of the bid package, prior to any contract bid negotiations and comply with the Executive Order 11246 as stated in the contract documents.

13.8 STATUTES

13.8.1 The Contractor and each Subcontractor shall comply with the following statutes (and with regulations issued pursuant thereto, which are incorporated herein by reference):

13.8.1.1 Copeland Anti-Kickback Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR part 3). This Act provides that each Contractor shall be prohibited from inducing, by any means, any person in connection with construction to give up any part of the compensation to which the person is otherwise entitled.

13.8.1.2 Clean Air Act (42 U.S.C. 7414), section 114, and Water Pollution Control Act (33 U.S.C. 1813), section 308. Under Executive Order 11738 and Environmental Protection Agency (EPA) regulations 40 C.F.R. part 15, all Contracts in excess of \$100,000 are required to comply with these Acts. The Acts require the Contractor to:

- .1 Notify the Owner of the receipt of any communication from EPA indicating that a facility to be utilized in the performance of the Contract is under consideration to be listed on the EPA list of Violating Facilities.
- .2 Certify that any facility to be utilized in the performance of any nonexempt Contractor or Subcontractor is not listed on the EPA list of Violating Facilities as of the date of the Contract Award.
- .3 Include or cause to be included the above criteria and requirements of paragraphs .1 and .2 in every nonexempt subcontract, and that the Contractor will take such action as the Government may direct as a means of enforcing such provisions.

13.8.1.3 Restrictions on Lobbying (Public Law 101-121, section 319) as supplemented in Department of Agriculture regulations (7 CFR part 3018). This statute applies to the recipients of contracts or subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, the Contractor must complete a certification form on lobbying activities related to the specific Federal loan or grant that is a funding source for this contract. The certification and disclosure forms shall be provided by the Owner.

13.9 RECORDS

13.9.1 If the Contract is based on a negotiated Bid, the Owner, the Agency, the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor which are pertinent to a specific Federal loan program for the purpose of making audit, examination, excerpts, and transcriptions. The Contractor shall maintain records for at least three years after the Owner makes final payment and all other pending matters are closed.

13.10 ENVIRONMENTAL REQUIREMENTS

13.10.1 Mitigation Measures - The contractor shall comply with applicable mitigation measures established in the environmental assessment for the project. These may be obtained from the Agency representative.

13.10.2 The Contractor, when constructing a Project involving trenching, excavating, or other earth moving activity, shall comply with the following environmental constraints:

13.10.2.1 Endangered Species, Historic Preservation, Human Remains and Cultural Items, Hazardous Materials, and Paleontology - Any excavation or other earth moving activity by the Contractor that provides evidence of the presence of endangered or threatened species or their critical habitat, uncovers a historical or archaeological artifact, human remains or cultural items, hazardous materials, a fossil or other paleontological materials will require the Contractor to:

- .1 Temporarily stop work;
- .2 Provide immediate notice to the Architect and the Agency, and in the case of potentially hazardous materials, provide immediate notice to local first responders and take such measures as necessary to protect the public and workers;
- .3 Take reasonable measures as necessary to protect the discovered materials or protected resource;
- .4 Abide by such direction as provided by the Agency, or Agencies responsible for resource protection or hazardous materials management; and
- .5 Resume work only upon notice from the Architect and the Agency.

13.10.3 Lead-Based Paint - The Contractor and Owner shall comply with applicable Agency requirements of the Lead-Based Paint Poisoning Prevention Act, as amended (42 U.S.C. 4821), and the Residential Lead-Based Paint Hazard Reduction Act of 1992 (42 U.S.C. 4851) for rehabilitation work on residential property built prior to 1978.

13.11 DEBARMENT AND SUSPENSION

13.11.1 The Contractor shall comply with the requirements of 7 CFR part 3017, which pertains to the debarment or suspension of a person from participating in a Federal program or activity.

ARTICLE 15 CLAIMS AND DISPUTES

Add the words "may be" after "on the parties but" in the last sentence of subparagraph 15.2.5.

Replace the word "shall" with the word "may" in the first sentence, first occurrence of subparagraph 15.3.2

Add the subparagraph: 15.4.1.2 The arbitrators will select a hearing location as close to the Owner's locale as possible.

oOo



TO: Benjamin Waldow, Loan Specialist

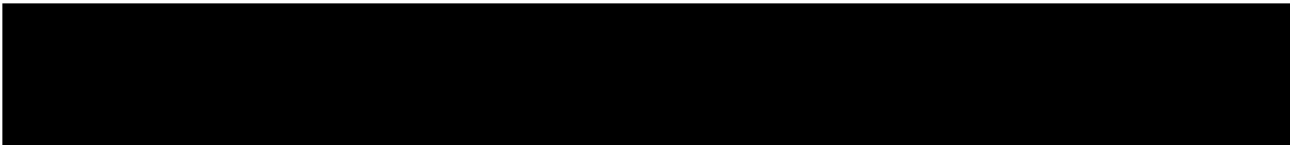
SUBJECT: PSS Architectural Services Branch Review
Project Name: East Windsor Community Center
Project Address: 28 Abbe Road, East Windsor, CT 06088
Owner/Borrower Name: Town of East Windsor
Program: Community Facilities

Document Reviewed	Date or No.	Recommendation
Construction Documents - Plans and Specs	August 7, 2023	Recommended subject to comments

This memo is for internal Agency use only. The Reviewer’s comments may be shared with Borrowers and their consultants as Program Staff considers appropriate.

This review is for Rural Development lending purposes only and does not relieve the Project Architect, Owner or Contractor from compliance with any Rural Development requirements or standards, applicable building codes, accessibility standards, other federal, state and local laws, or any other regulatory requirement. Agreements and contracts are reviewed for Agency requirements only. Program Staff must confirm legal names and do not pay status as applicable.

- See attached comments
- This change order is recommended provided there are sufficient funds to meet existing contractual obligations and the cost of the change. This review is limited to the information contained within the submitted documents; it is not based on a site inspection and does not attest to the work in place or conditions at the construction site.
- This pay application review is limited to the information contained in the submitted documents; it is not based on a site inspection and does not attest to the correctness of the quantities or that the work has been performed in accordance with the contract documents.



cc:

Comments:

1. Project Manual: Please include RD Attachment to the AIA A201 General Conditions of the Contract RD Instruction 1942-A Guide 27, Attachment 4.

ATTACHMENT TO AIA DOCUMENT A701-1997, *Instructions to Bidders*

The provisions of this Attachment shall delete, modify and supplement the provisions contained in the "*Instructions to Bidders*," AIA Document A701-1997 Edition. The provisions contained in this Attachment will supersede any conflicting provisions of the AIA Document. The term "Agency," as used in this Attachment, shall mean the United States of America, acting through the United States Department of Agriculture.

ARTICLE 2, BIDDER'S REPRESENTATIONS

2.1 Add the following subparagraph to paragraph 2.1:

2.1.5 This Bid has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this Bid, with any other Bidder or with any competitor.

ARTICLE 4, BIDDING PROCEDURES

4.1.1 Add the following sentence to subparagraph 4.1.1:

Only one copy of the Bid is to be submitted.

4.2.1 Delete subparagraph 4.2.1 and substitute the following:

4.2.1 Each Bid must be accompanied by a Bid Bond payable to the Owner for five percent of the total amount of the Bid.

4.2.2 Delete Subparagraph 4.2.2 and substitute the following:

4.2.2 The Bid Bond shall be written on a form identical to that included in the Bidding Documents, and the attorney-in-fact who executes the Bid Bond on behalf of the surety shall affix to the Bid Bond a certified and current copy of the power of attorney.

4.2.3 Add the words "payment and performance" before the word "bonds";
and add the following to subparagraph 4.2.3:

As soon as the Bid prices have been compared, the Owner will return the Bid Bonds of all except the three lowest responsible Bidders. When the Agreement is executed, the Bid Bonds of the two remaining unsuccessful Bidders will be returned.

4.2 Add the following subparagraph to paragraph 4.2:

4.2.4 If a Bidder refuses to execute the Agreement or obtain the Performance and Payment Bonds within the agreed time, the Owner may consider the Bidder in default, in which case the Bid Bond accompanying the Bid shall become the property of the Owner.

4.3 Add the following subparagraphs to paragraph 4.3:

4.3.5 All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the Project, shall apply to the Contract throughout.

4.3.6 The Bidder agrees to abide by the requirements of Executive Order 11246, specifically including the provisions of the Equal Opportunity Clause and the Standard Federal Equal Employment Construction Contract Specifications set forth in the Supplementary Conditions.

4.3.7 The Bidder agrees to abide by the requirements of section 319 of Public Law 101-121, which pertains to lobbying activities and applies to recipients of contracts or subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. Each Bid shall be accompanied by a completed lobbying certification form identical to that included in the Bidding Documents.

4.3.8 The Bidder agrees to abide by the requirements under 7 C.F.R. part 3017, which pertains to the debarment or suspension of a person from participating in a Federal program or activity. Each Bid exceeding \$25,000 shall be accompanied by a relevant completed certification form identical to that included in the Bidding Documents.

4.4.1 Delete subparagraph 4.4.1 and substitute the following:

4.4.1 No Bidder may withdraw, modify or cancel a Bid within 60 calendar days after the actual date of the opening thereof. Should there be reasons why the Contract cannot be awarded within the specified period? The time may be extended by mutual agreement between the Owner and the Bidder, and the concurrence of the Agency.

4.4.4 Delete the words ", if required," from Subparagraph 4.4.4.

ARTICLE 5, CONSIDERATION OF BIDS

5.3.2 Delete subparagraph 5.3.2 and substitute the following:

5.3.2 The Owner shall have the right to accept Alternates in the sequence or combinations listed and to determine the low Bidder on the basis of the sum of the Base Bid and the Alternates accepted.

ARTICLE 7, PERFORMANCE BOND AND PAYMENT BOND

7.1.1 Delete subparagraph 7.1.1 and substitute the following:

7.1.1 Prior to execution of the Contract, the Bidder shall furnish Bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder. Both Bonds shall be separately written, each in the amount of the Contract Sum. The cost shall be included in the Bid.

7.1.2 Delete subparagraph 7.1.2 and substitute the following:

7.1.2 Surety companies executing Bonds must hold a certificate of authority as a acceptable surety on Federal Bonds as listed in Treasury Circular 570, as amended, and be authorized to transact business in the State where the Project is located.

7.1.3 Delete subparagraph 7.1.3.

7.2.1 Delete subparagraph 7.2.1 and substitute the following:

7.2.1 The Bidder to whom the Contract is awarded will be required to execute the Agreement and obtain Performance and Payment Bonds within ten (10) calendar days from the date when the Notice of Award is delivered to the Bidder. The Notice shall be accompanied by the necessary Agreement and Bond forms.

7.2.2 Delete subparagraph 7.2.2 and substitute the following:

7.2.2 The Bonds shall be written on forms identical to those included in the Bidding Documents.

(Note: Any additional provisions that are necessary to remain effective after execution of the Contract for Construction will be inserted here and continue in the same format.)

FEDERAL OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
(OSHA)

Sec. 31-53b. Construction safety and health course. New miner training program. Proof of completion required for mechanics, laborers, and workers on public works projects.

Enforcement. Regulations. Exceptions. (a) Each contract for a public works project entered into on or after July 1, 2009, by the state or any of its agents, or by any political subdivision of the state or any of its agents, described in subsection (g) of section 31-53, shall contain a provision requiring that each contractor furnish proof with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268.

(b) any person required to complete a course or program under subsection (a) of this section who has not completed the course or program shall be subject to removal from the worksite if the person does not provide documentation of having completed such course or program by the fifteenth day after the date the person is found to be in noncompliance. The Labor Commissioner or said commissioner's designee shall enforce this section.

(c) Not later than January 1, 2009, the Labor Commissioner shall adopt regulations, in accordance with the provisions of Chapter 54, to implement the provisions of subsections (a) and (b) of this section. Such regulations shall require that the ten-hour construction safety and health courses required under subsection (a) of this section be conducted in accordance with federal Occupational Safety and Health Administration Training Institute standards, or in accordance with 29 CFR 1910.268, as appropriate. The Labor Commissioner shall accept as sufficient proof of compliance with the provisions of subsection (a) or (b) of this section a student course completion card issue by the federal Occupational Safety and Health Administration Training Institute, or such other proof of compliance said commissioner deems appropriate, dated no earlier than five years before the commencement date of such public works project.

(d) This section shall not apply to employees of public service companies, as defined in section 16-1, or drivers of commercial motor vehicles driving the vehicle on the public works project and delivering or picking up cargo from public works projects provided they perform no labor relating to the project other than the loading and unloading of their cargo.

(P.A. 06-175, S.1; P.A. 08-83, S.1.)

History: P.A. 08-83 amended Subsec. (a) by making provisions applicable to public works project contracts entered into on or after July 1, 2009, replacing provision re total cost of work with reference to Sec. 31-53(g), requiring proof in certified payroll form that new

mechanic, laborer or worker has completed a 10 hour or more construction safety course and adding provision re new miner training program, amended Subsec. (b) by substituting "person" for "employee" and adding "or program", amended Subsec. (c) by adding "or in accordance with Federal Mine Safety and health Administration Standards" and setting new deadline of January 1, 2009. Deleted former Subsec. (d) re "public building". Added new Subsec. (d) re exemptions for public service company employees and delivery drivers who perform no labor other than delivery and made conforming and technical changes, effective July 1, 2009.

Informational Bulletin
The 10-Hour OSH Construction
Safety and Health Course

1. This requirement was created by Public Act No. 06-175, which is codified in Section 31-53b of the Connecticut General Statutes (pertaining to the prevailing wage statutes);
2. The course is required for public works construction projects (projects funded in whole or in part by the state or any political subdivision of the state) entered into on or after July 1, 2007.
3. It is required of private employees (not state or municipal employees) and apprentices who perform manual labor for a general contractor or subcontractor on a public building project where the total cost of all work to be performed is at least \$100,000.
4. The ten-hour construction course pertains to the ten-hour Outreach Course conducted in accordance with federal OSHA Training Institute standards, and, for telecommunications workers, a ten-hour training course conducted in accordance with federal OSHA standard, 29 CFR 1910.268.
5. The internet website for the federal OSHA Training Institute is http://www.osha.gov/fso/ote/training/edcenters/fact_sheet.html ;
6. The statutory language leaves it to the contractor and its employees to determine who pays for the cost of the ten-hour Outreach Course.
7. Within 30 days of receiving a contract award, a general contractor must furnish proof to the Labor Commissioner that all employees and apprentices performing manual labor on the project will have completed such a course.
8. Proof of completion may be demonstrated through either: (a) the presentation of a bona fide student course completion card issued by the federal OSHA Training Institute; or (2) the presentation of documentation of provided to an employee by a trainer certified by the Institute pending the actual issuance of the completion card.
9. Any card with an issuance date more than 5 years prior to the commencement date of the construction project shall not constitute proof of compliance.
10. Each employer shall affix a copy of the construction safety course completion card to the certified payroll submitted to the contracting agency in accordance with Conn. Gen. Stat. 31-53(f) on which such employee's name first appears.
11. Any employee found to be in non-compliance shall be subject to removal from the worksite if such employee does not provide satisfactory proof of course completion to the

Labor Commissioner by the fifteenth day after the date the employee is determined to be in non-compliance.

12. Any such employee who is determined to be in noncompliance may continue to work on a public building construction project for a maximum of fourteen consecutive calendar days while bringing his or her status into compliance.
13. The Labor Commissioner may make complaint to the prosecuting authorities regarding any employer or agent of the employer, or officer or agent of the corporation who files a false certified payroll with respect to the status of an employee who is performing manual labor on a public building construction project.
14. The statute provides the minimum standards required for the completion of a safety course by manual laborers on public construction contracts; any contractor can exceed these minimum requirements; and
15. Regulations clarifying the statute are currently in the regulatory process and shall be posted on the CTDOL website as soon as they are adopted in final form.

THE ABOVE INFORMATION IS PROVIDED EXCLUSIVELY AS AN EDUCATIONAL RESOURCE AND IS NOT INTENDED AS A SUBSTITUTE FOR LEGAL INTERPRETIONS, WHICH MAY ULTIMATELY ARISE CONCERNING THE CONSTRUCTION OF THE STATUTE OR THE REGULATIONS.

Bid Form

East Windsor Department of Public Works
Community Center
Alterations & Additions
28 Abbe Road
East Windsor, Connecticut

To: Town of East Windsor, Department of Public Works
6 Woolam Road, East Windsor, Connecticut 06088

From: Name of Bidder: _____

Address of Bidder: _____

1. The undersigned, having examined the Contract Documents, including the Contract Drawings, Project Description, and Instructions to Bidders, and having visited the site and examined the conditions affecting the work, hereby proposes and agrees to furnish all labor, material, equipment, and appliances, and to perform operations necessary to complete the work as required by said proposed Contract Documents, for the stipulated sum of:
 - A. The undersigned understands that there may be changes, omissions, or modification in the work, and that appropriate adjustments will be made to the Contract price in accordance with the Contract Documents. The undersigned understands that the Owner reserves the right to accept or reject any or all bids, and to waive all formalities, any irregularities, and accept the Bid deemed to be in the Owner's best interest.
 - B. Bid prices shall not include any sales, excise, or other taxes for which the Owner is not liable. Town of East Windsor is the awarding authority. The Bidder agrees to hold the above pricing for sixty (60) days.

- C. The Bid security in the sum of 5% OF TOTAL BID is to become the property of the Town in the event the above forms are not executed within the time set forth above, as liquidated damages, and not as a penalty for the delay and additional expense to the Town caused thereby.
- D. The undersigned acknowledges receipt of addendum numbers: _____
- E. The undersigned understands and agrees to comply with and be bounded by the Instructions to the Bidders used for this work.
- F. This Bidder hereby agrees to being work immediately upon receipt of the official Notice to Proceed and to substantially complete the work within sixty (60) days thereafter. In submitting this bid, it is agreed that this bid may not be withdrawn for a period of thirty (30) days from the date of bid opening.

Respectfully Submitted By: (Signature) _____

Name (Please Print): _____

Title: _____

SEAL
(If Bid is by a corporation)

Company: _____

Business Address: _____

Business Phone: () _____

Business Fax: () _____

Email Address: _____

License No.: _____

License Type: _____

Type of Business Entity: _____
(Corporation, co-partnership, individual, etc.)

Individual members of firm:

A. List subcontractors to be used and identify the work they will perform, or attach a separate list:

President of Corporation: _____

Secretary of Corporation: _____

Corporation is organized under law of the State of: _____

Bid dated this _____ day of _____, 2013.

END OF BID FORM

PERFORMANCE BOND

Bond No. _____

KNOW ALL MEN BY THESE PRESENTS:

THAT _____ as Principal,

Hereinafter called "PRINCIPAL," and _____

As Surety, hereinafter called "SURETY," are held and firmly bound unto the Town of

East Windsor, Connecticut, as Obligee, hereinafter called "TOWN," in the amount of

_____ Dollars, (\$ _____), for the payment whereof

PRINCIPAL and SURETY bind themselves, their heirs, executors, administrators, successors

and assigns, jointly and severally, firmly by these presents.

WHEREAS, PRINCIPAL has by written Contract dated _____

entered into a Contract with TOWN for _____

Which Contract is by reference made a part hereof, and is hereinafter referred to as the

"CONTRACT."

NOW, THEREFORE, the condition of this obligation is such that, if PRINCIPAL shall promptly and faithfully perform said CONTRACT, and shall certify in writing that all wages paid under said CONTRACT to any mechanic, laborer or workman were equal to the rates of wages customary or then prevailing for the same trade or occupation in the Town of East Windsor, then this obligation shall be null and void, otherwise it shall remain in full force effect.

Whenever PRINCIPAL shall be, and declared by the TOWN to be in default under the CONTRACT, the TOWN having performed its obligations thereunder, the SURETY may promptly remedy the default, or shall promptly:

1. Complete the CONTRACT in accordance with its terms and conditions; or
2. Obtain a bid or bids for submission to the TOWN for completing the CONTRACT in accordance with its terms and conditions, and upon determination by the TOWN and SURETY of the lowest possible bidder, arrange for a CONTRACT between such bidder and the TOWN, and make available as work progresses (even though there should be a

default or a succession of defaults under the CONTRACT or Contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Contract Price; but not exceeding, including other costs and damages for which the SURETY may be liable hereunder, the amount set forth in the first paragraph hereof. The term, "Balance of the Contract Price," as used in this paragraph, shall mean the total amount payable by the TOWN to PRINCIPAL under the CONTRACT and any amendments thereto, less the amount properly paid by the TOWN to the PRINCIPAL.

No right of action shall accrue on this bond to or for use of any person or corporation other than the TOWN named herein or the heirs, executors, administrators, or successors of TOWN.

Signed and sealed this _____ day of _____, A.D., 20_____.

In the Presence of:

_____ (SEAL)

(PRINCIPAL)

_____ By: _____

_____ (SURETY)

By: _____

LABOR AND MATERIAL PAYMENT BOND

Bond No. _____

Note: This bond is issued simultaneously with another bond in favor of the Town of East Windsor, Connecticut conditioned for the full and faithful performance of the Contract.

KNOW ALL MEN BY THESE PRESENTS:

THAT _____ as Principal, hereinafter called "PRINCIPAL," and _____ as Surety, hereinafter called "SURETY," are held and firmly bound unto the Town of East Windsor, Connecticut, as Obligee, hereinafter called "TOWN," for the use and benefit of claimants as herein below defined, in the amount of _____ Dollars (\$ _____), for the payment whereof PRINCIPAL and SURETY bind themselves, their heirs, executors, administrators, successors, and assign, jointly and severally, firmly by these presents.

WHEREAS, PRINCIPAL has by written Contract dated _____ entered into a Contract with Town for _____ made a part hereof and is hereinafter referred to as the "CONTRACT."

NOW, THEREFORE, the condition of this obligation is such, that if the said PRINCIPAL shall pay for all labor and materials furnished to himself or his Subcontractors for use in the prosecution of the Work, and used therein, then, this obligation to be void; otherwise, to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Sections 49-41, 49-41a, 41-49b, 49-42 and 49-43 of the General Statutes (C.G.S.A. and Supp. 1989) of the State of Connecticut and any other applicable laws, and the rights and liabilities hereunder shall be determined and limited by said sections and said other applicable laws, to the same extent as if they were copied at length herein.

Signed and sealed this _____ day of _____, A.D., 20_____.

In the Presence of:

(PRINCIPAL) (SEAL)

By: _____

(SURETY)

By: _____

CONTRACT

THIS Contract, made this by and between the Town of East Windsor, a municipality located within the County of Hartford in the State of Connecticut, acting through its First Selectman, hereinafter called "TOWN," and hereinafter termed the "CONTRACTOR."

WITNESSETH: That the parties to this Agreement each in consideration of the Agreements on the part of the other herein contained have agreed, and by these presents do hereby agree, the TOWN for itself, and the CONTRACTOR for himself and his heirs, executors, administrators, successors, and assigns, as follows:

- A. That the Contract Documents consist of this Contract, together with all attachments including but not limited to, the Legal and Procedural Documents, General Conditions, Technical Specifications, Contract Drawings, Exhibits and Addenda issued before execution of the Contract, for the Contract, all of which are included as if fully set forth herein.
- B. That the CONTRACTOR has informed himself fully regarding all conditions pertaining to the place where the Work is to be done and other circumstances affecting the Work.
- C. That the CONTRACTOR has obtained all the information he needed to enable him to estimate fully and fairly the costs of the Work herein contemplated.
- D. That the CONTRACTOR shall furnish all plant, labor, materials, supplies, tools, equipment, other facilities, and things necessary for or incidental to properly construct the following:

"Alterations and Additions"

for the TOWN, in accordance with this Contract, and completing everything required of him under this Contract not later than the time stipulated in the Special Instructions to Bidders and the Form of General Bid.

- E. The CONTRACTOR hereby agrees to commence the work under this Contract on the date to be specified in written Notice to Proceed from the TOWN.
- F. The TOWN shall pay, and the CONTRACTOR shall receive as full compensation for fulfilling everything required of the CONTRACTOR under this Contract, the unit prices and lump sums recorded in the Bid, a copy of which is appended to and is made a part of this CONTRACT.

CONTRACT

G. That the quantities shown in the Bid are approximate only and are solely for the purpose of facilitating the comparison of Bids, that the TOWN shall not be held responsible if these quantities are not even approximately correct, that for all Work upon which unit prices are quoted the CONTRACTOR'S compensation shall be computed upon the Work actually performed, measured by the units of measurement specified, whether greater or less than the quantities as shown in the Bid, and that the unit prices set against the several items cover all incidental services required of the CONTRACTOR under the Contract.

That the CONTRACTOR shall give to the TOWN as liquidated damages, not as a penalty, the sum, if any, as specified in the Special Instruction to Bidders, for each day required by the CONTRACTOR to complete the Work of the Contract beyond the time herein stipulated.

IN WITNESS WHEREOF, the parties to these presents have executed this CONTRACT in the year and day first above mentioned.

East Windsor
(TOWN)

(SEAL)

By: _____
Jason Bowsza

First Selectman
(TITLE)

(CONTRACTOR)

(SEAL)

By: _____

(TITLE)

IMPORTANT: Execute Acknowledgement of Officer or Agent of Contractor who signs this document (use proper form next page).

CONTRACT

(ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION)

State of _____)
County of _____) SS:

On This _____ Day of _____, 20____, before me personally, came and appeared _____ to me known, who, being by me duly sworn, did depose and say that s/he resides at _____ and that s/he is the _____ of _____, the Corporation described in and which executed the foregoing instrument: that s/he knows the seal of said Corporation; that one of the impressions affixed to said instrument is an impression of such seal; that it was so affixed by order of the Directors of said Corporation, and that s/he signed his/her name thereto by like order.

(SEAL)

NOTARY PUBLIC

CONTRACT

(ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION)

State of _____)
) SS:
County of _____)

On This _____ Day of _____, 20____, before me
personally came and appeared _____ to me known,
and known to me to be, one of the members of the firm of

_____, described in and who executed the same as and for the
act and deed of said firm.

(SEAL)

NOTARY PUBLIC

CONTRACT

(ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION)

State of _____)
) SS:
County of _____)

On This _____ Day of _____, 20____, before me
personally, came and appeared _____ to me known,
and
known to me to be, one of the members of the firm of _____
_____, described in and who executed the same as and for the
act and deed of said firm.

(SEAL)

NOTARY PUBLIC

CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION
CONTRACTORS WAGE CERTIFICATION FORM

I, _____ of _____
Officer, Owner, Authorized Rep. Company Name

do hereby certify that the _____
Company Name

Street

City

And all of its subcontractors will pay all workers on the

Project Name and Number

Street and City

the wages as listed in the schedule of prevailing rates required for such project (a copy of which is attached hereto).

Signed

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

Notary Public

Return to:

Connecticut Department of Labor
Wage & Workplace Standards Division
200 Folly Brook Blvd.
Wethersfield, CT 06109

Rate Schedule Issued (Date): _____

ATTACHMENT TO AIA DOCUMENT A101-1997, *Standard Form of Agreement Between Owner and Contractor*

The provisions of this Attachment shall delete, modify and supplement the provisions contained in the "*Standard Form of Agreement Between Owner and Contractor*," AIA Document A101-1997 Edition. The provisions contained in this Attachment shall supersede any conflicting provisions of the AIA Document. The term "Agency," as used in this Attachment, shall mean the United States of America, acting through the United States Department of Agriculture.

ARTICLE 3, DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

3.1 Delete paragraph 3.1 and substitute the following:

3.1 The date of commencement shall be contained in by the Notice to Proceed.

3.3 Add the following sentences to paragraph 3.3

If the Work is not substantially complete on or before this date, or within this period of time, or extension thereof granted by the Owner, the Owner will sustain damage that will be impracticable and extremely difficult to quantify in the event of and by reason of such delays. The Contractor shall pay to the Owner liquidated damages in the sum of \$_____ for each calendar day of delay. Any sums that may be due the Owner as liquidated damages may be deducted from any monies due or to become due the Contractor under the Contract or may be collected from the Contractor's surety.

ARTICLE 5, PAYMENTS

5.1.6 Insert "ten" and "10" in the appropriate spaces in subparagraphs 5.1.6.1 and 5.1.6.2.

5.1.8 Insert the following sentences in subparagraph 5.1.8:

The amount retained shall be 10% of the value of Work until 50% of the Work has been completed. At 50% completion, further partial payments shall be made in full to the Contractor and no additional amounts may be retained unless the Architect certifies that the Work is not proceeding satisfactorily, but amounts previously retained shall not be paid to the Contractor. At 50% completion or any time thereafter when the progress of the Work is not satisfactory, additional amounts may be retained but in no event shall the total retainage be more than 10% of the value of Work completed.

ARTICLE 7, MISCELLANEOUS PROVISIONS

7.6 Add the following subparagraph to article 7.6:

7.6.1 This Agreement shall not become effective until concurred in writing by the Agency. Such concurrence shall be evidenced by the signature of a duly authorized representative of the Agency in the space provided at the end of the Agency Attachment to this Agreement. The concurrence so evidenced by the Agency shall in no way commit the Agency to render financial assistance to the Owner and is without liability to the Agency for any payment hereunder, but in the event such assistance is provided, the concurrence shall signify the provisions of this Agreement are consistent with Agency requirements.

ARTICLE 8, ENUMERATION OF CONTRACT DOCUMENTS

The following Documents should be referenced, if applicable:

Subparagraph 8.1.3:

Attachment to the *Standard Form of Agreement Between Owner and Contractor* (RD Instruction 1942-A, Guide 27, Attachment 3)
General Conditions of the Contract for Construction, AIA A201-1997
Attachment to the *General Conditions of the Contract for Construction* (RD Instruction 1942-A, Guide 27, Attachment 4)
Federal Supplementary Conditions of the Contract for Construction (AIA Document A201/SC) Attachment to the *Federal Supplementary Conditions of the Contract for Construction* (RD Instruction 1942-A, Guide 27, Attachment 5) Special Conditions

Subparagraph 8.1.7:

Invitation for Bids (Form RD 1924-5)
Instructions to Bidders (AIA Document A701)
Supplementary Instructions to Bidders (RD Instruction 1942-A, Guide 27, Attachment 2)
Bid Form
Bid Bond
Compliance Statement (Form RD 400-6)
Payment Bond
Performance Bond
Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions (Form AD 1048)
Disclosure of Lobbying Activities (SF-LLL)
Certification for Contracts, Grants and Loans (RD Instruction 1940-Q, Exhibit A-1)

SIGNATURE BLOCK:

Delete the signature block on page 7 of this Agreement and substitute the block on the following page:

(08-26-98) PN 296

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in duplicate on the respective dates indicated below:

OWNER:

ATTEST: _____ By _____
Type Name _____ Type Name _____
Title _____ Title _____
Date _____ Date _____

CONTRACTOR:

ATTEST: _____ By _____
Type Name _____ Type Name _____
Title _____ Title _____
Date _____ Date _____

AGENCY CONCURRENCE:

By _____
Type Name _____
Title _____
Date _____

o0o

ATTACHMENT TO AIA DOCUMENT A201-2017, *General Conditions of the Contract for Construction*

The provisions of this attachment shall delete, modify and supplement the provisions contained in the "*General Conditions of the Contract for Construction*," AIA Document A201-2017 Edition. The provisions contained in this attachment will supersede any conflicting provisions of the AIA Document. The term "Agency," as used in this Attachment, shall mean the United States of America, acting through the United States Department of Agriculture.

ARTICLE 1, GENERAL PROVISIONS

Add the following subparagraph:

1.2.4 Concurrence of the Contract by the Agency is required before it is effective.

ARTICLE 2, OWNER

Delete subparagraph 2.3.6 and substitute the following:

2.3.6 The Contractor will be furnished, free of charge, _____ copies of the Drawings and Projects Manuals necessary for execution of the Work. Additional copies will be available from the Architect at the cost of reproduction and handling.

ARTICLE 4, ARCHITECT

Add the following to subparagraph 4.1.1:

The term "Architect" means the Architect, or the Engineer when the nature of the work is within the authority granted engineers by the State licensure law, or an authorized representative of the Architect or Engineer.

ARTICLE 5, SUBCONTRACTORS

Add the following to subparagraph 5.2.2:

The Contractor shall not contract with any party who is suspended or debarred by any Federal government agency from participating in Federally assisted construction projects.

ARTICLE 7, CHANGES IN THE WORK

Delete the words ", Construction Change Directive" from subparagraph 7.1.1.

Insert the words ", Agency " after the word "Owner," and delete the words "A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor" in subparagraph 7.1.2.

Delete the words "Construction Change Directive" from subparagraph 7.1.3.

Delete subparagraph 7.2.1 and substitute the following:

7.2.1 A Change Order is a written order to the Contractor utilizing Form RD 1924-7, "Contract Change Order," or AIA G-701 signed by the Owner, Architect, Contractor, and the Agency representative. It is issued after the execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. The Contractor's signing of a Change Order indicates complete agreement therein.

Add subparagraph 7.2.2:

7.2.2 Methods used in determining adjustments to the Contract Sum may include any of the following:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluating.
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon.

Add the following sentence to paragraph 7.3.1: "A Construction Change Directive may be used only for a change in response to an emergency as described in paragraph 10.4.

Delete subparagraph 7.3.2.

Add the following, where appropriate, to 7.3.3 through 7.3.10: "When the use of a Construction Change Directive is justified"

ARTICLE 8, TIME

Add the following subparagraphs:

8.2.4 The Notice to Proceed shall be issued within twenty (20) calendar days of the execution of the Agreement by the Owner. Should there be reasons why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement of the Owner and Contractor, with the concurrence of the Agency. If the Notice to Proceed has not been issued within the twenty (20) calendar day period or within the period mutually agreed, the Contractor may terminate the Agreement without further liability on the part of either party.

8.3.4 As outlined in Article 3 of the Agreement, the Contractor agrees to pay liquidated damages to the Owner for each calendar day the Contractor shall be in default.

ARTICLE 9, PAYMENTS AND COMPLETION

Delete clause 9.3.1.1 and substitute the following:

9.3.1.1 Work performed and materials supplied under a Change Order may be included for payment only after the Change Order has been approved by all appropriate parties, including the Agency.

Add the words ", using AIA Document 702, 'Application and Certificate for Payment' or Form RD 1924-18, 'Partial Payment Estimate'," after "Certificate for Payment" in subparagraph 9.4.1.

Add the following subparagraph:

9.6.9 No progress payments will be made that deplete the retainage, nor place in escrow any funds that are required for retainage, nor invest the retainage for the benefit of the Contractor. Retainage will not be adjusted until after construction is substantially complete.

Replace the word "seven" with the words "fifteen (15)" in the first sentence, second line of subparagraph 9.7.

Delete subparagraph 9.8.5, after the first sentence, and substitute the following:

9.8.5 When the Work has been substantially completed, except for Work which cannot be completed because of weather conditions, lack of materials or other reasons, which, in the judgment of the Owner, are valid reasons for non-completion, the Owner may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the Work still to be completed. Provide a copy of the Certificate to the Agency.

Delete subparagraphs 9.9.1 and add the following:

9.9.1 The Contractor agrees to the use and occupancy of a portion or unit of the Project before formal acceptance by the Owner under the following conditions:

- .1 A "Certificate of Substantial Completion" shall be prepared and executed as provided in subparagraph 9.8.4, except that when, in the opinion of the Architect, the Contractor is chargeable with unwarranted delay in completing the Work or other Contract requirements, the signature of the Contractor will not be required. The Certificate of Substantial Completion shall be accompanied by a written endorsement of the Contractor's insurance carrier and surety permitting occupancy by the Owner during the remaining period of the Project Work. Occupancy and use by the Owner shall not commence until authorized by public authorities having jurisdiction over the Work.
- .2 Occupancy by the Owner shall not be construed by the Contractor as being an acceptance of that part of the Project to be occupied.
- .3 The Contractor shall not be held responsible for any damage to the occupied part of the Project resulting from the Owner's occupancy.
- .4 Occupancy by the Owner shall not be deemed to constitute a waiver of existing claims in behalf of the Owner or Contractor against each other.
- .5 If the Project consists of more than one building, and one of the buildings is to be

occupied, the Owner, prior to occupancy of that building, shall secure permanent property insurance on the building to be occupied and necessary permits which may be required for use and occupancy.

Add to subparagraph 9.9.3: Use and occupancy by the Owner prior to Project acceptance does not relieve the Contractor of responsibility to maintain all insurance and bonds required of the Contractor under the Contract Documents until the Project is completed and accepted by the Owner.

ARTICLE 11, INSURANCE AND BONDS

Replace the words "the Contract Documents" with the words "subparagraph 11.1.1" in the first sentence of subparagraph 11.1.2.

Add the following subparagraph:

11.1.1. Insurance shall be:

- .1 Written with a limit of liability of not less than \$500,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident; and a limit of liability of not less than \$500,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than \$200,000 for all property damage sustained by any one person in any one accident; and a limit of liability of not less than \$200,000 aggregate for any such damage sustained by two or more persons in any one accident, or
- .2 Written with a combined bodily injury and damage liability of not less than \$700,000 per occurrence; and with an aggregate of not less than \$700,000 per occurrence.

Add the following sentence to the end of subparagraph 11.3.1:

The provisions of this subparagraph shall apply to the Contractor if the Contractor purchases and maintains said insurance coverage.

Delete subparagraph 11.1.2 and substitute the following:

11.1.2 The Contractor shall furnish the Owner bonds covering faithful performance of the Contract and payment of obligations arising thereunder within ten (10) calendar days after receipt of the Notice of Award. The surety company executing the bonds must hold a certificate of authority as an acceptable surety on Federal bonds as listed in Treasury Circular 570, and be authorized to transact business in the State where the Project is located. The bonds (using the forms included in the Bidding Documents) shall each be equal to the amount of the Contract Sum. The cost of these bonds shall be included in the Contract Sum

Add the following subparagraphs:

11.1.3.1 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current power of attorney.

11.1.3.2 If at any time a surety on any such bond is declared bankrupt or loses its right to do business in the State in which the work is to be performed or is removed from the list of surety companies accepted on Federal Bonds, the Contractor shall within ten (10) calendar days after notice from the Owner to do so, substitute an acceptable bond in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums of such bond shall be paid by any Contractor. No further payment shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond to the Owner.

ARTICLE 13, MISCELLANEOUS PROVISIONS

Add the following paragraphs:

13.6 LANDS AND RIGHTS-OF WAY

13.6.1 Prior to the start of construction, the Owner shall obtain all lands and rights-of-way necessary for the execution and completion of work to be performed under this contract.

13.7 EQUAL OPPORTUNITY REQUIREMENTS

Non-discrimination in Employment by Federally Assisted Construction Contractors, by Executive Order 11246.

13.7.1 This section summarizes Executive Order 11246, which prohibits employment discrimination and requires employers holding non-exempt Federal contracts and subcontracts and federally-assisted construction contracts and subcontracts in excess of \$10,000 to take affirmative action to ensure equal employment opportunity without regard to race, color, religion, sex, or national origin. The Executive Order requires, as a condition for the approval of any federally assisted construction contract, that the applicant incorporate nondiscrimination and affirmative action clauses into its non-exempt federally assisted construction contracts.

13.7.2 Executive Order 11246, is administered and enforced by the Office of Federal Contract Compliance Programs (OFCCP), an agency in the U.S. Department of Labor's Employment Standards Administration. OFCCP has issued regulations at 41 CFR chapter 60 implementing the Executive Order. The regulations at 41 CFR part 60-4 establish the procedures which the Agency, as an administering agency, must follow when making grants, contracts, loans, insurance or guarantees involving federally assisted construction which is not exempt from the requirements of Executive Order 11246. The regulations which apply to Federal or federally assisted construction contractors also are published at 41 CFR part 60-4.

13.7.3 OFCCP has established numerical goals for minority and female utilization in construction work. The goals are expressed in percentage terms for the contractor's aggregate workforce in each trade. OFCCP has set goals for minority utilization based on the percentage of minorities in the civilian labor force in the relevant area. There is

a single nationwide goal of 6.9 percent for utilization of women. The goals apply to all construction work in the covered geographic area, whether or not it is federal, federally assisted or non-federal. A notice advises bidders of the applicable goals for the area where the project is to be located.

13.7.4 Application. This section applies to all of a construction contractor's or subcontractor's employees who are engaged in on-site construction including those construction employees who work on a non-Federal or non-Federally assisted construction site.

13.7.4.1 Agency officials will notify the appropriate Regional Director of OFCCP that an Agency financed construction contract has been awarded, and that the equal opportunity clauses are included in the contract documents.

13.7.4.2 The Regional Director, OFCCP-DOL, will enforce the non-discrimination requirements of Executive Order 11246.

13.7.5 The prospective contractor or subcontractor must comply with the Immigration Reform and Control Act of 1986, by completing and retaining Form I-9, "Employment Eligibility Verification," for employees hired. This form is available from the Immigration and Naturalization Service, and Department of Justice.

13.7.6 The prospective contractor or subcontractor must submit Form RD 400-6, "Compliance Statement," to the applicant and an Agency official as part of the bid package, prior to any contract bid negotiations and comply with the Executive Order 11246 as stated in the contract documents.

13.8 STATUTES

13.8.1 The Contractor and each Subcontractor shall comply with the following statutes (and with regulations issued pursuant thereto, which are incorporated herein by reference):

13.8.1.1 Copeland Anti-Kickback Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR part 3). This Act provides that each Contractor shall be prohibited from inducing, by any means, any person in connection with construction to give up any part of the compensation to which the person is otherwise entitled.

13.8.1.2 Clean Air Act (42 U.S.C. 7414), section 114, and Water Pollution Control Act (33 U.S.C. 1813), section 308. Under Executive Order 11738 and Environmental Protection Agency (EPA) regulations 40 C.F.R. part 15, all Contracts in excess of \$100,000 are required to comply with these Acts. The Acts require the Contractor to:

- .1 Notify the Owner of the receipt of any communication from EPA indicating that a facility to be utilized in the performance of the Contract is under consideration to be listed on the EPA list of Violating Facilities.
- .2 Certify that any facility to be utilized in the performance of any nonexempt Contractor or Subcontractor is not listed on the EPA list of Violating Facilities as of the date of the Contract Award.
- .3 Include or cause to be included the above criteria and requirements of paragraphs .1 and .2 in every nonexempt subcontract, and that the Contractor will take such action as the Government may direct as a means of enforcing such provisions.

13.8.1.3 Restrictions on Lobbying (Public Law 101-121, section 319) as supplemented in Department of Agriculture regulations (7 CFR part 3018). This statute applies to the recipients of contracts or subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, the Contractor must complete a certification form on lobbying activities related to the specific Federal loan or grant that is a funding source for this contract. The certification and disclosure forms shall be provided by the Owner.

13.9 RECORDS

13.9.1 If the Contract is based on a negotiated Bid, the Owner, the Agency, the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor which are pertinent to a specific Federal loan program for the purpose of making audit, examination, excerpts, and transcriptions. The Contractor shall maintain records for at least three years after the Owner makes final payment and all other pending matters are closed.

13.10 ENVIRONMENTAL REQUIREMENTS

13.10.1 Mitigation Measures - The contractor shall comply with applicable mitigation measures established in the environmental assessment for the project. These may be obtained from the Agency representative.

13.10.2 The Contractor, when constructing a Project involving trenching, excavating, or other earth moving activity, shall comply with the following environmental constraints:

13.10.2.1 Endangered Species, Historic Preservation, Human Remains and Cultural Items, Hazardous Materials, and Paleontology - Any excavation or other earth moving activity by the Contractor that provides evidence of the presence of endangered or threatened species or their critical habitat, uncovers a historical or archaeological artifact, human remains or cultural items, hazardous materials, a fossil or other paleontological materials will require the Contractor to:

- .1 Temporarily stop work;
- .2 Provide immediate notice to the Architect and the Agency, and in the case of potentially hazardous materials, provide immediate notice to local first responders and take such measures as necessary to protect the public and workers;
- .3 Take reasonable measures as necessary to protect the discovered materials or protected resource;
- .4 Abide by such direction as provided by the Agency, or Agencies responsible for resource protection or hazardous materials management; and
- .5 Resume work only upon notice from the Architect and the Agency.

13.10.3 Lead-Based Paint - The Contractor and Owner shall comply with applicable Agency requirements of the Lead-Based Paint Poisoning Prevention Act, as amended (42 U.S.C. 4821), and the Residential Lead-Based Paint Hazard Reduction Act of 1992 (42 U.S.C. 4851) for rehabilitation work on residential property built prior to 1978.

13.11 DEBARMENT AND SUSPENSION

13.11.1 The Contractor shall comply with the requirements of 7 CFR part 3017, which pertains to the debarment or suspension of a person from participating in a Federal program or activity.

ARTICLE 15 CLAIMS AND DISPUTES

Add the words "may be" after "on the parties but" in the last sentence of subparagraph 15.2.5.

Replace the word "shall" with the word "may" in the first sentence, first occurrence of subparagraph 15.3.2

Add the subparagraph: 15.4.1.2 The arbitrators will select a hearing location as close to the Owner's locale as possible.

oOo

NOTICE OF AWARD

TO: _____

PROJECT Description: _____

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated _____, 20____, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$_____.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR's Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

(note if Bonds are not required remove the reference to Bonds. Remove this note)

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____, 20____.

Owner

By _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged

by _____,
this the _____ day of _____, 20____.
By _____
Title _____

NOTICE TO PROCEED

TO: _____ Date: _____
 _____ Project: _____

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 19____, on or before _____, 19____, and you are to complete the WORK within _____ consecutive calendar days thereafter. The date of completion of all WORK is therefore _____, 19____.

 Owner

By _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED

is hereby acknowledged this the

_____, 19____

By _____

Title _____

Employer Identification
 Number _____

COMPLIANCE STATEMENT

This statement relates to a proposed contract with _____

(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

1. I have, have not, participated in a previous contract or subcontract subject to Executive Order 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.
2. If I have participated in such a contract or subcontract, I have, have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.
 If the proposed contract is for \$50,000 or more: or If the proposed nonconstruction contract is for \$50,000 or more and I have 50 or more employees, I also represent that:
3. I have, have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, I have, have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays the valid OMB control number. The valid OMB control number for this information collection is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, may 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

DATE _____

(Signature of Bidder or Prospective Contractor)

Address (including Zip Code)

COMPLIANCE STATEMENT

This statement relates to a proposed contract with _____

(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

1. I have, have not, participated in a previous contract or subcontract subject to Executive 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.
2. If I have participated in such a contract or subcontract, I have, have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.

If the proposed contract is for \$50,000 or more and I have 50 or more employees, I also represent that:

3. I have, have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, I have, have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods): (See Reverse).

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

(name)

(date)

(title)

oOo

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e. quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

DATE _____

(Signature of Bidder or Prospective Contractor)

Address (including Zip Code)

U.S. DEPARTMENT OF AGRICULTURE

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION - LOWER TIER COVERED TRANSACTIONS

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR Part 3017, Section 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989, Federal Register (pages 4722-4733). Copies of the regulations may be obtained by contacting the Department of Agriculture agency with which this transaction originated.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

- (1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Organization Name

PR/Award Number or Project Name

Name(s) and Title(s) of Authorized Representative(s)

Signature(s)

Date

Instructions for Certification

1. By signing and submitting this form, the prospective lower tier participant is providing the certification set out on the reverse side in accordance with these instructions.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms “covered transactions,” “debarred,” “suspended,” “ineligible,” “lower tier covered transactions,” “participant,” “person,” “primary covered transaction,” “principal,” “proposal,” and “voluntarily excluded,” as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this form that it will include this clause titled “Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions,” without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.



AIA Document G702® - 1992

Application and Certificate for Payment

TO OWNER:

PROJECT: E Windsor Community Center

APPLICATION NO: 001

Distribution to:

FROM CONTRACTOR:

VIA ARCHITECT:

PERIOD TO:

OWNER:

CONTRACT FOR: General Construction

ARCHITECT:

CONTRACT DATE:

CONTRACTOR:

PROJECT NOS: / /

FIELD:

OTHER:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. AIA Document G703®, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM \$0.00

2. NET CHANGE BY CHANGE ORDERS \$0.00

3. CONTRACT SUM TO DATE (Line 1 ± 2) \$0.00

4. TOTAL COMPLETED & STORED TO DATE (Column G on G703) \$0.00

5. RETAINAGE:

a. 0 % of Completed Work (Column D + E on G703) \$0.00

b. 0 % of Stored Material (Column F on G703) \$0.00

Total Retainage (Lines 5a + 5b or Total in Column I of G703) \$0.00

6. TOTAL EARNED LESS RETAINAGE \$0.00

(Line 4 Less Line 5 Total)

7. LESS PREVIOUS CERTIFICATES FOR PAYMENT \$0.00

(Line 6 from prior Certificate)

8. CURRENT PAYMENT DUE \$0.00

9. BALANCE TO FINISH, INCLUDING RETAINAGE \$0.00

(Line 3 Less Line 6)

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	\$0.00	\$0.00
Total approved this Month	\$0.00	\$0.00
TOTALS	\$0.00	\$0.00
NET CHANGES by Change Order		\$0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of: _____

Country of: _____

Subscribed and sworn to before _____

me this _____ day of _____

Notary Public: _____

My Commission expires: _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED \$0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT: _____

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

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AIA[®]

Document G701[®] – 2017

Change Order

PROJECT: *(Name and address)*

E Windsor Community Center

CONTRACT INFORMATION:

Contract For: General Construction

Date:

CHANGE ORDER INFORMATION:

Change Order Number: 001

Date:

OWNER: *(Name and address)*

ARCHITECT: *(Name and address)*

CONTRACTOR: *(Name and address)*

THE CONTRACT IS CHANGED AS FOLLOWS:

(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits. Also include agreed upon adjustments attributable to executed Construction Change Directives.)

The original Contract Sum was	\$	<u>0.00</u>
The net change by previously authorized Change Orders	\$	<u>0.00</u>
The Contract Sum prior to this Change Order was	\$	<u>0.00</u>
The Contract Sum will be increased by this Change Order in the amount of	\$	<u>0.00</u>
The new Contract Sum including this Change Order will be	\$	<u>0.00</u>

The Contract Time will be increased by Zero (0) days.

The new date of Substantial Completion will be

NOTE: This Change Order does not include adjustments to the Contract Sum or Guaranteed Maximum Price, or the Contract Time, that have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

ARCHITECT *(Firm name)*

CONTRACTOR *(Firm name)*

OWNER *(Firm name)*

SIGNATURE

SIGNATURE

SIGNATURE

PRINTED NAME AND TITLE

PRINTED NAME AND TITLE

PRINTED NAME AND TITLE

DATE

DATE

DATE



AIA[®]

Document G704[®] – 2017

Certificate of Substantial Completion

PROJECT: *(name and address)*

CONTRACT INFORMATION:

Contract For:
Date:

CERTIFICATE INFORMATION:

Certificate Number: 001
Date:

OWNER: *(name and address)*

ARCHITECT: *(name and address)*

CONTRACTOR: *(name and address)*

The Work identified below has been reviewed and found, to the Architect's best knowledge, information, and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated below is the date established by this Certificate.
(Identify the Work, or portion thereof, that is substantially complete.)

ARCHITECT *(Firm Name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE OF SUBSTANTIAL COMPLETION

WARRANTIES

The date of Substantial Completion of the Project or portion designated above is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:
(Identify warranties that do not commence on the date of Substantial Completion, if any, and indicate their date of commencement.)

WORK TO BE COMPLETED OR CORRECTED

A list of items to be completed or corrected is attached hereto, or transmitted as agreed upon by the parties, and identified as follows:
(Identify the list of Work to be completed or corrected.)

The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment, whichever occurs first. The Contractor will complete or correct the Work on the list of items attached hereto within () days from the above date of Substantial Completion.

Cost estimate of Work to be completed or corrected: \$

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work, insurance, and other items identified below shall be as follows:
(Note: Owner's and Contractor's legal and insurance counsel should review insurance requirements and coverage.)

The Owner and Contractor hereby accept the responsibilities assigned to them in this Certificate of Substantial Completion:

CONTRACTOR *(Firm Name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE

OWNER *(Firm Name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE



AIA[®] Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: <i>(Name and address)</i>	ARCHITECT'S PROJECT NUMBER:	OWNER: <input type="checkbox"/>
	CONTRACT FOR:	ARCHITECT: <input type="checkbox"/>
TO OWNER: <i>(Name and address)</i>	CONTRACT DATED:	CONTRACTOR: <input type="checkbox"/>
		SURETY: <input type="checkbox"/>
		OTHER: <input type="checkbox"/>

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

on bond of
(Insert name and address of Contractor)

, SURETY,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall
not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, CONTRACTOR,

as set forth in said Surety's bond.

, OWNER,

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

(Surety)

(Signature of authorized representative)

(Printed name and title)

Attest:
(Seal):

Date _____

Dear Sir:

I hereby acknowledge the receipt of _____ dollars
(\$ _____) in full payment of my contract dated _____ for improvement work which I did for you and
which is described in my contract.

I certify that I have paid in full for all materials purchased and all labor employed in the performance of this contract, and that there
are no claims against me under this contract on account of injuries sustained by workers employed by me or by subcontractors
thereunder. I hereby release you from any claims arising by virtue of this contract.

I am attaching Form RD 1924-10, "Release by Claimants," signed by all persons from whom I have purchased materials and by all
subcontractors and all persons employed in connection with my contract with the above-named borrower.

WARNING

**The statements and representations made above are made in connection with construction financed in whole or
in part by the United States Department of Agriculture (USDA). The statements and representations will be
used to determine the release of USDA provided funds. The making of any false statement or misrepresentation
herein may be a crime punishable under Title 18 U.S.C. § 1001 which provides in part: "Whoever, in any matter
within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals or
covers up by any trick, scheme, or device a material fact, or makes any false, fictitious or fraudulent statements or
representations, or makes or uses any false writing or statement or entry, shall be fined under [title 18 of the United
States code] or imprisoned not more than five years, or both.**

Sincerely,

Contractor

Position 6

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-0042. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

RELEASE BY CLAIMANTS

The undersigned, having received payment in full for all labor, materials, supplies, or equipment supplied to _____, Contractor,
 or to any subcontractor, in the construction or repair of the improvements upon the property located at:

 _____, and furnished in the execution and fulfillment of contract between said Contractor and
 _____ Owner, dated
 _____, do (does) hereby release and waive any and all claims, liens, and lien rights, of any kind, nature, or description whatsoever, against said property and the Owner thereof, and against said Contractor.

<i>Lien or Claimant</i>	<i>Work or Materials</i>	<i>Amount</i>	<i>Date</i>

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-0042. The time required to complete this information collection is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

SECTION 01 00 00 - CONSOLIDATED GENERAL REQUIREMENTS

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PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. This Section applies to all Work performed under the Contract.
- C. Owner Standards are made part of this Project Manual and incorporated by reference. See Owner for copies.
- D. Comply with the special requirements of Owner and attached or referenced documents.

1.2. SUMMARY OF WORK & PROJECT REQUIREMENTS

- A. Project Identification: As listed on cover page and in header.
- B. The work consists of:
 - 1. New construction.
 - 2. Alterations and additions.
 - 3. Selective demolition.
 - 4. All MEP trades; indicated site, civil, and landscape work.
 - 5. Coordination with the vendors, suppliers and installers of this Contract.
 - 6. A separate FF&E contract entered into by the Owner to provide furniture and/or equipment.
- C. Pricing & Contracting Requirements: Refer to Owner and Article 1.9 below.
- D. Comply with the Owner Standards. Specific attention is directed to:
 - 1. Written reports to be provided to the Owner Project Manager detailing subcontractors at the site, workers per sub, Contractor's workers at the site, weather conditions, description of work done, deliveries, Owner/Architect instructions and decisions. Deliver report to Owner's designated representative office the next following working day.

2. Requirements for regular project meetings, at intervals required by Owner or Architect.
 3. Construction Scheduling.
 4. Work hours, which are typically 7:00 to 5:00 unless otherwise arranged and approved in writing.
 5. Comply with requirements for permits, details, fire watch and shut downs. Note that addition fees for accelerated construction and off hours work and scheduling of work during on holidays or other times will not be permitted regardless of the fact that authorities having jurisdiction may prohibit work at certain hours or on certain days.
 6. Management of fire detectors and coordination with Fire Marshalls in locality having jurisdiction.
 7. Parking arrangements.
 8. The requirement for monthly progress photos.
 9. Punch list staffing and requirements
 10. Compliance with Factory Mutual Standards.
 11. The Owner's right to occupy and place equipment in completed areas of the building prior to Substantial Completion which does not interfere with the completion of the Work.
 12. Construction Management software: Where required by Owner or Architect, It is a contract requirement that software compatible with Architect/Owner systems be used during all construction phases. This included management and scheduling software.
 13. Owner Tax Exempt Status: Comply with the requirements of state statutes for payment of state taxes in connection with construction projects performed for tax exempt entities. Verify Owner status.
- E. Sustainable Design Intent: The Project is intended to be of sustainable or "green" design, and as a result the following requirements are made a part of the Contract Requirements for this Project:
1. Compliance with Institution/Local/State/Agency sustainability requirements and regulations and applicable building code standards.
 2. Take notice of Section 01 51 50, Construction Indoor Air Quality (IAQ) Management and Section 01 57 10, Construction Waste Management. See other sections and specific requirements throughout the contract.
 3. At interior locations, provide low-emitting (low VOC) adhesives, sealants, paints, coatings, carpet systems, systems furniture, and seating
 4. At interior locations, provide composite woods, agrifiber products, and laminate adhesives with no added urea-formaldehydes.
 5. Provide green housekeeping methods at final closeout.
 6. Owner certification goal: Review with Owner.
 7. The Contractor is responsible for a significant portion of the prerequisites and credits necessary to obtain the necessary certification, and these requirements are included in the Contract.
 8. Comply with Owner recycling goal for demolition and construction waste removed from the site.
 9. Refer to individual Specification Sections for additional requirements.
- F. Project Requirements for Temporary Utilities and Facilities:
1. Utility Costs: The Contractor shall meter and pay for cost of utility services consumed, including electricity, water, gas and temporary heat.
 2. Temporary Offices: Provide field offices.
 3. Toilet Facilities: Provide toilet facilities for construction personnel.
- G. Permits and Fees: Apply for, obtain, and pay for permits, fees, and utility company backcharges required to perform the work. Submit copies to Architect and Owner immediately upon receipt.
- H. Dimensions: Verify dimensions indicated on drawings with field dimensions before fabrication or ordering of materials. Do not scale drawings.

- I. Existing Conditions: Notify Architect of existing conditions differing from those indicated on the drawings. Do not proceed with work that requires deviation from the design with Architect's written approval.
 - J. Contractor's Conduct on Premises: The Contractor and his employees shall behave in a respectful, courteous and safe manner. Abusive, harassing, and lewd behavior is prohibited. Music playing is prohibited. Alcohol, tobacco and drug use is prohibited.
 - K. Hazardous Waste: Refer to Owner. Hazardous waste is outside the scope of responsibility of the Architect and his consultants.
 - L. Contractor's Management Staff Requirements: Provide staff necessary to manage project and acceptable to Owner.
 - 1. Experience, Qualifications: Minimum 10 years experience with projects similar to this Contract.
 - 2. Reassignment or Replacement: If requested by the Owner or Architect at any time during the Contract, replace Contractor's management staff with personnel acceptable to the Owner and Architect. Do not reassign or replace management staff, unless preapproved by the Owner.
 - 3. On Site: Contractor's Management Staff shall be on site whenever work is in progress.
 - 4. Work Restrictions: Contractor's Management Staff shall manage, supervise, coordinate, plan, and direct the work. Contractor's Management Staff shall not work with tools and provide production work.
 - 5. Installation/MEP Coordinator: Provide the services of an experienced installation coordinator to direct, manage and supervise the Coordination Drawing process and the installation of all building systems including interface with structure and architecture.
 - M. Restrictions on Noise: Comply with requirements of authorities having jurisdiction.
 - 1. Contract Noise Limit: Maximum 6 decibels above ambient measured at the work limits with slow response, A weighted, sound level meter [example: Radio Shack 33-2055].
 - 2. Use equipment with well maintained mufflers.
 - 3. Use the least noisy techniques practical.
 - 4. Schedule noisy activities when ambient background noise level is highest.
 - 5. Turn off all unneeded and idling equipment and engines.
 - 6. Locate noise sources as far as practical from noise sensitive locations.
 - 7. Orient noise sources away from noise sensitive locations
 - N. Phased construction:
 - 1. Construct the work in phases and as necessary to ensure the proper functioning of the project and of the facility. Pass all costs as in connection with phased construction and fdoor construction with out-of-sequence work and the costs of stopping and re-starting construction.
- 1.3. SPECIFICATION INFORMATION
- A. These specifications are a specialized form of technical writing edited from master specifications and contain deviations from traditional writing formats. Capitalization, underlining and bold print are only used to assist readers in finding information and no other meaning is implied.
 - B. Except where specifically indicated otherwise, the subject of all imperative statements is the Contractor.
 - C. Sections are generally numbered in conformance with Construction Specifications Institute Masterformat System. Numbering sequence is not consecutive. Refer to the table of contents for names and numbers of sections included in this Project.
 - D. Pages are numbered separately for each section. Each section is noted with "End of Section" to indicate the last page of a section.
 - E. Specification sections are only a portion of the Contract Documents. All Contract Documents including Conditions of the Contract, Division 1 General Requirements apply to each section. Each section applies to all specification section and work of the Contract.

1.4. DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Accepted": When used to convey Architect's action on Contractor's submittals, applications, and requests, "accepted" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. . Other terms including "requested," "authorized," "selected," "approved," "accepted," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, disposing of packaging, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete, in place, and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land or work or work area on which Project is to be built.
- J. "As shown, if not": As shown or indicated in the Contract Documents and if not so shown, then provide the item(s) following "if not,".
- K. "Section includes": unless otherwise noted, shall mean, "Section includes, without limitation, providing".
- L. "As indicated" or "As shown" or "As scheduled" shall mean as indicated on the drawings or finish schedule or finish legend.

1.5. INDUSTRY STANDARDS

- A. Referenced standards are part of the Contract Documents and have the same force and effect as if bound with these specifications.
- B. Except where specifically indicated otherwise, comply with the current standard in effect as of the date of the Owner/Contractor Agreement. Obtain copies of industry standards directly from publisher.
- C. The titles of industry standard organizations are commonly abbreviated; full titles may be found in Encyclopedia of Associations or consult Architect.

1.6. CODES AND REGULATIONS

- A. Comply with all applicable codes, ordinances, regulations and requirements of authorities having jurisdiction:
- B. Submit copies of all permits, licenses, certifications, inspection reports, releases, notices, judgments, and communications from authorities having jurisdiction to the Architect.

1.7. PROGRESS SCHEDULE

- A. Provide comprehensive bar chart schedule showing all major and critical minor portions of the work, sequence of work and duration of each activity. Update and reissue regularly, but not less than monthly. Comply with the following:

- B. Contract Progress Schedules and Reports: Provide Critical Path Method [CPM] progress schedules and reports.
1. Software Program: Subject to approval by Owner and Architect.
 2. First Submittal: Within 30 days after executed Owner Contractor Agreement.
 3. Updated Submittals: Required at least once per month.
 4. Subcontractors: Shall provide information requested by the General Contractor.
 5. Contract Progress Schedule and Schedule of Values: Make the Contract Progress Schedule work items with the Schedule of Value work items the same.
- C. Contract Progress Schedule Content: Include at least the following information.
1. All major and critical minor Contract activities.
 2. Sequence and duration of each activity.
 3. Project milestones.
 4. Early start and early finish for each activity.
 5. Late start and late finish for each activity.
 6. Total float time for each activity.
 7. Submittals related to each activity including dates of first submittal and last date for approval.
 8. Fabrication and delivery time for each item requiring off site fabrication.
 9. Start and completion dates for each mock up and sample including in place samples.
 10. The critical path of work.
- D. Contract Progress Schedule Reports: Submit reports including at least the following information:
1. The critical path of work and all work items on the critical path.
 2. Bar chart plot.
 3. Plot showing the content specified above.
 4. Monthly activity plots for each month.
 5. Two week "look ahead" plots.
 6. "Executive Summary" indicating if on schedule or, if not on schedule, problem areas.
- E. Contract Progress Schedule Updates: Update at least once per month, and as follows:
1. Unless otherwise agreed, submit with Application for Payment.
 2. Incorporate actual start and complete dates.
 3. Update whenever the Contract Time is revised by Change Order.
- F. Recovery Plan: Prepare and submit a "Recovery Plan" whenever the work is 10 calendar days or more behind schedule. Show how the project will be managed back to "on schedule" condition.
- 1.8. SCHEDULE OF VALUES
- A. Comply with Architect and Owner requirements and provide a Standard Schedule of Values in formats and minimum line items unless waived by the Owner. Prepare Schedule of Values to coordinate with application for payment breakdown. Submit at least 10 days before first payment application. Update and reissue regularly, but not less than monthly.
- 1.9. PAYMENT REQUESTS
- A. Format: Unless hard copy is requested by Architect, provide PDF formatted electronic documents.
- Provide [4 if hardcopy] copies of each request on completely filled out copies of AIA G702 and continuation sheet G703. Substantiate requests with complete documentation; include change orders to date. Provide partial [interim] lien waivers for work in progress and full lien waivers for completed work. Waiver of liens shall sum to the total of the applicable line items on the G702 AIA form
- B. Record Drawing Certification: Certify as a part of each application for payment that the project record documents are current at the time of application is submitted. The Contractor shall require such drawings to be current as a condition of approving any payment to the Trade Contractors and Subcontractors.

- C. Before first payment application, provide the following:
 - 1. List of subcontractors, suppliers and fabricators.
 - 2. Schedule of values.
 - 3. Progress schedule.
 - 4. Submittal schedule keyed to project schedule.
 - 5. List of Contractor's key project personnel.
 - 6. Copies of permits and other communications from authorities.
 - 7. Contractor's certificate of insurance.
 - 8. Performance and payment bonds if required.
 - 9. Unit price schedule.
 - 10. Construction Waste Management Plan, other specified sustainable construction management plans.

 - D. For typical payment application, provide the following:
 - 1. Updated Schedule of values,
 - 2. Progress schedule.
 - 3. Submittal schedule keyed to project schedule.
 - 4. Release of liens.
 - 5. Other documents required by Owner or municipalities.
 - 6. Certificate of title and insurance for goods stored off-site.
 - 7. Construction Waste Management Plan reports.
 - 8. Materials cost data as required to document recycled content, certified wood, location of manufacturing, and other sustainable requirements.

 - E. Before final payment application, provide and complete the following:
 - 1. Complete close out requirements.
 - 2. Complete punch list items.
 - 3. Settle all claims.
 - 4. Transmit record documents to Architect.
 - 5. Prove that all taxes, fees and similar obligations have been paid.
 - 6. Remove temporary facilities and surplus materials.
 - 7. Change lock cylinders or cores.
 - 8. Clean the work.
 - 9. Submit consent of surety, if any, for final payment.
- 1.10. PROCEDURES AND CONTROLS
- A. Project Meetings: Arrange for and attend project meetings with the Architect and such other persons as the Architect requests to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor's field superintendent. An authorized representative of any subcontractor or sub-subcontractor shall attend such meetings if the representative's presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives. Written reports of meeting minutes shall be prepared and distributed to attendees, the Architect, Contractor(s), and Owner in advance of the next meeting. Minutes shall be prepared by Contractor, except where Owner or agencies mandate minutes to be prepared by Architect.
 - 1. Pre-Construction Conference: Attendance by Architect, Contractor, major subcontractors. Agenda shall include: Quality of workmanship, coordination, interpretations, job schedule, submittals, approvals, requisition procedures, testing, protection of construction, indoor air quality, and construction waste management.

 - B. Emergency Addresses: Furnish the Owner and Architect, in writing, the names addresses and telephone numbers of individuals to be contacted in the event of an out-of-hours emergency at the building site. Post a similar list readily visible from the outside of the field office or a location acceptable to the Architect.

- C. Layout: Layout work and be responsible for all lines, elevations, and measurements of the work executed under the contract. Where required to complete the work properly, the Contractor shall engage and pay for a professional land surveyor.
- D. Field Measurements: Verify measurements at the building prior to ordering materials or commencing work. No extra charge or compensation will be allowed because of differences between actual dimensions and measurements indicated on the Drawings. Differences which may be found shall be submitted to the Architect for decision before proceeding with the work.
- E. Field Measurements for Fixed Equipment: Dimensions for fixed equipment to be supplied under this Contract or separate contracts shall be determined by field measurements taken jointly by the Contractor and the equipment supplier involved. A record of the field measurements shall be kept until time of substantial completion of the project, or until the equipment has been fully installed and accepted by the Owner, whichever is later. Responsibility for fixed equipment fabricated accurately to field measurements for proper fit and operation shall be that of the Contractor. Contractor shall pay all costs involved in correcting any mis-fitting fixed equipment as fabricated.
- F. Project Limit Line: The boundaries of the site do not limit the responsibility of the Contractor to perform the work in its entirety. Make utility connections as indicated.
- G. Matching: Where matching is indicated, the Architect shall be the sole and final judge of what is an acceptable match. Mockups and sample submissions are required.
- H. Observation: Notify the Architect and authorities having jurisdiction at least thirty-six hours in advance of concealing any work.
- I. Utilities: Prior to interrupting utilities, services or facilities, notify the utility owner and the Owner and obtain their written approval a minimum 48 hours in advance, but 72 hours is preferred.
- J. Furnishings, Fixtures, and Equipment: Cooperate and permit the Owner to install his furnished items. Installation of such furnishings or equipment does not signify Owner's acceptance of any portion of the work.
- K. Clean-Up: Frequently clean-up all waste, remove from site regularly, and legally dispose of off-site.
- L. Installer's Acceptance of Conditions: All installers shall inspect substrates and conditions under which work is to be executed and shall report in writing to the Contractor all conditions detrimental to the proper execution and completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means installer accepts previous work and conditions.
- M. Coordination: The Contractor shall be fully responsible for coordinating all trades, coordinating construction sequences and schedules, and coordinating the actual installed location and interface of all work.
 - 1. Prior to beginning mechanical, electrical and fire protection work, the Contractor shall prepare coordination drawings electronically showing the exact alignment, physical location and configuration of the mechanical, electrical and fire protection installations and demonstrating to the Contractor's satisfaction that the installations will clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. The Contractor shall be solely liable and responsible for any costs and delays resulting from the Contractor's failure to prepare any such coordination drawings or from the negligent preparation of such coordination drawings. At the completion of the work turn over all coordination drawings to the Architect and Owner. Provide drawings as follows:
 - a. Scale: $\frac{1}{4}$ inch = 1'-0" or larger scale.
 - b. Color: Color code each trade in a clearly different color.
 - c. Conflicts: Indicate all conflicts by means of a clear symbol and note.
 - 2. Exact locations and groupings of mechanical, electrical and fire protection fixtures, switches, heads, devices and outlets shall be obtained from the Architect before the Work is roughed in, if not already indicated. Work installed without such information from the Architect shall be relocated at the Contractor's expense if the Architect so requests.
- N. Request For Interpretation (RFIs):

1. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and prepare and submit an RFI in the form specified.
 - a. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 - b. Submit RFI electronically unless otherwise agreed.
 2. Content of the RFI: Include a detailed, legible description of item needing interpretation.
 3. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow 5 working days for Architect's response for each RFI and 7 where Architect's consultants are involved. RFIs received after 1:00 p.m. will be considered as received the following working day.
 4. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
- O. Existing Articles of Unusual Value: If during demolition, excavation, or disposal work articles of unusual value or of historical or archaeological significance are encountered, the ownership of such articles is retained by the Owner, and information regarding their discovery shall be immediately furnished to the Architect. If the nature of the article is such that work cannot proceed without danger of damage, work in the area shall be immediately discontinued until the Architect has determined the proper procedure to be followed. Delays in time thereby shall be a condition for which the time of the Contract may be extended. Costs incurred after discovery in the salvaging of such articles shall be borne by the Owner.
- P. Quality Control & Testing Services: Coordinate with the Owner and Architect in the event testing is required. Provide services necessary to enable inspectors, testing laboratory representatives and the like to perform their work.
- Q. Progress Photos: Comply with the following:
 1. Photographer: Any competent person approved by the Owner and Architect.
 2. Digital Photographs: Minimum 25 million pixel, clearly legible, "jpeg" file images.
 3. Digital Submission: Submit flash drive with digital photograph files or upload to job FTP site each month.
 4. Prints: Not required.
 5. Lighting: Provide supplemental lighting as needed to provide clear, detailed images.
 6. Construction Photographs:
 - a. Purpose: To document the progress of the work.
 - b. Quantity: At least 20 images per week.
 - c. Photo Identity: Give each photo a unique identity number.
 - d. Record: Date and time photo taken, included in filename.
 7. Preconstruction Photographs - New Construction: Record existing conditions with emphasis on nearby existing improvements indicated to remain. Clearly record existing damage, if any.
- R. Daily Reports: Provide daily reports and submit to Owner and Architect once per week.
- S. Long Lead Time Items: Time is of the essence in the Contract. Expedite and provide special management for "long lead time" items.
- T. Contractor's Responsibilities Related To The Owner's Management Staff:
 1. Cooperate with the Owner's management staff.
 2. Provide "Weekly Work Plan" each Monday morning by 8:00 am.
 3. Provide immediate notification of all unusual conditions and occurrences at the site.
 4. Identify all persons at the site, both workers and visitors.
- U. Documents On Site: Maintain the following documents on site and up-to-date:
 1. Contract Documents.

2. Modifications and changes to Contract Documents.
3. Coordination drawings.
4. Meeting notes for all types of meetings: progress, safety, preinstallation, special, and others.
5. Progress schedules and related information.
6. Project photographs.
7. Daily reports.
8. Submittal log and all submittals.

1.11. SUBMITTALS

- A. Form of Submittal: Use Architect's electronic system unless otherwise directed in writing. Comply with Architect's formatting and tel/data requirements. Where the Architect does not use a dedicated ftp site or server, submit documentation via scanned documents and email. Comply with required transmittal and data formats using numbering system approved by Architect.

Required Submittals: Submit shop drawings, product data, initial selection samples, verification samples, calculations, coordination drawings, schedules, and all other submittals as specified in individual specification sections.

1. Provide submittals for cleaning and maintenance products to be used during construction and final cleaning.
- B. Submittal Schedule: Within 30 days after award of contract and before first application for payment, prepare list of submittals in chronological sequence showing all submittals and proposed date first due at Architects office and proposed date due to be returned to Contractor. Note relevant specification section number.
- C. Contractor's Preparation of Submittals: Modify and customize all submittals to show interface with adjacent work and attachment to building. Identify each submittal with name of project, date, Contractor's name, subcontractor's name, manufacturer's name, submittal name, relevant specification section numbers, and Submittal Schedule reference number. Stamp and sign each submittal to show the Contractor's review and approval of each submittal before delivery to Architect's office; unstamped and unsigned submittals will be returned without action by the Architect. Leave 4" x 6" open space for Architect's "action" stamp.
- D. Product Data: Provide manufacturer's preprinted literature including, without limitation, manufacturer's standard printed description of product, materials and construction, recommendations for application and use, certification of compliance with standards, instructions for installation, and special coordination requirements. Collect data into one submittal for each unit of work or system; mark each copy to show which choices and options are applicable to project
1. Options: All required or available options shall be indicated and noted by the Contractor.
 2. Submittal Quantities: Unless otherwise requested, provide only electronic format. If hardcopy is requested, submit at least 1 reproducible copy and three additional copies.
 3. Installer Copy: Verify that the Installer has a current copy of the relevant product data, including installation instructions, before permitting installation to begin.
- E. Shop Drawings: Provide accurately prepared, large scale and detailed shop drawings prepared specifically for this project on scannable or reproducible sheets. Show adjacent conditions and related work. Show accurate field dimensions and clearly note field conditions. identify materials and products in the work shown. Note special coordination required.
1. PDF files: Contractor shall submit copies of portable document format files for review. At his discretion, the Architect may request hardcopy as per paragraph 2 below.
 2. Submittal Quantities: Submit at least 1 scannable copy and, if requested, three blackline prints of Shop Drawing submittals.
 3. After Architect's action, follow specified distribution procedure.
- F. Samples: Provide units identical with final materials and products to be installed in the work. Where indicated, prepare samples to match Architect's sample. Label each sample with description, source, generic

name or manufacturer's name and model number. Architect will review samples for confirmation of visual design intent, color, pattern, texture and type only; Architect will not test samples for compliance with quality and other Contract requirements which shall remain the exclusive responsibility of the Contractor.

1. Initial Selection Samples Submittal Quantities: Unless a specific, unique product is specified, for initial selection purposes, submit a set of samples showing the complete range of colors and finishes available, as follows:
For exterior assemblies: One for Owner, one for architect, and required quantity for contractor.
For interior assemblies: One for Owner, one for architect, one for interior designer, if any, and required quantity for contractor.
 2. Verification Samples Submittal Quantities: For verification of an initial selection, submit 3 sets of samples; one set will be returned to Contractor to be maintained at project site for quality control comparisons.
- G. Timing of Submittals: Submit submittals in a timely fashion to allow at least 10 business days for each office's review and handling. The Architect and their consultants make no commitments as to the duration of review of submittals. This is a condition of the work and Contractors agree that delay claims are exempt from shop drawing review time. This means that submittals which have to be reviewed by the Architect and one of his consultants require at least 20 business days for review and handling. Add ten business days for each additional consultant who must review a submission.
- H. Architect's Action on Submittals: Architect will review submittals, stamp with "action stamp", mark action, and return to Contractor. Architect will review submittals only for conformance with the design concept of the project. The Contractor is responsible for confirming compliance with other Contract requirements, including without limitation, performance requirements, field dimensions, fabrication methods, means, methods, techniques, sequences and procedures of construction, coordination with other work. The Architect's review and approval of submittals shall be held to the limitations stated in the Owner/Architect Agreement and the Conditions of the Contract. In no case shall approval or acceptance by the Architect be interpreted as a release of Contractor of his responsibilities to fulfill all of the requirements of the Contract Documents.
1. Required Re-submittal: Comply with indications on Transmittal and Stamp.
 2. Distribution: When submittal is reviewed and resubmittal is not required, make prints or copies and distribute to Owner, Subcontractors involved, and to all other parties requiring information from the submittal for performance or coordination of related work. Print shop drawings for distribution only from the final reviewed drawings showing all notations and comments.
- I. Mock-ups – General: Provide mock-ups where specified in individual sections or shown on drawings.
- J. Mock-ups – Type 1: Shall be disposable and not considered "In-Place Sample Mock-ups" are required unless otherwise indicated. All mock-ups shall be type 2 below, unless otherwise noted. Purpose and requirements are as follows:
1. To permit Owner and Architect to review and approve assemblies prior to ordering and to be used as sample of acceptable work.
 2. Construct mock-ups as early as possible and before ordering products.
 3. Provide actual materials indicated.
 4. Locate mock-ups as directed by architect.
 5. Develop and prepare mock-up construction drawings.
 6. Protect mock-ups until no longer needed by Owner and Architect.
 7. Demolish, remove and dispose of mock-ups as directed.
 8. Provide indicated mock-ups including the following:
Typical exterior wall assembly not less than 6x8 feet showing each exterior skin assembly, window, window frames, each glass type, flashings, weeps, roof edges, visible joints sealants
Concealed assemblies including concealed exterior wall construction, skin support, framing, concealed flashing, air barriers, dampproofing, waterproofing, concealed joint sealants and other elements concealed in typical assemblies.

- K. Mock-ups – Type 2 : Provide mock-ups indicated in specifications sections which unless otherwise indicated may be left in place if approved after review. Applicable requirements of Type 1 apply to this type of mock-up. All mock-ups shall be type 2 unless otherwise noted.
- I. Sustainable Construction Submittals : Comply with Sustainable Design specifications and requirements, including local municipality regulations and provisions.
- J. Maintain all necessary records in current form throughout the execution of the Work.
- M. The Architect's general approval of a submittal is not intended to modify or waive any requirements of the drawings and specifications. If a submittal proposes to modify materials, size, assembly, quality or appearance as required by the drawings and specifications, said proposed modification will be clearly and boldly marked upon the submittal. Absent Architect's explicit approval of this boldly marked modification, said proposed modification shall not be deemed approved.

1.12. WARRANTIES

- A. Warranties Required: Refer to individual trade sections for specific product warranty requirements.
- B. Procurement: Where a warranty is required, do not purchase or subcontract for materials or work until it has been determined that parties required to countersign warranties are willing to do so.
- C. Warranty Forms: Submit written warranty to Owner through Architect for approval prior to execution. Furnish two copies of executed warranty to Owner for his records; furnish two additional conformed copies where required for maintenance manual
- D. Work Covered: Contractor shall remove and replace other work of project which has been damaged as a result of failure of warranted work or equipment, or which must be removed and replaced to provide access to work under warranty. Unless otherwise specified, warranty shall cover full cost of replacement or repair, and shall not be pro-rated on basis of useful service life.
- E. Warranty Extensions: Work repaired or replaced under warranty shall be warranted until the original warranty expiration date or for ninety days whichever is later in time.
- F. Warranty Effective Starting Date: Guarantee period for all work, material and equipment shall begin on the date of substantial completion, not when subcontractor has completed his work nor when equipment is turned on. In addition to the one year guarantees for the entire work covered by these Contract Documents, refer to the various sections of the specifications for extended guarantee or maintenance requirements for various material and equipment.

1.13. CUTTING AND PATCHING

- A. Limitations: Do not cut and patch any work in a manner that would result in a failure of the work to perform as intended, decreased energy performance, increased maintenance, decreased operational life, or decreased safety.
 - 1. Structural Work: Do not cut structural work or bearing walls without written approval from Architect. Where cutting and patching of structural work is necessary and approved by Architect, perform work in a manner which will not diminish structural capacity nor increase deflection of member. Provide temporary shoring and bracing as necessary. Ensure the safety of people and property at all times.
- B. Cutting and Patching Materials: Use materials identical to materials to be cut and patched. If identical materials are not available or cannot be used, use materials that match existing materials to the greatest extent possible. Provide finished work that will result in equal to or better than existing performance characteristics.

- C. Inspection: Before cutting and patching, examine surfaces and conditions under which work is to be performed and correct unsafe and unsatisfactory conditions prior to proceeding.
 - D. Protection: Protect adjacent work from damage. Protect the work from adverse conditions.
 - E. Cutting: Cut work using methods least likely to damage adjoining work. Use tools designed for sawing or grinding, not hammering or chopping. Use saws or drills to ensure neat, accurately formed holes to sizes required with minimum disturbance to adjacent work. Temporarily cover openings ; maintain weather-tightness and safety.
 - 1. Utilities: Locate utilities before cutting. Provide temporary utilities as needed. Cap, valve, or plug and seal ends of abandoned utilities to prevent entrance of moisture or other foreign matter.
 - F. Patching: Patch with seams and joints which are durable and not visible. Comply with specified tolerances for similar new work; create true even planes with uniform continuous appearance. Restore finishes of patched areas and, if necessary, extend finish restoration onto adjoining unpatched area to eliminate evidence of patching and refinishing. Repaint entire assemblies, not just patched area. Remove and replace work which has been cut and patched in a visually unsatisfactory manner as determined by the Architect.
 - E. Qualifications: Retain experienced and specialized firms, original installers if possible, to perform cutting and patching. Workmen shall be skilled in type of cutting and patching required.
 - F. Cutting and patching includes coring and core drilling. Cutting and patching not performed by trades shall be performed by the (General) Contractor.
- 1.14. FIELD ENGINEERING
- A. Provide required field engineering including property metes, bounds and elevation surveying of both land and structures, civil engineering services and structural engineering services.
 - B. Field engineering submittals include:
 - 1. Certificates signed by the Land Surveyor or Professional Engineer certifying that the location, layout and elevation of improvements comply with the Contract Documents.
 - 2. Final Property Survey: Where the contract documents or the regulation of the municipality have jurisdiction require survey drawings, submit one copy for the Owner, one for the Architect and however many are required by the municipality..
 - 3. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of Sections "Submittals" and "Project Closeout".
 - C. Quality Assurance: Engage a Registered Land Surveyor registered or where required, a professional engineer in the State where the project is located, to perform land surveying services required.
 - D. Surveys & Control Points: Upon request, the Owner will identify existing control points and property line of which he is aware, and when available, will provide copies of site surveys. Where property surveys are not included in the contract documents, generate the needed property survey information as part of the work of this contract.
 - E. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
 - 1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.
 - 2. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.

- F. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.
- G. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- H. Existing utilities and equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.
- I. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, water service piping, and other underground utilities affected by the work.
- J. Performance: Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
- K. Advise entities engaged in construction activities, of marked lines and levels provided for their use.
- L. As construction proceeds, check every major element for line, level and plumb.
- M. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.
- N. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
- O. On completion of foundation walls, major site improvements, and other Work requiring field engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and sitework.
- P. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.
- Q. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical Work.
- R. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.
- S. Final Property Survey: Before Substantial Completion, prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the Surveyor, to the effect that principal metes, bounds, lines and levels of the Project are accurately positioned as shown on the survey.
- T. Recording: At Substantial Completion, have the final property survey recorded by or with local governing authorities as the official "property survey".

1.15. TEMPORARY FACILITIES AND UTILITIES

- A. Scope of Temporary Work: This article is not intended to limit the scope of temporary work required under the Contract. Provide all temporary facilities and utilities needed and to maintain on-going building operations in the case of existing facilities.
- B. Permits and Fees: Obtain and pay for all permits, fees and charges related to temporary work.
- C. Codes and Authorities Having Jurisdiction for Temporary Facilities and Utilities: Comply with all requirements of authorities having jurisdiction, codes, utility companies, OSHA, and industry standards including, but not limited to the following:

1. NFPA Code 241, Building Construction and Demolition Operations.
 2. ANSI-A10 Series, Safety Requirements for Construction and Demolition.
 3. NECA National Joint Guideline NJG-6, Temporary Job Utilities and Services.
 4. Electrical Service: NEMA, NECA, and UL.
- D. Field Offices: Provide Contractor's field offices as needed. Keep current copies of all Contract Documents and project paperwork neatly on file at jobsite. Permit Architect's unrestricted use of Contractor's field office facilities including copiers, telephones, plan tables, and other equipment. Furnish, maintain, and pay for light, power, phone, fax, and other field office services.
- E. Equipment and Tools: Provide all equipment including, but not limited to, hoists, lifts, scaffolding, machines, tools and the like, as needed for execution of the work. Provide safe access to all parts of the work.
- F. Temporary Enclosures: Provide temporary enclosures to maintain proper temperatures and to prevent weather damage. Always maintain legal means of egress.
- G. For cold weather climates only, Snow and Ice: Remove all snow and ice which interferes with work or safety.
- H. Streets, Walks and Grounds: Maintain public and private roads and walks clear of debris caused by construction operations. Repair all damage caused to streets, drives, curbs, sidewalks, fences, poles and similar items where disturbed or damaged by building construction and leave them in as good condition after completion of the work as before operations started.
- I. Protection: Protect nearby property and the public from construction activities. provide and maintain barricades, warning signs and lights, railings, walkways and similar items. Immediately repair damaged property to its condition before being damaged.
- J. Security: Secure site against unauthorized entry at all times. Provide secure, locked temporary enclosures. Protect the work at all times. Provide watchman service, if necessary, to protect the work.
- K. Signs: Erect project identification signs in compliance with details to be provided by Architect. Signs shall be minimum 4' x 8' exterior grade plywood and shall contain the names of the project, Owner, Architect, major Consultants, Contractor, and major financing institution. Except for safety and warning signs, no other signs are permitted. Location as acceptable to the Architect.
- L. Fire Prevention: Take every precaution to prevent fire. Provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and comply with recommendations regarding fire protection made by the representative of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.
- M. Egress: Maintain safe and legal means of egress at all times. At all times, provide at least two separate means of egress.
- N. Temporary Elevators, Hoists & Cranes: Provide equipment required to complete the Work as required and to comply with approved schedules. Do not use project elevators for project or construction purposes without express written permission from the elevator manufacturer, the elevator installer and the Owner.

Provide design and engineering services of professional engineers registered in the locality to evaluated temporary elevators, hoists and crane. Systems used shall be based upon engineered documents stamped the Engineer of Record. Such Engineers shall have professional liability insurance covering the value of the Work.

- O. Temporary Roads, Parking and Staging: Provide facilities necessary to accomplish the Work. Build temporary roads of adequate grade, substrate, and layout to provide safe, effective, efficient site work and access. Maintain roads and provide adequate temporary drainage. Provide parking required, whether on or off site. Pay all costs in connection with providing parking and ensure local traffic in, on, and around site is not adversely affected by workers or construction parking.

Provide staging or ensure staging is provided by subcontractors. Ensure staging is properly designed and where required, employ professional engineers in the locality to design or evaluate structural integrity of systems.

Where required provide or ensure subcontractors provide adequate closures of staging to ensure proper work temperatures and environmental safety.

- P. Protecting Installed Construction: Comply with the requirements of Section 01700 Execution and protect work until acceptance and Substantial Completion. Protect work not accepted at Substantial Completion or not yet installed and approved until Final Acceptance.

1.16. PRODUCTS AND SUBSTITUTIONS

- A. Specified Products: In all cases in which a manufacturer's name, trade name or other proprietary designation is used in connection with materials or articles to be furnished under this Contract, whether or not the phrase "or equal" is used after such name, the Contractor shall provide the product of the named manufacturers without substitution, unless a written request for a substitution has been submitted by the Contractor and approved in writing by the Architect as follows.
- B. Deviations from Detailed Requirements: If the Contractor proposes to use material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the material is submitted for approval, and shall request written approval of the deviation from the requirements of the Contract Documents.
- C. Approval of Substitutions: In requesting approval of deviations or substitutions, the Contractor shall provide evidence, including, but not limited to manufacturer's data, leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that attainable if the detailed requirements of the Contract Documents were strictly followed. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.
- D. Intent of Contract Documents: The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building including visible items of mechanical and electrical equipment have been selected to coordinate with the Design in relation to the overall appearance of the building. The Architect shall judge the design and appearance of proposed substitutes on the basis of the suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The Architect will not approve, as equal to materials specified proposed, substitutes which in the Architect's opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Project. In order to permit coordinated design of color and finishes the Contractor shall furnish the substituted material in any color, finish texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the owner.
- E. Additional Costs or Impact: Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner and the Architect. Any decrease in the cost of the substitution shall be returned to the Owner.

- F. Manufacturers: To the greatest degree possible, provide primary materials and products from one manufacturer for each type or kind. Provide secondary materials as recommended by manufacturers of primary materials.
 - G. Substitution Requests: Refer to relevant section and Substitution Request Form. Submit electronic copies. Identify product to be replaced by substitute by reference to specification sections and drawing numbers. Provide Contractor's certification and evidence to prove compliance with Contract. Document requirements as acceptable to Architect.
 - H. Substitution Conditions: Substitution requests will be returned without action unless one of the following conditions is satisfied. The Contractor shall state which of the following conditions applies to the requested substitution:
 - 1. Request is due to an "or equal" clause.
 - 2. Specified material or product cannot be coordinated with other work.
 - 3. Specified material or product is not acceptable to authorities having jurisdiction.
 - 4. Substantial advantage is offered Owner in terms of cost, time, or other valuable consideration.
 - 5. Specified material or product is not available.
 - 6. Invalid Substitutions: Contractor's submittal and Architect's acceptance of shop drawings, samples, product data or other submittal is not a valid request for, nor an approval of a substitution unless the Contractor presents the information when first submitted as a Request for Substitution.
 - 7. Requests do not meet or exceed Sustainable Design Goals and Requirements.
- 1.17. DELIVERY, STORAGE AND HANDLING
- A. Coordinate delivery to avoid delay in the Work. Strictly comply with manufacturer's or fabricators instructions and recommendations and prevent damage, deterioration and loss, including theft. Minimize long-term storage at the site. Maintain environmental conditions, temperature, ventilation, and humidity within range permitted by fabricator or manufacturers of materials and products used. Provide temporary supports and assemblies to maintain conditions and ensure work is stored to prevent distortion, warp or other deformation, degradation or damage. Determination satisfactory visual condition of stored work rests solely with the Architect.
- 1.18. MANUFACTURER RECOMMENDATIONS
- A. Handle, store work as above. Install work according to manufacturer's recommendations, instructions, literature and product limitations. Where conflicts existing between these specifications and manufacturer recommendations, advise Architect in writing and obtain written recommendations to resolve conflict. Failure to install work according to standards, instructions and recommendations shall be the responsibility of the contractor. Replace work at no cost to Owner where not installed according to written requirements, instructions or recommendations.
- 1.19. LABELS
- A. Labels, Trademarks, & Trade names: Locate required labels on inconspicuous surfaces. Do not provide labels, nameplates, or trademarks, which are not required. Provide permanent data plate on each item of equipment stating manufacturer, model, serial number, capacity, ratings and all other essential data.
- 1.20. RECORD DOCUMENTS
- A. General: Keep record documents neatly and accurately. Record information as the work progresses and deliver to Architect at time of final acceptance. include in record documents all field changes made, all relevant dimensions, and all relevant details of the work. Keep record documents up to date with all field orders and change orders clearly indicated.

Form of Record Documents: As directed by Architect, using flash drives or upload to a file transfer site (Sync, DropBox, WeTransfer, or similar FTP site), notify Architect that documents are available for download, and maintain files online until Architect notifies Contractor in writing that Architect has downloaded files, and only if requested as hard copy on approved media.

- B. Drawings: Keep four separate sets of prints at the site, one set each for mechanical, electrical, plumbing, and architectural/structural disciplines. Neatly and accurately note all deviations from the Contract Documents and the exact actual location of the work as installed. Marked-up and colored prints will be used as a guide to determine the progress of the work installed. Requisitions for payment will not be approved until the record documents are accurate and up-to-date
1. Work Outside Building: Record data outside of building to an accuracy of plus or minus 1 inch and determine and record the invert elevation of all drain lines.
 2. At completion of the work, submit one complete set of marked-up prints for review. After acceptance these marked-up prints shall be used in the preparation of the record drawings.
 3. Architect shall furnish Contractor with their standard computer-aided design files [hereafter "CAD"] for originals of the Contract Drawings. Make modifications to these files as shown on the marked-up prints. Remove superseded data to show the completed installation.
 4. Deliver the completed CAD record drawings on reproducible sheets and on an acceptable type of media [such as Flash drive] of the computer files, in the same version as Contract Drawings [unless otherwise directed by the Owner to provide a different CAD version], properly titled and dated to the Architect. Indicate preparer of record drawings. These record drawings shall become the property of the Owner. In addition, provide a set of final record drawings in PDF format.
- C. Specifications: Maintain one clean copy of complete specifications [including addenda, modifications, and bulletins with changes, substitutions, and selected options clearly noted. Circle or otherwise clearly indicate which manufacturer and products are actually used.
- D. Operating and Maintenance Manuals: Manuals shall be submitted which contain the following:
1. Description of the system provided.
 2. Handling, storage, and installation instructions.
 3. Detailed description of the function of each principal component of the systems or equipment.
 4. Operating procedures, including pre-startup, startup, normal operation, emergency shutdown, normal shutdown and troubleshooting.
 5. Maintenance procedures including lubrication requirements, intervals between lubrication, preventative and repair procedures, and complete spare parts list with cross reference to original equipment manufacturer's part numbers.
 6. Control and alarm features including schematic of control systems, control loop electric ladder diagrams, controller operating set points, settings for alarms and shutdown systems, pump curves and fan curves.
 7. Safety and environmental considerations.
- E. Copies of Operating and Maintenance Manuals: Three copies of the manuals shall be provided within sufficient time to allow for training of Owner's personnel. Submit one copy of the manuals to the Architect for review no later than 90 calendar days prior to substantial completion, or building turn over, whichever comes first. Submit the remaining five copies within 15 days after first review set is returned to contractor. Progress payment may be withheld if this requirement is not met.
- F. Additional Requirements for Operating and Maintenance Manuals: The requirements for manuals applies to each packaged and field-fabricated operating system. The manuals shall be provided in three-ring side binders with durable plastic covers. The manuals shall contain a detailed table of contents and have tab dividers for major sections and special equipment.

- G. Framed Data: Provide charts and lists of all valves, circuits, switches, controls and equipment. Install on walls under glass at locations directed by Architect
- 1.21. EXTRA STOCK MATERIALS [aka "ATTIC" or "MAINTENANCE "STOCK"]
- A. Provide extra stock materials specified throughout Project Manual. Provide quantities indicated, where extra stock is specified but quantities not indicated carry 1% of surface area of material installed; include at one of every color provided. Provide work in unopened boxes or containers of same lot or run of installed products. Identify, label and store products where directed.
- 1.22. SYSTEM DEMONSTRATION & TRAINING
- A. Provide system demonstration and training as specified throughout the Project Manual and as follows, whether or not specified elsewhere:
1. Demonstrate project equipment and systems to ensure Owner personnel understand operation, functioning and long-term and short term maintenance of equipment and systems.
 2. Explain and demonstrate systems restrictions, safety procedures and operational limitations.
 3. Provide trained personnel which previous experience training and demonstrating systems. Devote sufficient time to each piece of equipment or system to ensure personnel have an effective understanding of requirements to operate and maintain work being demonstrated.
 4. Provide follow-up and additional training where Owner advises that personnel need additional time to fully understand systems or equipment.
 5. In general demonstration and training shall be conducted for all systems containing microprocessors, are programmable, convey people or goods, are affected by or part of safety or fire suppression systems, are part of environmental controls or require training in order to use or operate properly.
 6. Make a video of demonstration session(s) and provide electronic files of same to the Owner.
- 1.23. PROJECT CLOSE OUT
- A. Complete the following prior to Substantial Completion:
1. Provide Contractor's Punch List of incomplete items stating reason for incompleteness and value of incompleteness.
 2. Advise Owner of insurance change over requirements.
 3. Submit all warranties, maintenance contracts, final certificates and similar documents.
 4. Obtain Certificate of Occupancy and similar releases which permit the Owner's full and unrestricted use of the areas claimed "Substantially Complete".
 5. Submit record documents.
 6. Deliver maintenance stocks of materials where specified.
 7. Make final change over of lock cylinders or cores and advise Owner of change of security responsibility.
 8. Complete startup of all systems and instruct Owner's personnel in proper operation and routine maintenance of systems and equipment.
 9. Complete clean up and restoration of damaged finishes
 10. Satisfy all commissioning requirements.
 11. Remove all temporary facilities and utilities that are no longer needed.
 12. Request Architect's inspection for Substantial Completion.
- B. Architect will either issue a Certificate of Substantial Completion or notify Contractor of work which must be performed prior to issue of certificate
- C. Complete the following prior to Final Acceptance and payment:
1. Obtain Certificate of Substantial Completion.
 2. Submit final application for payment, showing final accounting of changes in the work.

3. Provide final releases and lien waivers not previously submitted.
 4. Submit certified copy of final punch list stating that Contractor has completed or corrected each item.
 5. Submit final meter readings, record of stored fuel and similar information.
 6. Submit Consent of Surety for final payment.
 7. Submit evidence of Contractor's continuing insurance coverage (if required by Contract Documents).
- D. Form of Record Documents: Upload to a file transfer site (Sync, DropBox, WeTransfer, or similar FTP site), notify Architect that documents are available for download, and maintain files online until Architect notifies Contractor in writing that Architect has downloaded files, and only if requested as hard copy on approved media.

1.24. REMEDIAL WORK

- A. Extent/Applicability: Remedial work includes cutting and patching associated with:
1. Defective, non-conforming, ill timed, and improperly fitting work.
 2. Removing samples of installed work for testing, inspection, and verification.
 3. Patching of sample removal locations.
- B. Comply with the following:
1. Patching Materials: Identical in quality and appearance to materials to be cut and patched.
 2. Craft: Employ highly skilled trade workers for all patching work.
 3. Subcontractors: Coordinate their work with the General Contractor to minimize remedial work.
 4. Make durable, permanent patches.
 5. Comply with specified tolerances for similar new work.
 6. Match the visual quality and character of adjacent unpatched work in good condition.
 7. Create true, even surfaces with uniform, continuous appearance.
 8. Extend patched area onto adjoining unpatched areas to eliminate visible evidence of patching.
 9. Repaint entire assemblies, not only the patched area, to nearest major change of plane.
 10. Obtain Architect's approval of each patch.
 11. Visible evidence of patching is sufficient cause for rejection and replacement.

1.25. FINAL CLEANING AND REPAIR

- A. The following is a resume of requirements. Refer to other specification sections and the General Conditions of the contract. .
- B. Clean Up: immediately prior to the Architect's inspection for Substantial Completion, the Contractor shall completely clean the premises and clean and prepare the completed work in order for it to be used for its intended purpose in accordance with the Contract Documents. Such work shall include, but not be limited to the following:
1. Concrete and ceramic surfaces shall be cleaned and washed.
 2. Resilient coverings shall be cleaned, waxed and buffed as applicable.
 3. Woodwork shall be dusted and cleaned.
 4. Sash, fixtures and equipment shall be thoroughly cleaned.
 5. Stains, spots, dust, marks and smears shall be removed from all surfaces.
 6. Hardware and metal surfaces shall be cleaned and polished.
 7. Glass and plastic surfaces shall be thoroughly cleaned by professional window cleaners. Clean windows inside and outside.
 8. Damaged, broken or scratched glass or plastic shall be replaced by the Contractor at the Contractor's expense.
 9. Vacuum carpeted and soft surfaces with high efficiency particulate arrestor (HEPA) vacuum.
 10. Use low-emitting, environmentally friendly cleaning agents and procedures.' 11. Comply with Owner's requirements for Green Housekeeping.
- C. Repairs: Repair and touch-up all damaged and deteriorated products and surfaces.

1.26. E-DOC & CAD TRANSMITTAL REQUIREMENTS

- A. Provide Electronic exchange of information and acceptable formats and file types; Where practical, all project documents.
- B. Intent / purpose:
 - 1. Purpose: Expediting exchange of information and approvals, and minimize time, cost and paper use, handling and storage.
 - 2. Intent: To extent possible, provide required documentation in form of computer-readable files - hereafter: "e-docs".
 - 3. Signing & sealing: As necessary, sign digitally and version-protect project documents so they are legally binding.
 - 4. Use of paper is discouraged. Unless impractical, paper documents will have corresponding e-docs available and distributed to all parties.
- C. Scope & Exceptions: Unless determined to be impractical for an acceptable reason, provide each of the following as an e-doc:
 - 1. General purpose communications, contact information, meeting scheduling.
 - 2. RFI inquiries and responses.
 - 3. Sketches and sketch revisions.
 - 4. Most submittals, including shop drawings, product information, MSDS representations, manufacturer's catalogs (complete or partial), and other customary submittals, along with Architect disposition of same.
 - 5. Contractor's progress schedules.
 - 6. Field orders.
 - 7. Change order requests and proposals.
 - 8. Photo documentation.
 - 9. Punch lists.
 - 10. Draft versions and review copies of documents requiring original signatures and/or notarization, including payment applications and executed change orders.
- D. Produce and distribute hard copy paper records in quantities required in addition to the e-doc record for at least the following, subject to confirmation with the Architect:
 - 1. Documents requiring multiple original signatures and/or notarization.
 - 2. Applications for Payment.
 - 3. Changer Orders.
 - 4. Warranties.
 - 5. Equipment operation & maintenance manuals.
- E. File formats & Information Exchange: Comply with the following:
 - 1. Preferred file format: Portable document format, PDF, Adobe Acrobat V.8 or later.
 - 2. Combined pages: Submit related documents incorporated into single PDF files, as though stapled together. Include transmittal as part of file.
 - 3. Acceptability: Properly identified, digitally signed/countersigned, pdf documents shall be binding upon the Project and its parties as if issued in paper form.
- F. Email: Electronic email shall be an acceptable e-docs, binding upon the Project and its parties and equal in force to hardcopy or PDFs.
 - 1. Use email applications having interoperability with all parties of the Project.
 - 2. Use project name in subject line of each and every email issued; and include writer's name, address, telephone number and position in each email.
- G. Acceptable picture / graphic file formats: "TIF", "GIF", and "JPEG".
 - 1. Color in files: Acceptable, but not required.
 - 2. Do not use other formats without approval of all parties.
- H. Proprietary file formats: Do not use for e-docs unless all parties agree. These include:
 - 1. MS Word.
 - 2. PowerPoint.

3. FileMaker.
 4. MS Excel.
 5. Photoshop.
- I. File sizes, formats and naming conventions:
1. Use only agreed to, Project-accepted naming conventions for e-docs.
 2. File sizes: Acceptable to internet service providers and parties servers.
 3. Large files: Use FTP file transfer protocol up/down loads to pre-agreed servers.
 4. Large files: DVD / CD ROMs disks may be used, only if FTP or DropBox sites are not available.
 5. Maximum file size: Do not exceed 25 MGs without prior agreement of parties.
 6. Files compression: Do not use Stuff-It, PK-ZIP or the like without prior agreement.
 7. Unacceptable files: Unopenable, illegible, damaged, unintelligible files will be discarded without action. Originator shall correct and re-issue.
- J. Cost of E-Doc Management: Each party to e-doc exchange shall maintain staff, programs and equipment, and storage adequate for generation, processing and archiving of e-docs as appropriate to their needs. Costs of for e-doc exchange and management shall be an internal overhead and administrative cost absorbed by each party.
- K. Paper documents not also issued electronically and received by the Architect from the Contractor will be sent out for scanning to e-doc file and charged to Contractor or deducted from the Contract Sum.
- L. If requested, Contractor, vendors, suppliers and subcontractors shall create their submittals in BIM file formats per Owner requirements with appropriate tags for facility management applications.
- M. Terms, Conditions and requirements for transmittal of CAD files:
1. Unless otherwise indicated, computer-aided-design files will be furnished as “shells” only of architect/engineer drawings.
 2. As a condition of receipt of files of this kind, sign a release in the form provided by the Architect – who, upon receipt of same, will issue the indicated drawings.
 3. Comply with the following:
 - a. The Contractor may use information for preparation of base sheets for “Coordination Drawings” and “Record Drawings”, but not for “Shop Drawings”.
 - b. The Architect and the Architect’s consultants retain all copyrights to their documents.
 - c. The Architect and the Architect’s consultants give the Contractor a limited and nontransferable license to use their documents for the sole purpose of preparing “Coordination Drawings” and “Record Drawings” for this project only. No other use or purpose is authorized or permitted.
 - d. The Contractor shall not copy, distribute, or disseminate the documents furnished to him for any use or purpose other than the purposes authorized by this Agreement.
 - e. The Architect and the Architect’s consultants do not warrant that the documents furnished to the Contractor are complete or accurate. All addenda and modifications may not have been incorporated into the documents furnished to the Contractor.
 - f. The documents will be furnished in their existing layering, filing, and directories. No special layering, file organization, directory organization, or compilation will be created for the Contractor.
 - g. The Architect and the Architect’s consultants do not warrant that the electronic documents furnished to the Contractor are usable with any computer hardware or software other than the computer hardware and software used by the Architect and the Architect’s consultants. The Architect and the Architect’s consultants may have used multiple different and non compatible computer hardware and software systems and products.
 - h. The Contractor shall check the information contained in the documents furnished by the Architect and the Architect’s consultants. The Contractor shall be solely responsible for the completeness and accuracy of the “Coordination Drawings” and “Record Drawings” prepared using the documents furnished by the Architect and the Architect’s consultants.

- i. The Contractor shall remove the Architect's and the Architect's consultants' professional seals from "Coordination Drawings" and "Record Drawings" prepared using the documents furnished to him.
- j. The Contractor shall indemnify and hold harmless the Architect and the Architect's consultants and the officers, employees, and assigns of the Architect and the Architect's consultants from all damages and claims resulting from the use of documents furnished to him.
- k. Documents will be made available to the Contractor on an internet FTP [File Transfer Protocol] site.
 - 1) A user ID and password may be required to access information.
- l. These terms and conditions constitute the complete Agreement between the Contractor and the Architect and the Architect's consultants.
- m. These terms and conditions may only be modified in writing by mutual agreement of all parties to this Agreement.
- n. This Agreement is governed by the laws of the state where the Architect has their principal place of business.

PART 2 -PRODUCTS [Not Used]

PART 3 -EXECUTION [Not Used]

END OF SECTION

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of Contract including General and Supplementary Conditions and applicable portions of Division 1 - General Requirements, apply to work of this Section.
- B. Section includes providing alternate prices.

1.2 ALTERNATE REQUIREMENTS & ADMINISTRATION

- A. List price for each alternate in Bid Form. Include cost of modifications to other work to accommodate alternate. Include related costs such as overhead and profit.
- B. Owner will determine which alternates are selected for inclusion in the Contract.
- C. Definition: An alternate is an amount proposed by Bidders that will be added to or deducted from Base Bid amount if Owner decides to accept a corresponding change in either scope of work or in products, materials, equipment, systems or installation methods described in Contract Documents.
- D. Coordination: Contractor shall be responsible to coordinate related work and modify or adjust adjacent work as required to ensure that work affected by each accepted alternate is complete and fully integrated into project.
- E. Notification: Immediately following award of Contract, prepare and distribute to each party involved, notification of status of each alternate. Indicate whether alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to alternates, if any.
- F. Include as part of each alternate, miscellaneous devices, appurtenances and similar items incidental to or required for a complete installation whether or not mentioned as part of Alternate.

PART 2 - PRODUCTS - Not Applicable

PART 3 - EXECUTION

3.1 SCHEDULE

- A. Refer to Section 01 23 01 – Schedule of Alternates. If this section is not included, no alternates are required to date.

END OF SECTION

SECTION 01 23 01 SCHEDULE OF ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of Contract including General and Supplementary Conditions and applicable portions of Division 1 - General Requirements, apply to work of this Section.
- B. Section includes schedule of alternates.
- C. Related requirements:
 - 1. Section 01 23 00 - Alternates

PART 2 - PRODUCTS - Not Applicable

PART 3 - EXECUTION

3.1 SCHEDULE

- A. Alternate 1 - Refer to drawings.
- B. Alternate 2 - Refer to Drawings.
- C. Alternate 3 - Refer to drawings.
- D. **END OF SECTION**

SUBSTITUTION REQUEST FORM

No substitutions will be considered without this completed substitution request form and supporting documentation.

Substitutions made without completion of this form will be considered defective work as defined by the General Conditions of the Contract.

Date: _____ No.: _____

Project Name: _____

Project address: _____

To: Architect of Record

Re: _____

The Contractor proposes the following substitution in accordance with the Contract Documents.

Scope of Substitution _____

Spec. Section Reference _____

Drawing Reference _____

Drawing Reference _____

Reason for proposed Substitution _____

Impact on project cost _____

Impact on sustainable design characteristics _____

Impact on project Schedule _____

Impact on project _____

Guarantees & Warranties _____

Coordination
required
with adjacent
materials
and systems

List deviations
from specified
requirements

Coordination
required
with adjacent
materials
and systems

Attachments: Attach supporting documentation sufficient for Architect to evaluate substitution.
[Substitution forms lacking adequate documentation will be returned without review.]

Attachments

Response date: List date by which response by Architect is requested to maintain project schedule and allow sufficient time for inclusion of proposed substitution.

Response Date

Submitted by

Firm

Address

Signature below signifies acceptance of responsibility for accuracy and completeness of information included in this Substitution Request Form.

Authorized
signature

ARCHITECT'S RESPONSE

Notations listed below shall have the same meaning as on Architect's approval stamp. Clarifications to or changes in project schedule or time shall be processed on standard project forms.

- ____ Accepted / Reviewed
- ____ Accepted / Reviewed as corrected
- ____ Revise and resubmit
- ____ Rejected
- ____ Returned without review

Remarks

Date

Signed

END OF FORM

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.
 - 1. Multiple Prime Contracts: Provisions of this Section apply to the work of each prime contractor.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Allowances" for procedural requirements governing the handling and processing of allowances.
 - 2. Division 1 Section "Submittals" for requirements for the Contractor's Construction Schedule.
 - 3. Division 1 Section "Applications for Payment" for administrative procedures governing Applications for Payment.
 - 4. Division 1 Section "Product Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK

- A. The Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on AIA Form G710, Architect's Supplemental Instructions.

1.4 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: The Architect will issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal requests issued by the Architect are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
 - 2. Within 20 days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Architect for the Owner's review.
 - a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.
 - 1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
 - 2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Comply with requirements in Section "Product Substitutions" if the proposed change requires substitution of one product or system for a product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Change Order Proposal Requests.
- D. Proposal Request Form: Use forms provided by the Owner for Change Order Proposals.

1.5 ALLOWANCES

- A. Allowance Adjustment: For allowance-cost adjustment, base each Change Order Proposal on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in the purchase amount only where indicated as part of the allowance.
 2. When requested, prepare explanations and documentation to substantiate the margins claimed.
 3. Submit substantiation of a change in scope of work claimed in the Change Orders related to unit-cost allowances.
 4. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or the Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. The Owner will reject claims submitted later than 21 days.
1. Do not include the Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in Contract Documents.
 2. No change to the Contractor's indirect expense is permitted for selection of higher or lower-priced materials or systems of the same scope and nature as originally indicated.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: When the Owner and the Contractor disagree on the terms of a Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G714. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. The Construction Change Directive contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Proposal Request, the Architect will issue a Change Order for signatures of the Owner and the Contractor on AIA Form G701.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 35 32 – COVID-19 PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Work place health safety.
 - 2. Public health safety.
 - 3. Compliance with applicable health safety provisions in force.
 - 4. Emergency response.
 - 5. Health Safety and infection reporting.
- C. Extent: The Contractor is solely responsible for providing for job site, work place and public safety and for complying with:
 - 1. Applicable codes, laws, rules, regulations, and requirements of authorities having jurisdiction including, without limitation, Building Codes and applicable health and safety regulations and requirements.

1.2 REFERENCES

- A. Review safety provisions requirements. Confer with authorities having jurisdiction including:
 - 1. Building officials.
 - 2. Fire Department.
 - 3. Police Department.
 - 4. Public Health Department.

1.3 HEALTH SAFETY OFFICERS

- A. Designate a Primary Health Safety Officer and Deputy Officer. Each Health Safety Officer shall:
 - 1. Be responsible for health safety at the Project site.
 - 2. Be aware of current Federal, State, and Local applicable health safety provisions, rules and regulations.
 - 3. Be on site whenever any Contract activity is in progress.
 - 4. Have the authority to direct all workers and subcontractors to prevent unsafe conditions.
 - 5. Have the authority to penalize subcontractors and workers for health safety violations.
 - 6. Be subject to approval of the Owner and Architect. Replace unacceptable persons.
- B. The Health Safety Officer may be the Project Superintendent or other employees.
- C. The Deputy Safety Officer may cover the Primary Health Safety Officer's reasonable absences.

1.4 HEALTH SAFETY PLAN

- A. The Contractor shall submit a written plan for jobsite COVID-19 Procedures in compliance with applicable governmental regulations and as supplemented by the Contractor's own requirements, if any. Scope shall include that people and materials entering the site shall be required to comply with the written plan.
- B. Documentation: At least 10 days prior to beginning any work on site, prepare and submit a written Safety Plan.
 - 1. The Owner and Architect may review the safety plan and may make suggestions.
 - 2. The Owner's and Architect's option to review and suggest does not transfer any safety responsibility to the Owner or Architect. The Contractor remains solely responsible for health safety.
- C. Enforcement: The General Contractor shall enforce the Health Safety Plan and require all on-site workers to comply with the Safety Plan.
- D. Plan Content: Address at least the following:
 - 1. Identify the Contractor's personnel responsible for implementing such procedures. For the record, submit a monthly statement certifying that the Contractor has enforced the provisions in its written plan. The Contractor acknowledges that its written plan and monthly statements are submitted for the record only and not for approval by neither the Owner nor the Architect nor their agents.

1.5 EMERGENCY RESPONSE

- A. Plans: As part of the Safety Plan, prepare “Emergency Response Plans” which identify actions to be taken, persons responsible for each action, contact telephone numbers of all authorities having jurisdiction, governmental emergency telephone numbers, and other information.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION Not used.

END OF SECTION

SECTION 01 35 44 – UNKNOWN EXISTING MATERIALS PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. General requirements relative to unknown existing materials.
- C. Extent of Contractor responsibilities, if any existing material is suspected of being hazardous, without limitation, in connection with these materials include:
 - 1. Confer with Owner about available project information, available reports and the like.
 - 2. Notifying Owner.
 - 3. Protecting workers and public from exposure.
 - 4. Preventing disturbance of these materials.
 - 5. Redirect work to other locations to maintain project progress and avoid delays.
 - 6. Allowing 15 business days for Owner's investigation, and possible remediation.
- D. Owner responsibilities include:
 - 1. Employing an independent agency to investigate the unknown condition.
 - 2. Providing certified report to the Contractor stating results of the investigation.
 - 3. Taking action to remove, abate, encapsulate, or remediate hazardous conditions, if any.
 - 4. Completing investigation and remediation within 15 business days after Contractor's notification.
- E. Comply with applicable provisions of the General Conditions in connection with hazardous materials.

END OF SECTION

SECTION 01 45 50 – ENGINEERING BY CONTRACTOR

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: All Contract Documents, including Drawings, General and Supplementary Conditions and Division 1 General Requirements apply to this Section.
- B. Section includes, without limitation, administrative and procedural requirements for engineering services and:
 - 1. General requirements for engineering by the Contractor.
 - 2. Civil engineering services.
 - 3. Structural engineering services.

1.2 REQUIREMENTS

- A. General: Certain sections require work of the Contract to be engineered by qualified professionals employed by the Contractor. The following requirements apply:
 - 1. Minimum intent: Meet the design intent, performance, appearance and minimums indicated in the Contract Documents. Even when engineering may provide for lesser values do not reduce specified or indicated minimums, such as metal gage, wind speeds and the like.
- B. Engineers' responsibilities shall include:
 - 1. Being solely professionally responsible for the work.
 - 2. Calculate, design, engineer, and document the work.
 - 3. Meet requirements of authorities having jurisdiction including applicable Codes.
 - 4. Meet requirements specified in Contract Documents including visual requirements.
 - 5. Meet applicable industry standards, unless higher are indicated herein.

1.3 SUBMITTALS

- A. Prepare, professionally seal, sign and submit calculations, shop fabrication drawings, erections and installation drawings and other documents needed to show compliance with Contract requirements.
- B. Architect's [of Record] Review: Limited solely to review of visual appearance and design intent.
- C. Project Record Documents: Submit a record of Work performed required under provisions of Sections "Submittals" and "Project Closeout".

1.4 QUALITY ASSURANCE

- A. Engineer: Engage a Professional Engineer of the discipline required, registered in the state in which the Project is located, to perform required engineering services.

1.5 SUBSTITUTIONS

- A. Work engineered by the Contractor which deviates from Contract requirements shall comply requirements affection Substitutions.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify layout information shown on the Drawings, and existing benchmarks before proceeding to design, engineer or layout the Work.
- B. Coordinate with and comply with requirements of Division 01 where Field engineering is required.

3.2 PERFORMANCE

- A. Engineer construction and assemblies required by or indicated in the Contract Documents.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing, maintaining and managing:
 - 1. Minimum indoor air quality (IAQ) performance during the construction period and before occupancy.
 - 2. Compliance with performance standards.
 - 3. Construction Indoor air quality management plan.
- C. limitation:
 - 1. Section 01 57 10 - Construction waste management.
 - 2. Division 23 - HVAC.
 - 3. Divisions 2 through 33 Specification Sections:
Specific requirements relating to indoor air quality for each Section.

1.2 PERFORMANCE REQUIREMENTS

- A. Comply with minimum requirements of Sections 4 through 7 of ASHRAE 62.1-2010, Ventilation for Acceptable Indoor Air Quality and approved Addenda.
 - 1. Coordinate with requirements of other Divisions 2.
- B. Prevent exposure of building systems to environmental tobacco products during construction. At a minimum, take the following measures:
 - 1. Do not allow tobacco products in enclosed portions of the project site.
 - 2. Do not allow tobacco products adjacent to fresh air intakes for the building and operable windows, nor within 25 feet of building.
- C. During construction meet or exceed the minimum requirements of the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, Chapter 3.
- D. Protect occupied portions of the building from transfer of dust and particulate matter, noise and odor emissions generated during construction in compliance with the minimum requirements of the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, Chapter 3.
- E. Protect absorptive materials from moisture damage when stored on-site and after installation.
- F. During construction, comply with the following requirements:
 - 1. Develop and implement a moisture control plan to ensure dry conditions will be maintained to protect absorptive materials stored on site. Include criteria for protecting the building from moisture intrusion and occupant exposure to mold spores.
 - 2. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-2007. Protect active outdoor air intakes and return air grilles with applicable filtration media. Periodically inspect temporary media and replace as necessary. Replace filtration media immediately prior to occupancy.
 - 3. Develop and implement a plan to reduce noise and emissions on the construction site; address the following:
 - a. Surrounding community noise and vibration impacts. Determine which areas on and adjacent to the site will require special protection from noise.
 - b. Construction Worker training and protective equipment. Determine construction activities that may require the use of protective gear or specialty equipment and properly train workers in their use and/or operation.
 - c. Source Reduction. Develop and implement policies to limit truck and equipment idling on site and to limit vibration and noise from demolition and construction activities.
 - d. Compliance with tobacco smoking performance requirements.
- G. After construction ends but before occupancy, comply with one of the following requirements: ,

1. Perform a building flush-out with outside air.
2. Conduct IAQ testing for air contaminant levels in the building.

1.3 SUBMITTALS

- A. Construction Indoor Air Quality Management Plan: With the completed Form of Bidder's Proposal, the Contractor shall submit a preliminary Construction IAQ Management Plan.
 1. Within 21 calendar days after receipt of Notice to Proceed, the Contractor shall submit to the Owner a finalized Construction IAQ Management Plan.
- B. Indoor Air Quality (IAQ) Data: If requested, submit:
 1. Emission test data as required, with testing laboratory and date clearly identified.
 2. Test results for final building flush out or final IAQ test procedure.
- C. Material Safety Data Sheets (MSDS):
 1. Submit MSDS for materials as required, with date clearly identified.
 2. MSDS must contain specific chemical content data identifying the percent of the total product mass represented by each listed chemical.
- D. Product data: Submit documentation from manufacturer indicating requirements for materials and products of this Section and include:
 1. Each type of filtration media used during construction and installed immediately prior to occupancy, include and highlight MERV values the documentation provided.

1.4 PRODUCT REQUIREMENTS

- A. Comply with product requirements, delivery storage and handling provisions of Division 1 and the following:
 1. Do not deliver materials until job is ready for installation.
 2. Store products in ventilated dry area; protect from dampness, freezing, and direct sun light.
 3. Take special care to prevent accumulation of moisture on materials and within packaging prevent development of mold and mildew in packaging and on products.
 4. When not in use, store products in original sealed containers, in a designated location.
 5. Immediately remove from site and properly dispose of materials showing signs of mold and mildew, including materials with moisture stains.

PART 2 - PRODUCTS

2.1 FILTRATION MEDIA

- A. Filtration Media: Comply with ASHRAE 52.2-2007 and provide filtration media with compliant MERV ratings as required.

PART 3 - EXECUTION

3.1 CONSTRUCTION IAQ MANAGEMENT PLAN IMPLEMENTATION

- A. IAQ Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Construction IAQ Management Plan for the Project.
- B. Distribution: The Contractor shall distribute copies of the Construction IAQ Management Plan to the Job Site Foreman, each subcontractor, the Owner, and the Architect.
- C. Preconditioning: allow products, which have odors and significant VOG emissions, to off-gas in a dry, well ventilated space for sufficient period to dissipate odors and emissions prior to delivery to Project.
 1. Remove containers and packaging from materials prior to conditioning to maximize off-gassing of VOCs.
 2. Condition products in ventilated warehouse or other building.

END OF SECTION

SECTION 01 57 10 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Implementation of waste management controls and systems for the duration of the Work.
- C. Specific responsibilities:
 - 1. Masonry subcontractor is responsible for waste management of masonry work.
 - 2. Roofing and flashing subcontractor is responsible for waste management of roofing and flashing work.

1.2 INTENT

- A. The intent of this Section is to develop and implement a waste management plan, quantifying material diversion by either weight or volume to recycle and/or salvage to the extent practical of non-hazardous construction and demolition debris indicated.
- B. The Owner and Architect have established that this Project shall generate the least amount of waste practical and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.
- C. Of the waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized to the greatest extent practical.
- D. With regard to these goals the Contractor shall develop, for the Architect's review, a Waste Management Plan for this Project.
- E. Each Subcontractor shall be responsible for segregating his own waste into different dumpsters as directed by the Contractor. In particular:
- F. Contractor shall be responsible for ensuring that debris will be disposed of at appropriately designated licensed solid waste disposal facilities.

1.3 SUBMITTALS

- A. Waste Management Plan: Within 21 calendar days after receipt of Notice to Proceed, the Contractor shall provide a plan containing the following:
 - 2. Alternatives to Land filling: A list of each material proposed to be salvaged or recycled during the course of the Project. Include the following and any additional items proposed:
 - a. Cardboard.
 - b. Clean dimensional wood.
 - c. Beverage containers.
 - d. Land clearing debris.
 - e. Concrete.
 - f. Metals from framing, banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - g. Mechanical and electrical equipment.
 - h. Packaging materials.
 - i. Glass.
 - j. Carpet and pad.
 - k. Plastic bags, sheeting, and wrapping.
 - 5. Meetings: A description of the regular meetings to be held to address waste management.
 - 6. Materials Handling Procedures: A description of the means by which any waste materials identified above will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.

7. Transportation: A description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials.
- B. Waste Management Progress Report: Concurrent with every third Application for Payment, submit a written Waste Management Progress Report in the same format as required for Final Report.
 - C. Waste Management Final Report: Prior to Substantial Completion, submit a written Waste Management Final Report summarizing the types and quantities of materials recycled and disposed of under the Waste Management Plan. . Quantity may be measured by either weight or volume; be consistent in calculations. Include the following:
 1. Material category.
 2. Generation point of waste.
 3. Total quantity of waste, by weight.
 4. Total quantity of waste recovered (salvaged plus recycled).

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION

3.1 RECYCLING

- A. Metal, including but not limited to aluminum stairs, structural beams and sections, and reinforcing steel shall be recycled.
- B. Wood that is not painted and does not contain preservatives (i.e. creosote, arsenic, and chromium-containing preservatives) shall be segregated and recycled.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.
- B. Distribution: The Contractor shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner and the Architect.
- C. Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
- D. Separation Facilities: The Contractor shall lay out and label a specific area to facilitate separation of materials for recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. Location shall be acceptable to the Architect.
- E. Hazardous Wastes: Any unforeseen hazardous wastes shall be separated, stored, and disposed of according to local regulations and as directed by the Owner.

END OF SECTION

SECTION 01 70 00 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: All of the Contract Documents, including the Drawings, the General and Supplementary Conditions and Division 1 General Requirements apply to the work of this Section.
- B. Section includes: General execution requirements.

1.2 INSPECTION & EXAMINATION

- A. Examine and inspect work daily to ensure compliance with Contract Documents and comply with the following:
 - 1. Inspection by Contractor, subcontractors or installers:
 - a. Inspect work of other trades to ensure areas are ready to receive next phase of work.
 - b. Verify required work of other sections or trades is properly and fully installed before proceeding.
 - c. Examine previous work, related work and conditions.
 - d. Take action to ensure defects are corrected.
 - 2. Notify in writing Contractor, Architect and where applicable, Owner, of deficiencies or conditions detrimental to proper completion of the Work.
- B. Acceptance: Beginning installation or execution of work constitutes acceptance and approval of previous work, related work and conditions.

1.3 TOLERANCES & MEASUREMENT

- A. Confirm measurements and dimensions and comply with the following:
 - 1. Do not deviate from measurements and dimensions of Contract documents without written authorization to do so from the Architect.
 - 2. Field check measurements and tolerances periodically and regularly.
 - 3. Notify Architect in writing of differences between field and Contract Documents. Submit drawings showing differences.
 - 4. Confirm tolerances and do not allow them to grow or accumulate.
- B. Tolerances: Unless otherwise shown, indicated, specified or approved in writing, install work plumb, aligned, and straight as follows:
 - 1. 48 inches or less: within 0.06 inch.
 - 2. 10 feet or less: within 0.125 inch.
 - 3. 20 feet or less: within 0.18 inch.
 - 4. Over 20 feet: Within 0.25 inch.

1.4 APPROVALS, INSPECTIONS, FIELD QUALITY CONTROL

- A. Obtain required inspections and approvals of authorities having jurisdiction before concealing applicable work.
- B. Field Quality Control: Perform or coordinate with those performing, required field quality control, field tests and the like.

1.5 LAYOUT

- A. Employ skilled, experienced person to establish lines, elevations and layout of the work and comply with the following:
 - 1. Provide and maintain layout lines, benchmarks, and necessary working points.

2. Do not change, deviate or alter indicated lines and elevations without prior written approval from the Architect.
- B. Architect's review of interior layout:
1. Layout interior partitions and doorways on floor.
 2. Do not continue to work without Architect's approval.
 3. Do not alter layout without written approval from Architect.
- C. Floor finishes: Unless otherwise specifically indicated:
1. Extend floor finishes under open bottom items, movable items, furnishings, equipment and casework.
 2. Extend into closets, recesses, alcoves and toe spaces.
 3. Extend tight to walls, columns, permanent work.
- 1.6 ADJUSTING
- A. Adjust operable items to operate freely and properly.
- 1.7 AIR INFILTRATION & FREEZE PROTECTION
- A. General: Ensure the building envelope provides a continuous barrier to air infiltration and to freeze damage. Upon completion the building envelope shall:
1. Separate all occupied and mechanical spaces from exterior temperatures with weather tight construction as necessary to protect against freezing or excessive heat loss.
 2. Provide solid blocking, sheathing and/or framing to support construction to accomplish this requirement.
- B. Extent of Contractor obligation: As part of this Contract, be responsible for any and all damages which occur due to lack of weather tight construction.
- C. Air Infiltration: Comply with provisions of other sections. Ensure different components forming the air infiltration barrier system are interconnected and sealed together without discontinuities or open penetrations.
- D. Freeze protection: Construct assemblies to ensure the typical thermal and air barrier systems are on the cold-in-winter side of work subject to freezing. In particular, soffits, ceilings and chases subject to freezing shall only be constructed after typical assemblies are insulated and finished off.
- 1.8 CLEANING
- A. Clean work areas daily. Do not permit debris to accumulate.
- B. Clean completed work using appropriate materials complying with Contract Documents and manufacturer recommendations, instructions and limitations.
- C. Comply with application sustainability requirements, if any, including:
1. Cleaning materials.
 2. Indoor air quality.
 3. Construction waste disposal.
- 1.9 PROTECTION / ISOLATION
- A. Protect installed work from damage or deterioration and as follows:
1. Restrict traffic from completed protected work or areas.
 2. Prohibit traffic, storage or other work from waterproofing and roofing.
 3. Protect doors, frames, and hardware.
 4. Protect glass from damage, scratches, or stains.
 5. Maintain proper humidity levels and protect work from dampness, moisture, stains, marks or abrasions.

6. Replace work with evidence of growths, mold or mildew.
 7. Replace damaged or deteriorated work with new acceptable work complying with Contract Documents.
- B. Isolate dissimilar metals from galvanic action or corrosion with non-absorptive dielectric material, tape or coatings of type recommended by manufacturer or approved by Architect.

PART 2 - PRODUCTS Not used

PART 3 - EXECUTION Not used

END OF SECTION

DOCUMENT 01 70 53 – TAX EXEMPTION USAGE REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Document Includes, without limitation, requirements for usage of:
 - 1. Owner's tax exemption.
- C. Tax exemption: The Owner is exempt for the payment of sales taxes on materials and products permanently incorporated into the work.
- D. Extent of Contractor responsibilities for tax exemption usage, without limitation, includes:
 - 1. Notices & verification:
 - a. Obtain from Owner their tax exempt documentation.
 - b. Complete forms required by the state Department of Revenue.
 - c. Comply with state filing and regulatory requirements.
 - 2. Records: Providing Owner with one copy of each purchase order, invoice, and receipt which used the Owner's tax exemption certificate number.
 - 3. Certification: Upon Contract completion, provide a notarized certification to the Owner stating that all purchases made under the Owner's tax exemption certificate number were legitimate, for this Contract, and entitled to the exemption.
- E. Penalties: Pay all penalties assessed by authorities having jurisdiction for the Contractor's improper or illegal use of the Owner's tax exemption certificate number.

END OF DOCUMENT

SECTION 01 89 20 – RENOVATION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Compliance with renovation requirements.
 - 2. Pest control.
- C. Extent of renovation work: Renovate, reconstruct, rebuild, and repairing existing construction and surfaces to eliminate damaged and deteriorated materials and construction, and to create a continuous “like new” appearance and condition where required and as follows:
 - 1. At each interface between new and existing work.
 - 2. Where damage or holes are caused by installation of new work.
 - 3. At each location of demolition and removal of existing work.
 - 4. Wherever the Contract Documents indicate work on existing surfaces.
 - 5. At all existing construction and surfaces to remain except those specifically noted as “No Work Required”

1.2 QUALITY ASSURANCE

- A. Comply with Division 01 requirements and governing codes and regulations.
- B. Preconstruction Photographs for Renovation Work:
 - 1. Prior to beginning work at the site, provide a complete and detailed record of existing conditions with emphasis on existing items and surfaces indicated to remain and existing damage and deterioration.
 - 2. Basic Photography Requirements: Comply with applicable requirements of Division 01.
 - 3. Identify each photo by room number or similar exterior description.
- C. Project/environmental conditions: Protect work according to best practices and as specified below:
 - 1. Because the Project Cost is based on existing conditions, the Contractor shall maintain existing conditions.
 - 2. If the scope or cost of renovation work increases because of worsening conditions or degradation of conditions, the Contractor shall be solely responsible for the increased scope and costs since the Contractor had responsibility to maintain the existing condition and to prevent the degradation and worsening condition.
 - 3. At no increase cost to the Owner, expand and extend the renovation work to correct degraded and worsened existing conditions. Eliminate all loose, deteriorated, and damaged conditions, finishes, surfaces, and substrates, which are not maintained to the condition existing at the beginning of the contract.
- D. Study Existing Field Conditions: Thoroughly study, examine, and investigate existing field conditions including, without limitation, conditions in all crawl spaces, plenums, attics, accessible chases, and above accessible ceilings
 - 1. Compare the Contract Documents with existing field conditions prior to beginning any work on site. Fully understand the full extent of the renovation work.
 - 2. Field Measurements: Measure existing conditions and coordinate new work with existing conditions. Review details of construction with the Architect prior to beginning work.

1.3 GENERAL RENOVATION REQUIREMENTS

- A. Contract drawing limitations: The Contract Documents do not show
 - 1. Every existing conditions.
 - 2. Nor all new work to existing condition interfaces.
 - 3. Nor complete and precise extent of patching, repair and renovation required.
 - 4. The above are not indicated everywhere since the Contractor has control over means methods, and techniques of selective demolition and integrating new and existing construction.
- B. Cutting requirements: Comply with applicable requirements of Division 01 including documents relating to cutting and patching, selective demolition and remedial work.

- C. Existing to Remain” and “Existing to be Relocated” Requirements: Throughout the Contract, effectively protect and maintain existing conditions, finishes, surfaces, and substrates indicated to remain “as is”, indicated to remain “with specific cleaning”, or indicated to remain “ with new finishes”.

PART 2 - PRODUCTS

2.1 RE-USED & REPLACED MATERIALS

- A. Existing re-used or new replaced materials and surfaces shall meet the following criteria:
1. Sound solid materials, free of cracks, chips or other damage.
 2. Functional for intended use.
 3. Free of stains or abrasions or other degraded materials.
 4. Consistent shape and size matching typical adjacent components.

PART 3 - EXECUTION

3.1 RENOVATION

- A. Pipes, Chases, and Enclosures for Renovation Work: Not all chases and enclosures required in renovated areas are shown on Drawings.
1. Provide metal framed, gypsum drywall chases and enclosures to enclose and completely conceal all new piping, ducts, cables and conduits located in renovated finished spaces other than dedicated mechanical rooms, electrical rooms or Tele/Data rooms.
 2. Provide fire-rated chases and enclosures to meet Building Code requirements.
- B. Floor Elevations: Make new floors level and align with existing floors. Where existing floors are not level and leveling of existing floors is not required by the Contract, build new work to meet and be flush with the existing out of level condition. Survey, record, and submit existing condition and level information.
- C. Newly Exposed To View Concrete: Renovate all newly exposed to view existing concrete surfaces.
1. Patch and fill voids, honeycombs, cracks, pits, “bug holes”, and other defects.
 2. Grind rough areas and protrusions down to flush and smooth.
 3. Eliminate visible reinforcing steel including cut ends.
 4. Cut reinforcing back at least 0.75 inch below surface, then paint steel for rust resistance.
- D. Lead Paint: If the Contract Documents do not include a complete existing lead paint survey, assume all surfaces which may have been painted prior to 1978 are coated with lead paint.
1. Comply with OSHA, Lead in Construction Industry Standard, 29 CFR1926.62.
 2. Deleading and removal of lead coatings is not intended.
- E. Holes in Floors, Walls, Roof, and Existing Construction: Patch, repair, rebuild, and rework to eliminate all holes including, without limitation, holes resulting from removal of partitions, pipes, ducts, conduits, equipment, and other work. Make patches and repairs match the material, quality, fire rating, and load capacity of the adjacent existing condition. Frame, reinforce, and support patches and repairs so they cannot fall out or fall through the opening.
- F. Transition of New to Existing Work:
1. Unless specifically indicated or specified otherwise, provide a smooth, continuous, monolithic and uniform appearance with no visible evidence of patching, rebuilding, or repair and no visually discernible difference between new work and existing work.
 2. Control Joints: Where this requirement is not possible, and after obtaining Architect’s prior written approval, provide a controlled, defined straight line break and a control joint between new work and existing work.
 3. Painting and Finishing: Unless specifically indicated or specified otherwise, uniformly extend painting and finishing of rebuilt and repaired work over adjacent existing unprepared surfaces to the nearest significant change of plane.
 4. Create and Maintain Planes: Where the removal of existing construction (example: existing partition removal) creates new spaces and new planes, rework and rebuild adjacent planar surfaces (examples: walls, ceilings, and floors) to create new smooth planes free from holes, valleys, depressions, bumps, offsets, breaks, and other defects. Conceal and eliminate all visible evidence of construction removed.

3.2 PEST CONTROL:

- A. Engage a licensed exterminator, who practices integrated pest management (IPM), to inspect the project and eliminate rodents, termites and all other insects and pests. Coordinate pest control plan with Owner. Owner's written approval is required prior to application. Submit proposed program to Owner and Architect. Program shall clearly indicate the following:
1. Area or areas to be treated.
 2. Manufacturer's printed instructions and MSDS for each chemical to be used.
 3. Pollution preventive measures to be employed.

3.3 CLEANING

- A. Immediately before Owner occupancy:
1. Thoroughly and completely strip, scrub and clean all vinyl floor tile and vinyl base, cabinetry and equipment, window treatments, and interior sidelights, glass and exterior window glazing and all other interior finishes in the work area.
 2. Remove all dirt, soil, stains and marks from all surfaces whether existing, new, re-built or replaced.

END OF SECTION

SECTION 02 22 00 – EXISTING CONDITIONS ASSESSMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Assessing existing conditions.
 - 2. Reviewing available existing conditions documentation.
- C. Existing conditions information:
 - 1. Was collected by Owner and Architect for use in designing the project.
 - 2. Is not part of Contract Documents.
 - 3. Is not guaranteed by Owner nor Architect as complete or accurate.
 - 4. Made available to Contractor solely as a courtesy.
 - 5. Used by the Contractor at their sole risk, liability and judgment.
- D. Additional Existing Conditions Information Obtained By Contractor: The Contractor may obtain additional existing condition information and may perform selective exploratory demolition by making a specific written request to the Owner and obtaining his pre-approval.
- E. Concealed and Unknown Conditions: Comply with the Conditions of the Contract for Construction. The following conditions are not “concealed” or “unknown” for the purposes of claims:
 - 1. Conditions above lay-in ceilings.
 - 2. Conditions shown on existing building drawings or record drawings.
- F. Existing Building Drawings: Where existing buildings are part of the project, existing building drawings may be available for Contractor’s review. Refer to Architect.

1.2 SUBMITTALS

- A. Comply with Division 01 General Requirements and submit for approval:
 - 1. Existing conditions drawings: Show location and elevation of each measurement required or indicated below.
 - a. Field Measurements: Take accurate field measurements and indicate same on drawings.

PART 2 - PRODUCTS

2.1 NEW MATERIALS USED IN CONNECTION WITH ASSESSEMENT

- A. Match existing, as applicable.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the provisions of Section 01 70 00 - especially requirements related to:
 - 1. Inspection and examination. Tolerances and measurement.
 - 2. Approvals, inspections and filed quality control.
 - 3. Layout. Adjusting.
 - 4. Cleaning. Protection.
- B. Install materials and systems in accordance with manufacturer's instructions, limitations and restrictions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

END OF SECTION

SECTION 02 41 10 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: All Contract Documents, including Drawings, General and Supplementary Conditions and Division 1 General Requirements apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Protection of work to remain
 - 2. Pollution and dust control
 - 3. Removing work indicated not to remain.
 - 4. Structural elements
 - 5. Temporary supports
 - 6. Interior partitions
 - 7. Interior non-structural finishes
 - 8. Doors, windows frames and the like
 - 9. Electrical, plumbing and heating components
 - 10. Coordination with related work and separate Owner contracts
- C. Extent includes, without limitation:
 - 1. Provide demolition work necessary for execution and completion of the Work whether shown on the drawings or not.

1.2 QUALITY ASSURANCE:

- A. Legal Requirements: Work under this section shall be done in full conformance with all governing local, state and federal laws, codes and regulations, including, but not limited to:
 - 1. Occupational Safety and Health Standards (29 CFR 1910).
 - 2. Department of Public Health regulations.
 - 3. State and local Waste Specific Restrictions.
- B. Permits: Obtain all agency and utility company permits required for the work of this section.
- C. Interface between work to remove and work to remain: Perform all removals of existing construction neatly, to sharp cut-off points or lines as shown, unless otherwise indicated.
- D. Qualifications: Personnel employed by the contractor to survey or verify the condition of structures shall be competent to determine both the condition of the framing, floors, and walls and the possibility of unplanned collapse of any portion of the structure and shall have the authority to take prompt corrective action when necessary

1.3 SUBMITTALS

- A. Demolition Plan and Schedule: Submit an itemized plan and schedule of demolition for review prior to the start of work.
- B. Project Record Documents: Provide written graphic description of unanticipated structural, electrical, or mechanical conditions.
- C. List of items to be salvaged: For approval and coordination.

1.4 INTENT

- A. A major intent of the work of this section is to demolish, remove from the site and legally dispose of items to be completely or selectively demolished as required to complete the work shown on the drawings.
- B. Upon completion of work, remove tools, materials and equipment and dispose of scrap. Leave interior areas broom clean. Leave exterior areas free of debris. Remove all nails, hangers, system components, and other items down to bare substrates unless otherwise indicated.

- C. Comply with requirements of applicable Federal, State, and local safety and health regulations, regarding demolition of structures including ANSI/NFPA 241 – Building Construction and Demolition Operations.
- D. The Owner intends to investigate the facility after major demolition work is complete to survey and document conditions to ensure design intent and layout requirements are met. Include time in job schedules for this activity.

1.5 JOB CONDITIONS

- A. Existing Conditions: The owner assumes no responsibility for actual condition of structures or portions of structures to be demolished.
- B. Explosives: Use of explosives will not be necessary nor permitted.
- C. Traffic: Do not close or obstruct streets, ways or occupied facilities without written permission from owners and governmental authorities, as appropriate. Perform demolition operations and removal of debris so as to minimize conflict with normal use of such off-site streets, ways and facilities.
- D. Disposal of Debris: Make arrangements necessary for legal and proper execution of the work.
- E. Public protection: Take protective measures as required to prevent spread of dirt and debris, damage to adjacent properties, and injury to occupants and passers-by. To this end control noise, vibration, and spread of dust; keep all life-safety hazards enclosed, and take measures as required to prevent and suppress fire. Make provisions for medical first-aid as required.
- F. Barriers: Within the area of the work, provide safety barriers, rails and closures as required at all hazardous areas including floor and roof edges and openings. Take all measures as required by O.S.H.A. and by other Government Authorities and as prudent to protect workers against, hazards to health and safety. Do not allow dust or odors to migrate into adjacent occupied areas.
- G. Unforeseen Conditions and Occurrences: Promptly advise the responsible authorities and Architect of:
 - 1. Any conditions of site or structure which appear unsafe, unsound or disintegrated and which may require removal or special protective measures.
 - 2. Any occurrences involving injuries to persons on or off site, or damage to structures on or off site.
 - 3. If unanticipated mechanical, electrical, or structural elements which conflict with intended function or design are encountered, investigate and measure both the nature and extent of the conflict. Submit report to Contractor/Construction Manager orally and in written, accurate detail, with a copy to the Architect. Pending receipt of directive from the architect, rearrange demolition schedule as necessary to continue overall job progress without delay.
- H. Utilities: Coordinate utility shutoff and obtain all utility company requirements and written approvals for demolition work. Utilities required temporarily for Contractor operations and for on-going occupancy shall not be discontinued. Do not interrupt existing utility services to other properties, except when properly authorized. In such cases, provide temporary services as required.
- I. Damages: Promptly repair, at no cost to the owner, damages caused to facilities to remain.

1.6 POLICE AND FIRE DEPARTMENT

- A. Coordinate demolition schedule with the Chiefs of Police and Fire Departments in the locality having jurisdiction.
- B. Promptly notify Police and/or Fire Department of any occurrences, planned or unexpected, requiring their knowledge or assistance.

1.7 HAZARDOUS MATERIALS

- A. Detection, removal and disposal of hazardous materials, including lead and asbestos, are not within the scope of documents prepared by the Architect of Record. Such work shall be performed in accordance with the law, by duly qualified and licensed firm[s]. Promptly report to the Owner any materials discovered in the course of the work, which are suspected of being hazardous. Do not proceed with work on such materials until so directed by the Owner.

PART 2 - PRODUCTS Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities to be permanently or temporarily shut off have been disconnected and sealed.
- B. Survey existing conditions and correlate with drawings and specifications to determine extent of demolition, salvage, protection, or temporary construction required.
- C. Insofar as is practicable, arrange operations to reveal unknown or concealed structural conditions for examination and verification before removal or demolition.
- D. Verify actual conditions to determine in advance whether or demolition of any element will result in deficiency, overloading, failure, or unplanned collapse.
 - 1. Comply with the requirements of Section 01 54 10 – Temporary Shoring & Bracing.
- E. Perform continuing surveys as the work progresses to detect hazards resulting from demolition or construction activities.

3.2 SALVAGE

- A. Do not commence work until Owner's salvage requirements are understood and list of items to be salvaged has been approved in writing.

3.3 PREPARATION

- A. Protection: Ensure safe passage of persons around area of demolition
 - 1. Conduct operations so as to prevent damage to structures to remain.
 - 2. Erect temporary covered passageways as required by authorities having jurisdiction.
- B. Protect walls, floors, and other new or existing work damage during demolition operations.
Temporary Partitions: Construct temporary partitions where directed by construction manager.
- C. Exterior closures: Provide weatherproof closure constructed to prevent water leakage, insulated to prevent excessive heat loss or gain to occupied areas, and sealed to prevent excessive air filtration.
- D. Structural Support: Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or unplanned collapse of structures to be demolished and adjacent facilities to remain as well as new work to be installed. Increase or add new supports as required by the progress of the work.
- E. Damages: Promptly repair, at no cost to the owner, damages caused to facilities to remain.
- F. Salvage: Turn over any work indicated for salvage and store on site in a location designated by Owner. Protect the work from damage during the work and until reinstalled or removed from the site by Owner.
- G. Finishes: Where finishes are to be removed, remove completely remove adhesives, mastics, undercoats, setting beds and leveling coats to smooth, plane surface and leave no residues which could adversely affect the installation of new finishes.

3.4 POLLUTION CONTROLS

- A. For exteriors: Use water sprinkling, temporary enclosures, and other suitable methods to limit spread of dust and dirt.
- B. For interiors: Erect dust barriers and the like. For concrete, masonry and other major gut demolition projects proper use of water sprinkling may be required.
- C. Prevent and limit the spread of dust and dirt. Comply with governing regulations pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

3.5 DEMOLITION - PROCEDURES

- A. Remove: Items indicated to be removed, or required to be removed for the proper installation of new work, and not otherwise indicated to be reinstalled or salvaged shall be removed and disposed of by the contractor, at no additional cost to the Owner.

- B. Scrap: Remove and dispose of items indicated.
- C. Existing to Remain: Construction or items indicated to remain shall be protected against damage during demolition operations. Where practical, and with the Owner's permission, the contractor may elect to remove items to a suitable storage location during demolition and then properly clean and reinstall the items.
- D. Perform work in a systematic manner.
- E. Demolish and remove existing construction only to the extent required by new construction and as indicated in the contract documents.
- F. Use such methods as are necessary to complete the work within the limitations of governing regulations and the requirements of the contract documents.

3.6 SUSTAINABILITY

- A. Comply with Section 01 57 10 – Construction waste management, and site separate materials as required to section provisions.

3.7 DISPOSAL OF DEMOLISHED MATERIALS:

- A. Promptly dispose of materials resulting from demolition operations. Dispose of debris in a systematic manner at regular intervals and to ensure speedy, proper prosecution of the Work. Do not allow materials to accumulate on site in excess of amounts normally removed at the intervals scheduled.
- B. Transport materials resulting from demolition operations and legally dispose of off-site.
- C. Do not burn removed materials on project site.
- D. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
- E. Transport and dispose of all debris in a legal manner and at legal disposal site, as it is removed.

3.8 CLEANING

- A. Remove debris daily.
- B. Clean soil and dust from surfaces to remain.
- C. Replace or repair damaged work to the satisfaction of the Architect, and return such work to remain to condition equal or better than at commencement of work.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Elevated slabs
- B. Related Sections include the following:
 - 1. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.
 - 2. Division 32 Section "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Samples: For waterstops and vapor retarder.
- E. Welding certificates.
- F. Qualification Data: For Installer.

- G. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

- H. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Steel reinforcement and accessories.
 - 4. Fiber reinforcement.
 - 5. Curing compounds.
 - 6. Floor and slab treatments.
 - 7. Bonding agents.
 - 8. Adhesives.
 - 9. Vapor retarders.
 - 10. Semirigid joint filler.
 - 11. Joint-filler strips.
 - 12. Repair materials.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4-inch, minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable, or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

- C. Plain-Steel Wire: ASTM A 82, as drawn.
- D. Deformed-Steel Wire: ASTM A 496.
- E. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 3/4-inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 3. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor, or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 - 1. Available Products:
 - a. Grace Construction Products, W. R. Grace & Co.; DCI-S.
 - b. Sika Corporation; FerroGard-901.

2.7 WATERSTOPS

- A. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factories fabricate corners, intersections, and directional changes.
 - 1. Available Products:
 - a. JP Specialties, Inc.; Earth Shield TPE-Rubber.
 - b. Vinylex Corp.; PetroStop.
 - c. WESTEC Barrier Technologies, Inc.; 600 Series TPE-R.
 - 2. Profile: Ribbed with center bulb.
 - 3. Dimensions: 6 inches by 3/16 inch thick; non tapered.

2.8 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Available Products:
 - a. Fortifiber Corporation; Moistop Ultra.
 - b. Stego Industries, LLC; Stego Wrap, 15 mils.

2.9 CURING MATERIALS

- A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- B. Water: Potable.
- C. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch-thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned based on laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash: 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

B. Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 540 lb/cu. yd.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of interior troweled finished floors to exceed 3 percent.

D. Suspended Slabs on Metal Deck: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 540 lb/cu. yd.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

E. Concrete Toppings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 5000 psi at 28 days.
2. Minimum Cementitious Materials Content: 540 lb/cu. yd.
3. Slump Limit: 5 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of interior troweled finished toppings to exceed 3 percent.

2.14 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.

- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Locate vertical joints in walls beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths if practicable. Where more than one length is required, lace or clip sections together.

- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, or built-up or membrane roofing.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- E. Broom Finish: Apply a broom finish to parking garage slabs, exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. **Moisture-Retaining-Cover Curing:** Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..
2. **Curing Compound:** Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
3. **Curing and Sealing Compound:** Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

- A. **Defective Concrete:** Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. **Patching Mortar:** Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. **Repairing Formed Surfaces:** Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and

- compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.
- 3.14 FIELD QUALITY CONTROL
- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.

6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure five standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test two laboratory-cured specimens at 7 days and two specimens at 28 days. The fifth specimen shall be tested at 56-days at engineer's request.
 - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 8. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 033000

SECTION 04 22 21 - REINFORCED CONCRETE MASONRY ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Concrete masonry units.
 - 2. Reinforcing, ties and anchors.
 - 3. Mortar & grout.
 - 4. Miscellaneous masonry accessories.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction. Included special shapes anchors and reinforcing.
- A. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

1.3 QUALITY ASSURANCE

- A. Fire Performance for Fire-Rated Brick and Concrete Block Assemblies: ASTM E 119.
 - 1. CMU in walls with hourly fire ratings shall be certified and UL classified and stamped to meet wall rating. Provide the appropriate class rating depending upon wall classification.
 - a. For 2 hour walls, provide certified stamped D-2 CMU.
 - b. Separate storage and deliveries of differently rated CMU.
- B. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship.
- C. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

1.2 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS:

- A. Manufacturers: Basalite Concrete Products; BASF Construction Chemicals; Clayton Block; or approved equal.
- B. Application: Concrete masonry non-bearing partitions.
- C. Concrete Masonry Units: ASTM C 90, 1500 f'm compressive strength, Normal weight, unless otherwise shown.
- D. Size: Face dimension of 7-5/8 inches high by 15-5/8 inches long by width required for application.
- E. Concrete Building Brick: ASTM C 55.
- F. Special Finish: As shown, if not:
1. Standard aggregate, standard finish.
- G. Special Shapes: As required by building configuration.
- H. Bond Pattern: As shown, if not, running Bond.
- I. Fire Brick and Clay Flue Linings:
1. Type: ASTM C 1261 medium duty fire brick, and ASTM C 315 clay flue linings.
- J. Mortar for Unit Assemblies:
1. Mortar Mix: ASTM C 270, Type S, for reinforced masonry, masonry below grade and masonry in contact with earth and ASTM C 270, Type N, for above-grade loadbearing and nonloadbearing walls and parapet walls and for interior loadbearing and nonloadbearing partitions.
2. Mortar Materials: Ready mixed, ASTM C 207, Type S.
3. Mortar Aggregate: ASTM C 144, natural color unless otherwise indicated.
a. Natural color
b. White color
c. Special color
4. Grout Aggregate: ASTM C 404.
5. Hydrated Lime: ASTM C 207, Type S.
6. Mortar Color:
a. Natural color.
b. Colored pigmented mortar where exposed at building exterior and natural color elsewhere.
- F. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump as measured according to ASTM C 143/C 143M, as follows:
a. As shown on structural drawings, if not, 8 to 11 inches.
- K. Reinforcing Steel: Reinforcing Bars: ASTM A 615, and ASTM A 775, Grade 60 epoxy-coated.
- L. Reinforcing: Welded wire with deformed side rods. Steel Wire: 9 gauge (.1875 inch) stainless steel.
1. Type: Ladder or truss type.
2. Steel Wire: 9 gauge (.1875 inch) galvanized steel.
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
5. Provide in lengths of not less than 10 feet with prefabricated corner and tee units.
- M. Ties and Anchors: Stainless steel or hot dipped galvanized.
- N. Masonry Accessories:
1. Cavity Drainage Material.
2. Flashing: Rubberized-Asphalt or EPDM Flashing with stainless steel drip edge.

3. Flashing: Stainless steel or copper-laminated flashing.
4. Loose-Granular Fill Insulation.
5. Nonmetallic expansion joint strips.
6. Preformed control joint gaskets.
7. Bond breaker strips.
8. Weeps: Plastic tubing.
9. Cavity vents.

2.2 EMBEDDED FLASHING MATERIALS

- A. Refer to Division 07 00 00.

PART 3 EXECUTION

3.1 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (in a story height or 1/2 inch) total.
- B. Lines and Levels:
 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 2. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 3. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet), or 1/2 inch maximum.
- C. Joints:
 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.2 INSTALLATION

- A. Installation of Masonry Assemblies:
 1. Comply with PCA Recommended Practices for Laying Concrete Block, Brick Institute of America BIA Tech Notes, and NCMA TEK Bulletins.
 2. Comply with cold weather and warm weather protection procedures as recommended in BIA Tech Notes.
 3. Provide fire-rated assemblies complying with ASTM E 119.
 4. Saw cut units when required. Maintain uniform joint width. Provide full bed, head and collar joints except at weepholes.
 5. Install lintels and accessories in masonry construction.
 6. Coordinate installation of flashings.
 7. Comply with applicable codes and regulations for spacing of ties and horizontal reinforcing.
 8. Provide expansion and control joints in accordance with BIA and NCMA recommendations.
 9. Remove and replace damaged units.
 10. Clean brick using bucket and brush method, BIA Tech Note 20.
 11. Clean concrete masonry by dry brushing, NCMA TEK No. 28.

END OF SECTION

SECTION 04 73 05 – MECHANICALLY FASTENED SIMULATED STONE VENEER

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Manufactured synthetic stone masonry veneer.
 - 2. Mortarless, mechanically fastened interlocking panelized units.
 - 3. Anchors, fasteners and accessories.
 - 4. Shapes and trim pieces.
 - 5. Manufacturer supplies assembly and installation components
- C. Extent, without limitation: Where shown, if not:
 - 1. Exterior walls.

1.2 SYSTEM DESCRIPTION

- A. Glass-fiber-reinforced concrete (GFRC) molded stone-shaped veneer panels that interlock with a tongue and groove system, with embedded nailing/screw strip for attaching to framing and exterior sheathing.
- B.

1.3 SUBMITTALS

- A. Comply with Division 01 General Requirements and submit for approval:
 - 1. Product Data: Manufacturer's literature including installation instructions, use restrictions and limitations.
 - 2. Shop drawings: Large scale drawings for fabrication, installation and erections including plans, elevations, details, anchorages, connections and accessories along with head, jamb, sill and joining details. Provide templates for work installed by others. Show substrate water resistant barrier.
 - a. Field Measurements: Take accurate field measurements before fabrication and indicate same on shop drawings.
 - 3. Selection samples: Submit two (2) appropriate size panels or shapes to Architect for review illustrating surface finish, color, texture and design details.
 - 4. Maintenance Data: Provide recommended maintenance procedures.
 - 5. Certification: Certify submitted materials comply with requirements.
 - 6. Test Results: Provide compressive strength and water absorption test results prepared and certified by an independent laboratory and showing compliance with specification requirements. Provide evidence of compliance specified surface burning characteristics.
- B. Mock-up:
 - 1. Include complete back-up construction assembly.
 - 2. Obtain approval of assemblies before proceeding with actual construction.
 - 3. Illustrate: Field pattern of selected stone veneer.
 - 4. Incorporate all conditions including: Field cuts, interior and exterior corners, water/repellent sealer, full color range, joints, joint tooling, installation trim fasteners, copings, sills, caps, flashing and caulking.

1.4 QUALITY ASSURANCE

- A. Comply with Division 01 requirements and governing codes and regulations.
- B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for 5 years. Use experienced installers with 2 projects of comparable complexity and conditions. Deliver, handle, and store materials in accordance with manufacturer's instructions and protect from humidity, soil, weather, staining, damage, stress.
- C. Project/environmental conditions: Protect work according to best practices and as follows:
 - 1. Pack work to prevent damage during transportation.
 - 2. Take special precautions during unloading to prevent damage and soiling.
 - 3. Special conditions: Comply with manufacturer recommendations and:

- a. Maintain materials and surrounding air temperature to a minimum of 40 degrees F and protect work from rain, moisture and freezing prior to, during and for 48 hours after completion of work.
 - b. Do not allow construction activity on opposite side of wall structure to which work is being applied during and for 48 hours after completion of work.
- D. Additional quality assurance requirements: Comply with the following:
1. Pre-installation conference: Required.
 2. Special Warranty: 10 year non-prorated full labor and materials warranty which will guarantying full repairs and replacements of the system and any damaged portions of building at no cost to Owner.. In addition, provide
 3. Manufacturer's warranty: Provide standard 50 year limited.
 4. Extra Materials: Confer with Owner and building manager and make recommendations for extra stock to be paid in addition to contract sum.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Acceptable manufacturers and fabricators include:
1. Boral Limited; ww <http://www.boralamerica.com/>. [aka "Versetta Stone"]
 2. Eldorado Stone; <http://www.eldoradostone.com/>.
 3. StoneCraft Industries, A Headwaters Company; www.stonecraft.com/.
 4. Coronado Stone Products; <http://www.coronado.com/>.
 5. Approved equal.
- B. Basis of design: "Versetta Stone System" by Boral Ltd.
- C. Color and style: As selected by Architect and include blended pigments
1. Style: LedgeStone.
 2. Style: Tight-Cut.
 3. Color: Plum Creek.
 4. Color: Sterling.
 5. Color: Terra Rosa.
 6. Or other options, when available.

2.2 PRODUCT PERFORMANCE

- A. Provide products from a single manufacturer and equal or superior to basis of design and specified performance minimums as follows:
1. Shipping weight: 8 2 pounds per square of panel.
 2. Fire performance: UL listed, Class A.
 3. Flame & Smoke spread: Zero per UL723.
 4. Testing: Regular testing to maintain published performance standards.
 5. Wind resistance: 110 mph.
 6. Standards compliance:
 - a. Flexural Strength: Greater than 700 psi.
 - b. Density: 1218 kg/m³.
 - c. Moisture Movement, ASTM C 1185: Average linear change in moisture content 0.06 percent
 - d. Water Absorption, ASTM C 1185: Less than 19 percent.
 - e. Moisture Content, ASTM C 1185: Less than 10 percent.
 - f. Water Tightness, ASTM C1185: No water droplets present.
 - g. Heat/Rain Exposure, ASTM C 1185: No damage or structural alternations.
 - h. Bond Strength: Tensile strength greater than 45 lb/inch.

2.3 MATERIALS

- A. GFRC materials:
1. Reinforced Concrete Shapes: Composed of Portland Cement based materials reinforced with continuous filament random glass fiber mat; asbestos and resin free. Chopped fiber reinforcing shall not be used.
 2. Glass Fiber: Alkali resistant, formulated for casting.

- B. Coloring Agent:
 - 1. Inorganic, synthetic mineral oxide pigments meeting ASTM C-979
 - 2. Excluding use of cement grade of carbon black pigment.
 - 3. Guarantee: By manufacturer to be light-fast and lime-proof.
 - 4. Pigment/cement ratio: Controlled, consistent not adversely affect unit strength.
- C. Fabricated Shapes: Universal corners, flat panel units, trimstone, wainscot cap, light boxes, and receptacle boxes.
- D. Installation components:
 - 1. Nailing Strip: 26 gage steel with G90 galvanizing and factory-applied black paint.
 - 2. Channels: Manufacturer's standard vinyl starter strip and J channels.
 - 3. Fasteners: Corrosion-resistant galvanized roofing nails or screws with minimum 5/16 inch head diameter and 1/8 inch shank diameter, with length suitable to penetrate framing material minimum 1 inch. Electro-galvanized fasteners are acceptable but may exhibit premature corrosion.
 - 4. Flashing and Lath as Applicable: Non-painted, non-corrosive flashing and 2.5 lb./yard² expanded metal lath.
 - 5. Adhesive: Manufacturer's recommended PL Premium Construction Adhesive.
 - 6. Concealing Material: Colored sanded caulk at nail/ screw heads and as applicable.
- E. Flashing, caulking, and sealants: Furnished and installed under Division 07.
- F. Weather barrier: As shown, if not, as follows:
 - 1. Minimum No.15 Grade D felt building paper meeting ASTM D 226 or material meeting the requirements of ICC Acceptance Criteria #38 or ASTM E 2556.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the provisions of Section 01 70 00 - especially requirements related to:
 - 1. Inspection and examination. Tolerances and measurement.
 - 2. Approvals, inspections and filed quality control.
 - 3. Layout. Adjusting.
 - 4. Cleaning. Protection.
- B. Install materials and systems in accordance with manufacturer's instructions, limitations and restrictions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- C. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.
- D. Verify compliance of existing conditions with manufacturer's requirements including the following:
 - 1. Wood framing studs are spaced 16 inches on center or closer, designed to limit out-of-plane wall deflection to a minimum of L/240.
 - 2. Sheathing is code approved and nailable, minimum 7/16 inch oriented strandboard or 1/2 inch exterior grade plywood.
 - 3. Substrate is plumb within 1/4 inch in 10 lineal feet.
 - 4. Building corners have been sheathed to meet code requirements and mitigate the effects of wall racking.
 - 5. Expansion joints, if any, have been installed.
 - 6. Roofing and interior wallboard have been installed.
 - 7. Height for panelized stone veneer not exceed 30 feet.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Water Resistive Barrier Application: Cover sheathing with a minimum of one layer of water resistive barrier, following the installation instructions provided by the manufacturer and local building code requirements. Wrap minimum 16 inches past all inside and outside corners. Integrate with flashing, panel channels and trim.
- B. Starter Strip: Install starter strip level at the base starting point line. Fasten every 8 to 10 inches.
- C. J Channel where specified: Install J channel at windows, doors, material transitions, penetrations and terminations. Fasten every 8 to 10 inches.
- D. Drainage: Provide a means for drainage and ventilation at all horizontal terminations by using starter strip and J channel in conjunction with flashing products.
- E. Comply with manufacturer's installation instructions including the following
 1. Each full flat panel or Universal Corner panel requires a minimum of 4 fasteners. A minimum of 2 fasteners per panel shall penetrate framing.
 2. Attach products without nail flanges using adhesive. Non-painted, clean metal flashing or expanded metal lath, fastened 16 inches on center into framing is required for an acceptable bonding surface. After bonding surface has been prepared, apply minimum 3/8 inch beads of adhesive, in vertical beads, every 2 to 3 inches. Install partial panel and press into adhesive to assure complete contact. Secure until adhesive has cured.
 3. Install trim pieces and sills, as indicated.
 4. Install electrical/fixtures. Stones as required or as indicated.
 5. Conceal fasteners or unsightly gaps as needed.

3.4 FIELD QUALITY CONTROL

- A. Erect units without damage to shape or finish. Replace or repair damaged units to the satisfaction of the Architect.
- B. Erect units level and plumb within allowable tolerances for type of texture and pattern being used.
- C. Touch-up, repair or replace damaged products before Substantial Completion.
- D. Follow adhesive manufacturers instructions and temperature limitations.

3.5 CLEANING

- A. Clean installation to provide a like-new unblemished surface free of defects, discoloration, or traces of contraction processes. Comply with manufacturer's recommended cleaning methods; in general use clear water and manufacturer recommended brushes. No acids or prepared cleaners shall be used without written approval of the stone manufacturer.

3.6 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION

SECTION 05 08 00 – FACTORY APPLIED METAL COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Factory applied metal finishes.
- C. Extent, without limitation, includes:
 - 1. Aluminum finishes on glazed exterior framing, interior frames, and roofing components and the like.
 - a. Metal framed skylights.
 - 2. Aluminum components.
 - 3. Where required.
- D. Related Sections, without limitation, include factory applied finishes on assemblies in:
 - 1. Section 05 08 50 - Hot Dip Galvanizing
 - 2. Section 05 08 60 - Shop Coatings on Galvanizing
 - 3. Division 07 00 00 – Pre-finished sheet metal components
 - 4. Division 08 00 00 – Prefinished opening and aluminum framing components

1.2 SUBMITTALS

- A. Comply with Division 01 General Requirements and submit for approval:
 - 1. Product Data: Manufacturer's literature including installation instructions, use and limitations.
 - 2. Shop drawings: Submit under respective sections. Indicate which finishes used on which application.
 - 3. Initial Selection samples: Under respective sections, provide samples of color and material ranges.
 - 4. Verification: Under respective sections, submit final samples of selected products. Include samples showing full variation of color and finish expected.
 - 5. Maintenance Data: Provide recommended maintenance procedures.
 - 6. Certification: Certify submitted materials comply with requirements.

1.3 QUALITY ASSURANCE

- A. Comply with Division 01 requirements and governing codes and regulations, and the following:
 - 1. Fabricator/Installer: Shall be a firm which has at least five years experience in work of the type required by this project.
 - 2. Comply with product requirements, delivery storage and handling provisions of Division.
 - 3. Protective film: Install protective packaging, film and covers in shop before shipping.
 - 4. Provide manufacturer's standard warranty applicable to applicable finish.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

1.4 COLORS FOR RESIN AND POWDER COATINGS

- A. Provide colors indicated or specified. Colors, if indicated, may be from one of the following, as indicated or required:
 - 1. Stock color from available full range.
 - 2. Custom color to match office sample provided by Architect.
 - 3. Custom color selected and determined by Architect during submittal process.
 - 4. Selected from AAMA 2605 [Kynar resins] and AAMA 2604 [powder coatings] systems, such as PPG Duranar or Envirocron line, of standard colors, exotic colors, metallic colors and pearlescent colors.
 - 5. Selected from RAL Color space system [a German system developed by *Reichs-Ausschuß für Lieferbedingung*], and using either "RAL Design" or "RAL Effect". Sheens as selected.

PART 2 - PRODUCTS

2.1 SHOP/FACTORY FINISHES - GENERAL

- A. Concealed steel items provided in connection with other assemblies
 1. Refer to section 05 08 50 – Hot Dip Galvanizing
 2. Type A: Hot dipped Galvanized - per ASTM A 123 with 2.0 ounces per square foot.
- B. Specified aluminum components shall be free of scratches or other serious blemishes and receive a caustic etch followed by an anodic oxide treatment.
- C. Anodized Finish: Exposed surfaces with the indicated Architectural Class coating, fully sealed and free of powdery surfaces. Coating shall conform to minimum requirements for thickness and weight of ASTM B 137.
- D. Extent: As shown, if not, all panels, trim, copings, members, flashings and closures color coated on exposed faces.
- E. Field touch up paint: Provide from manufacturer to exactly match coating as found in field.

2.2 SHOP FINISHES – TYPES

- A. Provide finishes indicated, if not indicated, as follows:
 1. Exposed aluminum: Type 4.
 2. Concealed aluminum in contact with masonry or concrete: As specified in the respective sections.
 3. Concealed aluminum: mill finish.
 4. Aluminum indicated on drawings as "clear finish": Type 1.
- B. Type 1: Anodized Aluminum
 1. Class I anodic finish type A41/A42/44.
 2. Performance Standard: AAMA 611.
 3. Minimum coating thickness: 0.7 mils
 4. Min weight: 27.0 mg/in².
 5. Apparent Density: 38.0 g/in³
 6. Color: As selected, if not, clear.
- C. Type 2: Anodized Aluminum
 1. Class II anodic finish type A31/A42/44.
 2. Performance Standard: AAMA 611.
 3. Minimum coating thickness: 0.4 mils
 4. Min weight: 15.0 mg/in².
 5. Apparent Density: 38.0 g/in³
 6. Color: As selected, if not, clear.
- D. Type 3 – Standard Performance Paint – Acrylic or polyester based .
 1. Standard System: High solids polyester equal to "PPG Duracon" two-coat thermo-cured.
 2. Performance Standard: Comply with AAMA 2603.
 3. Guarantee: 20-year regarding color fading, cracking, chipping and peeling.
 4. Preparation: Cleaning and rinsing, conversion treatment followed by rinse and drying.
 5. Color /coating system equal to the following PPG are included:
 - a. Standard colors: Yes.
 - b. Colors indicated on drawings: Yes.
 - c. Pearlescent colors: Yes.
 - d. Exotic Coatings: Yes.
 - e. Metallic coatings: Yes.
 - f. Textured: Yes.
- E. Type 4 – High Performance Paint – Polyvinylidene fluoride / PVDF.
 1. Standard System: "Kynar 500 or Hylar 5000 two-coat thermo-cured.
 2. Exotics/Metallics System: If indicated below " Kynar 500XL three-coat thermo-cured.
 3. Performance Standard: Comply with AAMA 2605 [620/621 for coil coatings].
 4. Guarantee: 20-year regarding color fading, cracking, chipping and peeling.
 5. Preparation: Cleaning and rinsing, conversion treatment followed by rinse and drying.
 6. Color /coating system equal to the following PPG are included:

- a. Standard colors: Yes.
 - b. Duranar "XL" colors: Yes.
 - c. Duranar Exotic Coatings: Yes.
 - d. Duranar Pearlescent Coatings: Yes.
 - e. Duranar ULTRA-Cool Coatings: Yes.
 - f. Duranar "XL" plus exotics: No.
 - g. Duranar "XL" specialties: No.
 - h. Duranar "XLB" specialties: No.
 - i. Duranar "XLTS" textured: No.
 - j. Endurastone Spatter Coating: No.
7. Color selections will include the following:
- a. Stock colors from full available range of systems above: Yes.
 - b. Custom colors to match Architect office samples: Yes.
- F. Type 5 – High Performance Powder Coating – Polyester based.
- 1. Standard System: Equal to PPG "Envirocron Ultradurable Powder Coating" or "Duncan Thermoset".
 - 2. Performance Standard: Comply with AAMA 2604.
 - 3. Guarantee: **20**-year regarding color fading, cracking, chipping and peeling.
 - 4. Preparation: Cleaning and rinsing, conversion treatment followed by rinse and drying.
 - 5. Dryfilm thickness: 2.0 mil minimum.
 - 6. Color selections will include the following:
 - a. Stock colors from full available range of systems above: Yes.
 - b. Custom colors to match Architect office samples: Yes.

2.3 PRODUCT PERFORMANCE

- A. Weatherometer: When subjected to accelerated weathering test according to ASTM D-822/G-23 for 2500 hours, the maximum chalk shall be No. 9 and color change shall not exceed 3 NBS Units Delta E. When tested for 500 hours in the dew cycle weatherometer (ASTM D-3361) Model XWR, 60/60 cycle, the sample shall not exceed 5 NBS Units Delta E. When subjected to an accelerated weathering test in accordance with ASTM D-822, Apparatus D for 2000 hours, there shall be no more than slightly perceptible color change or chalking. There shall be no checking nor adhesion loss.
- B. Abrasion Resistance: (1) Flat specimens, 4" x 8" shall be subjected to falling sand abrasion tests conducted in accordance with Federal Test Method Standard No. 141A, Method 6191 (ASTM D-968), with no less penetration through the finish coating to the primer of 67 liters (89 liters per mil) and penetration through to exposure of base steel 490 liters (258 liters per mil).
- C. Bend Test: Sample shall be capable of being bent around a 1/8" diameter mandrel in accordance with ASTM D-1737. Slight micro-checking may occur, but adherence between coatings and to base metal shall be maintained.
- D. Impact Test: Coating shall show no loss of adhesion or show no cracking when subjected to 160" per pound as recorded by a Gardner Impact Tester according to ASTM D-2794. Test shall employ a 9/16" ball and there shall be no loss of adhesion when tested with a cellophane tape.
- E. Hardness: Shall be "F" minimum pencil hardness (ASTM D-3363).
- F. Water Immersion: A specimen shall remain submerged in distilled water at a constant temperature of 100°F in accordance with ASTM D-870 for 300 hours with no evidence of blistering nor loss of adhesion.
- G. Salt Spray Test: When subjected to a salt spray (fog) test performed in accordance with ASTM Standard Method B-117-73 for 3000 hours, blistering shall not exceed 5% No. 6 blisters in the field (ASTM D-1654). No more than 1/8" creep corrosion and tape off from area scribed to base metal.
- H. Humidity Test: When subjected to a 100% humidity test in accordance with ASTM Standard Method D-2247 for 3000 hours (Cabinet Type A-1) or 250 hours (Cabinet Type A-2), the coating shall show no softening or color change and there shall be a minimum of 95% of the area with no blisters. No blisters shall be larger than ASTM No. 8 when evaluated in accordance with ASTM D-714.

PART 3 - EXECUTION

3.1 APPLICATION / PROTECTION

- A. Apply coating to applicable performance standards, manufacturer recommendations , limitations and instructions to properly prepared surfaces. Provide coats and toppings to match indicated coating system in uniform, consistent manner free of defects.
- B. At factory option and subject to providing acceptable finish, provide temporary films and other forms of protection required to protect coatings. Instruct installers as to limitations, protection and removal procedures.

3.2 COMPLETION & TOUCH UP

- A. Comply with requirements of Division 1.
- B. Instruction: Instruct field installers in proper field methods for touch up.
- C. Touch up: Installers shall touch up in place work to eliminate any apparent evidence of damage or repair.

END OF SECTION

SECTION 05 08 50 – HOT DIPPED GALVANIZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Hot dip galvanizing.
- C. Extent, without limitation, includes:
 - 1. Ferrous metals indicated to be galvanized.
 - 2. Ferrous metals in exterior assemblies whether exposed to weather or not.
 - 3. Exterior ferrous metals.
- D. Related work includes, without limitation:
 - Division 05 00 00 – Metals.
 - Division 09 00 00 – Painting.

1.2 REFERENCES

- A. Comply with reference standards, and as follows:
 - 1. ASTM A123 – Standard Specification for zinc [hot dipped galvanizing] coatings on Iron & Steel
 - 2. ASTM A153 - Standard Specification for zinc [hot dipped galvanizing] coatings on ferrous hardware
 - 3. ASTM A143 – Recommended practice for safeguarding against embrittlement and detecting same.
 - 4. ASTM A384 – Practice for safeguarding against warping and distortion during hot dip galvanizing
 - 5. ASTM A385 – Standard practice for providing high quality zinc coatings, hot dipped.
 - 6. ASTM A653 – Standard specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 7. NAAMM Metal Finishes Manual
 - 8. Steel Structure Painting Manual, Volumes 1 and 2
 - 9. Occupational Safety and Health Standards
 - 10. State Building Code and Regulations applicable to building systems.
- B. Grade Stamps: All galvanized metal shall bear a stamp indicating ASTM number and weight of zinc coating in ounces per square foot.

1.3 SUBMITTALS

- A. Comply with Division 01 General Requirements and submit for approval:
 - 1. Product Data: Manufacturer's literature including installation instructions, use restrictions and limitations.
 - 2. Shop drawings: Indicate specifications for shop finishes and galvanizing on shop drawings
 - 3. Maintenance Data: Provide recommended maintenance procedures.
 - 4. Certification: Certify submitted materials comply with requirements, specifications and referenced standards

1.4 PRODUCTS DELIVERY AND STORAGE

- A. Store galvanized members at the project site above ground on platforms, skids or other supports. Store beams with webs vertical.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials shall conform to the latest edition of the specifications or manufacturer's standards.
 - 1. Zinc: ASTM B6, Prime Western Grade or High Grade
 - 2. Galvanizing ASTM A-123, , or A-153 as applicable; 2.0 ounces zinc per square foot, unless otherwise indicated; provide under its section.
 - 3. Galvanized Sheet Steel ASTM A-526 or A-526, G-90
 - 4. Provide nickel zinc galvanizing bath where shop applied primers or top coats are required containing .05-.09% nickel and other earthy materials.

5. Perforated sheet metal shall be perforated steel hot dip galvanized and shop primed steel with perforations fabricated to sizes and locations shown. Where perforations are not indicated provide 1/4 inch perforations with approximately 50% free area. Acceptable manufacturer is McNichols Co. of Tampa, Florida. Shop priming shall comply with requirements below.

- B. Galvanizing Repair Paint: High zinc dust content paint complying with the following:
1. Designed specifically for field and shop repair of hot dip galvanizing
 2. ASTM A 780 Galvanizing repair specification with 65 per cent zinc dust content of dry film or more.
 3. SSPC-Paint 20 Type II Organic.
 4. DOD-P-21035A for "Paint, High Zinc Dust Content, Galvanizing Repair."
 5. Single-component
 6. Apply by brush, roller or spray
 7. Applicable VOC standards
 8. Acceptable product: ZRC Galviline Galvanizing Repair Compound.

2.2 FABRICATION AND WORKMANSHIP

- A. Comply with reference standards and the following:
1. Vents: For all hollow members, size as shown, if not, 0375 inch.
 2. Vent locations: Where shown, if not, where approved by Architect.
 3. Do not galvanize until all welds have been ground smooth.
 4. Minimize surface imperfections (eg: flux inclusions), by dipping material in a solution of Zinc Ammonium Chloride (pre-flux) immediately prior to galvanizing.
 5. Flux blanket overlaying molten zinc will not be permitted.
 6. ASTM A 153 for galvanizing iron and steel hardware, zinc thickness in accordance with standard.
 7. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier, grade 85 unless otherwise indicated.
 8. ASTM A 386 for galvanizing assembled steel products, with 2 ounces per square foot unless otherwise indicated.
 9. After galvanizing, chromate material by dipping material in a 0.2% chromic acid solution.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with general requirements and if applicable, Ssection 01 70 00 – Execution, and the following:
1. Inspect field conditions and correct imperfections affecting work.
 2. Touch-Up of Shop Primers: Touch up field welds and unprimed steel using specified shop primers and following procedures specified for shop work.
 3. Galvanizing: Repair all zinc-coating that has been damaged in handling or transporting or in welding, riveting, or bolting by wire brushing to bright metal and applying two (2) coats of a galvanizing repair paint conforming to specifications.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - 5. Identify members and connections of the Seismic-Load-Resisting System.
- C. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Welding certificates.
- C. Mill test reports for structural steel, including chemical and physical properties.
- D. Source quality-control reports.
- E. Field quality-control and special inspection reports.

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1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
 - 2. Use Allowable Stress Design; data are given at service-load level.
- B. Moment Connections: Type FR, fully restrained.
- C. Construction: Moment frame.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles, M-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M
- D. Column Base Plates: ASTM A 572/A 572M, Grade 50.
- E. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
- G. Welding Electrodes: Comply with AWS requirements.

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2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- D. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: Straight.
 - 2. Finish: Plain.
- E. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Finish: Plain.
- F. Threaded Rods: ASTM A 36/A 36M.
 - 1. Finish: Plain.
- G. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

2.4 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat. Must be compatible with fireproofing.

2.5 GROUT

- A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.
- B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

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- B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

- 1. Joint Type: Snug tightened and Slip critical at moment connections.

- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:

- 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing) unless compatible with fireproofing.
 - 5. Galvanized surfaces.
 - 6. Surfaces enclosed in interior construction.

- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

- 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
 - 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

- 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

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1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened and Slip critical at moment connections.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs as indicated, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high strength bolted connections.

- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

- C. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.

END OF SECTION 051200

SECTION 053100
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Composite floor deck.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Evaluation reports.
- D. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 COMPOSITE FLOOR DECK

- A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

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1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Profile Depth: 1.5 inches.
3. Design Uncoated-Steel Thickness: 0.0358 inch.

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- G. Galvanizing Repair Paint: [ASTM A 780/A 780M] [SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight].
- H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- C. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- D. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- E. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- F. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

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- G. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.
 - 1. Install reinforcing channels in ribs or angle frame to span between supports and mechanically fasten.
- H. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- I. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- J. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Prepare test and inspection reports.

3.3 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

END OF SECTION 053100

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing exceeding height limitations of standard, nonstructural metal framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing signed and sealed by Professional Engineer.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product certificates.

C. Product test reports.

D. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

2.1 PERFORMANCE REQUIREMENTS

- A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
 - 1. Wall Studs: AISI S211.
 - 2. Headers: AISI S212.
 - 3. Lateral Design: AISI S213.
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60, A60, AZ50, or GF30.
- B. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60.

2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch.
 - 2. Flange Width: 1-5/8 inches min.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and matching minimum base-metal thickness of steel studs.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch.
 - 2. Flange Width: 1-5/8 inches min.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0428 inch.

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2. Flange Width: 1-5/8 inches min.

- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.
- C. Vertical Deflection Clips: Manufacturer's standard [bypass] [head] clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 INTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch.
 - 2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

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2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by.
- C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, as appropriate for the substrate.
 - 1. Uses: Securing cold-formed steel framing to structure.
 - 2. Type: Torque-controlled adhesive anchor.
 - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
- D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: [ASTM A 780/A 780M] [MIL-P-21035B] [or] [SSPC-Paint 20].
- B. Cement Grout: Portland cement, ASTM C 150/C 150M, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

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- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.
- C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- E. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.3 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: To match stud spacing.
- B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: 16 inches or as indicated on Drawings.

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- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
 - 2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically 48 inches. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

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1. Stud Spacing: 16 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
1. Install single deep-leg deflection tracks and anchor to building structure.
 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 3. Connect vertical deflection clips to infill studs and anchor to building structure.
 4. Connect drift clips to cold-formed steel framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated but not more than 48 inches apart. Fasten at each stud intersection.
1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
1. Install solid blocking at 96-inch centers.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:
1. Stud Spacing: 16 inches.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
1. Install single deep-leg deflection tracks and anchor to building structure.
 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 3. Connect vertical deflection clips to studs and anchor to building structure.
 4. Connect drift clips to cold-formed steel metal framing and anchor to building structure.

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- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 1. Install solid blocking at 96-inch centers.
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 ERECTION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.7 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

END OF SECTION 054000

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract including the General and Supplementary Conditions and Division 1 specifications apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Exterior back-up wall cold-formed metal framing.
 - 2. Miscellaneous indicated wind or gravity load bearing framing components.
- C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. Related work includes, without limitation:
 - 1. Section 01 45 50 - Engineering by Contractor.
 - 2. Division 05 00 00 - Steel assemblies & components.
 - 3. Section 06 16 20 - Gypsum sheathing.
 - 4. Section 09 10 00 - Interior light gage non-structural framing.
 - 5. Division 07 00 00 - Thermal insulation.

1.2 REFERENCED CODES AND STANDARDS

- A. All references to codes, specifications and standards referred to herein shall become a part of this section as though written out, and shall mean, and is intended to be the latest edition, amendment, and/or revision of such reference unless otherwise specified.
 - AISI - American Iron and Steel Institute, "Cold Formed Steel Design Manual".
 - ASTM - American Standards for Testing Materials.
 - AWS - American Welding Society.
 - LGSI - Light Gage Steel Institute, "Light Gage Structural Steel Framing System Design Handbook".

1.3 SUBMITTALS AND DESIGN COMPUTATIONS

- A. Comply with requirements of Division 01.
- B. Light gage framing erector shall engage the services of a professional engineer, registered in the project's locality, to prepare complete shop drawings indicating structural design computations of all work of this section, based on and closely following, the layouts, details and loadings on the drawings. Provide engineer's registered stamp on drawings.
- C. Shop drawings and structural design computations shall be sufficient in conjunction with this specification, to provide the complete basis for the fabrication and installation of the work of this section.
 - 1. Shop drawings shall show complete framing elevations, sections and details of all installations. Include complete large scale details of all typical and special conditions of construction, and clearly indicate materials, sizes, shapes, sections, gages, thicknesses and finish of all members.
 - 2. Shop drawings shall be prepared and stamped by a qualified engineer licensed in the jurisdiction of the project.
 - 3. Clearly indicate all materials and methods used on the connections and anchoring of work, including designs, locations, and spacing of all welds, fastenings, anchors and proposed section tolerances.
 - a. Include spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - b. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 4. Approval of shop drawings will be for size and arrangement of items and strength of connections. Error in dimensions and calculations shown on the shop drawings shall be the responsibility of this erector.
 - 5. Obtain Architect's approval of shop drawings before proceeding with fabrication and erection.
- D. Structural design computations: Provide a complete structural analysis of all typical and special conditions of construction and shall certify the various conditions as designed conforming to the governing building code with specific added statements that seismic and wind load forces have been taken into full account.

- E. Deflection computations for vertical cantilever and general wall conditions shall comply with State code.
- F. Engineering Certification: Submit for approval engineering certification of loading, deflection and structural criteria used.
- G. Submit all samples of stud members, bolts, clips and other items as requested by the Architect.
- H. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.

1.4 QUALITY ASSURANCE

- A. Light gage framing manufacturer shall be a company specializing in fabrication of structural light gage framing components with a minimum of five (5) years experience and continued operations, and shall be presently certified by the Light Gage Structural Institute.
- B. Welders shall be experienced in applications being performed and shall be qualified welders certified by American Welding Society.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.5 DESIGN REQUIREMENTS AND TOLERANCES

- A. All exterior light gage member design shall be based on Cold-Formed Steel Design Manual, as published by the AISI and the Light Gage Structural Steel Framing Design Handbook as published by the LGSF.
- B. Design loadings shall be taken from all applicable sections and references of the current edition of the Building Code in force at the project site. Refer to structural drawings for minimum wall and connection design loadings.
 - 1. Erected framing at masonry veneer shall be designed for an allowable deflection of $L/720$ maximum or deflection criteria shown on structural drawings, whichever is more stringent.
- C. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to Upward and downward movement and to accommodate live and snow load deflection of primary building structure as follows:
 - 1. Not less than deflection head details shown.
 - 2. Not less than amount indicated in structural documents.
 - 3. Not less then amount specified in Part 2 and 3 of this section.
 - 4. Not less than 0.50 inch.
 - 5. Whichever is the largest of values indicated above.
- D. Erected framing at composite and metal panels shall comply with the tolerances required for erection of such panels as determined by the panel manufacturer, including manufacturer's references to specific trade practices.
- E. Design wall system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
- F. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials

1.6 REGULATORY REQUIREMENTS

- A. Provide scaffolding in accordance with OSHA, state and local requirements. Erect scaffolding so as not to interfere with the work of other trades.
- B. Exterior wall framing system shall meet the wind and seismic loading requirements as specified in the State Building Code.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Comply with Division 01 and the following:
1. Deliver and store work under this section in a manner to prevent wracking or stress of components, and to prevent mechanical damage.
 2. Steel shall be carefully unloaded on delivery and suitably stored at the site in approved locations. No steel shall be dumped or dropped.
 3. Steel shall be neatly stacked on skids off the ground so that it will not be in contact with water or soil; shall be piled and blocked so that it will not be damaged or bent.
 4. Protect all materials from weather damage at all times.
 5. Deliver work under this section to site in ample time to avoid delay in job progress and at such times as to permit proper coordination of the various parts.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Structural stud and joist framing members, tracks, bridging, and required accessories shall be of the type, gage, and size shown on the drawings as manufactured by
1. Marino \ WARE Industries Corporation.
 2. ClarkDietrich Building Systems.
 3. CEMCO / California Expanded Metal Products Co.;
- B. Accessories: Simpson Strong Tie.

2.2 FRAMING MEMBERS

- A. All framing members shall be formed to profiles, shapes, gage and nominal sizes required to resist loading as indicated and designed in accordance with referenced standards and codes.
- B. All 16-gage and heavier structural members shall be formed from galvanized steel sheets meeting requirements of ASTM A-446, Grade D; with coating conforming to ASTM A-653, designation G-90 and G-115 in basement or wet areas; except that steel shall have 50 ksi minimum yield strength.
- C. All 18-gage and lighter structural members shall be formed from galvanized steel meeting requirements of ASTM A-446, Grade A; with coating conforming to ASTM A-653, designation G-90 and G-115 in basement or wet areas; except that steel shall have 33 ksi minimum yield strength.
- D. All framing members shall be nominal 4", 6", 8", and 10" at respective areas indicated on the drawings, with 1.65 inch minimum flange.
- E. Tracks shall conform to stud sizes and shall have a minimum of 1.3125 [1-5/16] inch flange.
- F. Steel Box or Back-to-Back or L-Headers: Manufacturer's standard C-shapes or L-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows
1. Minimum Base-Metal Thickness: 0.0329 inch (0.836 mm)
 2. Flange Width: 1-5/8 inches (41 mm) minimum for C-shapes, and top flange width minimum 2 inches (51 mm) for L-shapes.
 3. Holes in header members greater than 1/4 inch (6 mm) are not permitted without an approved design.
- G. Steel Sheet for Vertical Deflection Clips: ASTM A 653, structural steel, zinc coated, of grade and coating as follows
1. Grade: 50.
 2. Coating: G90.

2.3 SPECIALTY COMPONENTS

- A. Use of customized components is recommended and if shown on drawings, mandatory. These include:
1. ClarkDietrich: PRO Red Header, variable flange width, gage and KSI capacity system for simplified jamb and header use. Manufacturer recommends use both for exterior and interior use.
- B. Vertical Deflection Clips: Where shown, or required by fabricator design, provide manufacturer's standard bypass and head-of-wall clips, capable of accommodating 1.5 inches (38 mm) upward and downward vertical displacement

of primary structure (with total vertical movement of 3 inches (76 mm)) through positive mechanical attachment to stud web. Minimum deflection clip thickness: 97 mil (2.46 mm) (12 gauge). Provide from one of the following:

1. Super Stud Building Products, Inc.
2. Simpson Strong-Tie, Inc
3. The Steel Network.
4. Approved equal.

- C. Single Deflection Track: Where shown, or required by fabricator design, provide manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch (1.1 mm) (43 mil, 18 gauge).
 2. Flange Width: 1 inch (25 mm) plus the design gap, or 1.5 inches (38 mm), whichever is greater.
- D. Job fabricated deflection heads: Per manufacturer engineering and requirements of part 3 of this section.
- E. Drift Clips: Where shown, or required by fabricator design, manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.4 ACCESSORIES

- A. All accessories and miscellaneous members shall be formed sheet steel, thicknesses and gage determined by conditions and referenced standards. Shapes shall be manufacturer's standard, same finish as framing members.
- B. Include all bridging, bracing, plates, gussets, subgirt hat channels, vertical slide clips, kickers, diagonal tension strapping, angles and the like to complete the erection in accordance with project requirements and code.
- C. Z furring channels: Design, and size components based upon criteria, code and loads. Provide the following minimum properties:
1. Steel: 33ksi yield strength or more.
 2. Thickness: 20 gage or heavier.
 3. Coating: Match framing.
 4. Custom sizes and lengths: Where required.
 5. Conventional configuration [modify as required to meet design]: 0.75 leg and 1.25 inch leg x required depth.
 6. Toed in leg: Required to provide positive grip, for insulated assemblies.
- D. At thru-wall fabric conditions, provide continuous metal screw strip, formed of minimum 20-gage sheet steel in 4" widths, fastened to exterior face of metal studs to receive fabric flashing
- E. Coatings to isolate dissimilar metals: Bituminous paint.
- F. Galvanizing Repair Paint: Comply with one of the following: SSPC-Paint 20, MIL-P-21035B, or ASTM A 780.
- G. Shims: Load bearing, high-density multi-monomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- H. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.5 FASTENERS, ANCHORS & CLIPS

- A. Screw fasteners shall be self-tapping complying with ASTM C-1002, non-corrosive, of size, type and quantity recommended by manufacturer for each application. Power-driven fasteners for 20-gage runner attachment to 3,000 psi concrete shall be 5/32" diameter, length to be determined by conditions.
- B. Bolts, nuts and washers shall be non-corrosive of size, type and quantity recommended by the manufacturer required for connecting members, supporting substrates and the like. Provide expansion masonry anchor types to suit conditions.
- C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency

2.6 FABRICATION

- A. Furnish and fabricate all light gage steel framing at exterior as indicated on the drawings and as specified herein. Comply with the following:
1. Do all required forming, drilling, fitting, cutting, welding, and finishing.
 2. Fabrication of steel shall conform to the AISI and AWS Standards "Structural Welding Code D1.1 and D1.3", and Codes listed above.
 3. Connections shall be capable of supporting the maximum uniform load of the member for the span shown and the material specified.
 4. All connections shall be welded and/or bolted to provide maximum strength to meet project design criteria.
 5. Details of all joints, techniques of welding employed, appearance and quality of welds made, and methods used to correct defective work shall conform to requirements of the AISI and AWS Codes.
 6. Welding shall be done only by experienced welders who have been qualified by tests as prescribed in AWS "Standard Qualification Procedure" for the type of work required.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the provisions of Section 01 70 00 - especially requirements related to:
1. Inspection and examination. Tolerances and measurement.
 2. Approvals, inspections and filed quality control.
 3. Layout. Adjusting.
 4. Cleaning. Protection.
- B. Prior to installation, inspect work of other trades. Verify such work is complete and accurate to the point where this installation may properly commence in accordance with approved framing shop drawings.

3.2 ERECTION / GENERAL

- A. Preparation & Equipment: Provide all erection equipment, bracing, planking, field bolts, nuts, washers, drift pins, and similar materials which do not form a part of the completed construction but are necessary for its proper erection. Provide temporary support as required to keep structure safe and aligned.
- B. General: Comply with requirements and indications of the following:
1. Indicated Standards.
 2. Manufacturer's recommendations and instructions.
 3. Approved engineered shop drawings.
 4. Anchorage & Fastening: Secure assemblies to building according to approved engineered shop drawings accurately set to established lines and elevations.
 5. Stud spacing: 16 inches or less as required by deflection requirements. and rigidly fastened in place with suitable attachments to the construction of the building. All framing shall be spaced as indicated or referred to on the drawings.
 6. Tolerances: Install work plumb, plane and to line within tolerance of 1/8 inch in 20 feet.
 7. Factory punched holes: Align to permit proper passage of other work. Where studs are lighter than 16 gage, provide grommets.
 8. Openings: Provide additional framing members at least doubled at jambs.
 9. Insulation: Ensure boxed cavities are filled with insulation where required as part of system.
 10. Bridging: Provide continuous horizontal bridging, anchored at each framing with 2 fasteners or more.
 11. Flange exposure: Construct corner conditions, jambs openings, and intersecting partitions to provide stability and adequate flange exposure to receive drywall, sheathing, interior metal studding, and the like.
 12. Isolate dissimilar metals.
- C. Adjustment and plumbing: Prior to the final welding, adjust members using slotted holes and bolts to tolerances required to plumb framing.
- D. Connections: Weld and/or screw attach except fasten runner tracks to concrete with approved power-driven fasteners. Perform welding only using certified welders.
- E. Accessories: Include all clips, braces, panels and accessories required to provide a flush exterior wall framing ready to receive exterior sheathing.

- F. Deflection: Engineer, fabricate and erect framing to accommodate structural building deflections, and if not otherwise indicated or approved:
1. Provide minimum 2 inch deep heavy gage top runners.
 2. Cut studs short 0.75 +/- 0.05 inch short.
 3. Do not fasten studs to top runner.
 4. Provide continuous horizontal bridging specified above with top 10 inches of studs.
 5. Direct sheathing installers not to attach sheathing to top runner.
 6. Do not place any fasteners into studs closer than 1 inch from bottom edge of top runner.
- G. Exterior Ceiling Requirements: Comply with the following:
1. Support hangers only from building structure and capable of supporting at least 150 pound live load.
 2. Space hangers no more than 4 feet along length of main framing. And provide them within 8 inches of ends of main framing.
 3. Ensure connections do not fail under positive and negative loads. Cross brace framing assemblies.
 4. Tolerance: 1/8 inch in 12.
 5. Provide trapeze suspension where at obstructions.
 6. Counterbalance horizontal forces of out of plumb hangers.
 7. Maintain bottom of assemblies plumb, plane and true to line.

3.3 FIELD TOUCH-UP

- A. Touch-up damaged and abraded galvanized surfaces in the field using "ZRC" zinc paint as manufactured by ZRC Chemical Products Company, or equal approved by the Architect. **Touch up all fasteners.**

3.4 FIELD QUALITY CONTROL

- A. Field welding shall be subject to inspection in accordance with AWS Code by inspectors furnished by Testing Laboratory. Provide welded blanks for testing if required by Architect.

3.5 CLEAN-UP

- A. At completion of installation, all rubbish and debris shall be removed from building, excess material, scaffolding, tools, and other equipment shall be removed from building and jobsite.

3.6 REMEDIAL WORK

- A. In addition to the new work specified herein, it is the intent of this section to include the replacement of existing exterior light-gage metal framing scheduled to remain which is damaged or removed due to the alterations and removal of existing work under this Contract. Application and workmanship shall be equal to the quality of new work as specified herein as approved by the Architect. Use specific components at respective areas affected.

END OF SECTION

SECTION 05 50 00 - MISCELLANEOUS METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Miscellaneous metal fabrications.
 - 2. Shop applied ferrous metals priming paint
 - 3. Anchorages, brackets, supports, inserts and backing required for a complete job but not included in other sections.
 - 4. All other ferrous or non-ferrous metal work not specifically given to other Sections and necessary for a complete job.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
 - 1. Shop drawings shall be prepared and stamped by a qualified engineer licensed in the jurisdiction of the project.
- C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. As required by application and including:
 - 1. Kee Industrial Products, Inc.
 - 2. ACL Industries, Inc.; ALACO Ladder Co.
 - 3. DeMuth Steel Products, Inc.;
 - 4. Jomy Products, Inc.;
 - 5. O'Keeffe's, Inc.;

2.2 APPLICATIONS

- A. Applications are as shown and may include:
 - 1. Rough hardware.
 - 2. Loose bearing and leveling plates.
 - 3. Remodeling of existing metal fabrications.

2.3 MATERIALS

- A. Ferrous Materials:
 - 1. Steel Plates, Shapes and Bars: ASTM A 36.
 - 2. Rolled Steel Floor Plates: ASTM A 786.
 - 3. Steel Tubing: ASTM A 500 or A 501.
 - 4. High Strength Tube Steel: ASTM A1085, cold formed welded, with minimum yield strength of 50 ksi and minimum tensile strength of 65 ksi. Work on the exterior, in exterior assemblies or installed in humid, damp or wet environments shall be hot dipped galvanized.

5. Uncoated Structural Steel Sheet: ASTM A 611 or A 570.
6. Uncoated Steel Sheet: ASTM A 366 or A 569.
7. Galvanized Steel Sheet: ASTM A 653, G90.
8. Steel Pipe, Black Finish: ASTM A 53.
9. Steel Pipe, Galvanized Finish: ASTM A 53.
10. Gray Iron Castings: ASTM A 48, Class 30.
11. Malleable Iron Castings: ASTM A 47, Grade 32510.
12. Reinforcing Bars: ASTM A 615, Grade 60.
13. Brackets, Flanges, and Anchors: Cast or formed metal.
14. Concrete Inserts: Threaded or wedge type.
15. Welding Rods and Bare Electrodes: AWS specifications.
16. Zinc-Coating: Hot-dip galvanized coating for materials in exterior assemblies or exterior walls.

B. Fasteners & hangers:

1. Bolts and Nuts: Hexagon head type, ASTM A 307, Grade A.
2. Lag Bolts: Square head, FS FF-B-561.
3. Machine Screws: Cadmium plated steel, FS FF-S-92.
4. Wood Screws: Flat head carbon steel, FS FF-S-111.
5. Plain Washers: Round carbon steel, FS FF-W-92.
6. Drilled-In Expansion Anchors: FS FF-S-325.
7. Toggle Bolts: Tumble-wing type, FS FF-B-588.
8. Lock Washers: Spring type carbon steel, FS FF-W-84.
9. Zinc-Coating: Fasteners in exterior assemblies or exterior walls.
10. Hangers and suspension: Where required, provide "Uni-strut" A1000 or assemblies of types recommended by manufacturer for application; see www.unistrut.us/

C. Auxiliary Materials:

1. Nonshrink Metallic Grout: ASTM C 1107.
2. Nonshrink Nonmetallic Grout: ASTM C 1107.
3. Interior/Exterior Anchoring Cement: Hydraulic expansion cement, non-shrink grout.
4. Exterior/Interior Anchoring Cement: Erosion-resistant hydraulic expansion cement, CGM "Por-Rok" or equal, meeting ASTM C1107
5. Shop Primer: Fast curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79, compatible with topcoats, containing pigments distinguishable from zinc-rich primer.
6. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
7. Galvanizing Repair Paint: SSPC - Paint 20.
8. Bituminous Paint: Asphalt mastic, SSPC - Paint 12.

2.4 FABRICATION

- A. Fabricate work where manufactured assemblies are not available, using proper methods and means to provide true, straight, function assemblies of proper strength and durability.
- B. Where indicated or if exposed to weather, and unless provided under other sections, hot dip galvanize work as follows:
 1. Comply with Section 05 08 50 Hot Dip Galvanizing and the following.
 2. Zinc: ASTM B6, Prime Western Grade or High Grade
 3. Galvanizing ASTM A-123, A-386, or A-153 as applicable; 2.0 ounces zinc per square foot, unless otherwise indicated.
 4. Galvanized Sheet Steel ASTM A-526 or A-526, G-90.

2.5 SHOP PRIMING

- A. Shop priming uncoated ferrous metals:
 1. Preparation: SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.
 2. Primer: Zinc rich primer unless otherwise approved.
 3. Primer application: SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel.
- B. Field coats: Comply with Painting sections in Division 09.

2.6 FABRICATION

- A. General: Fabricate work to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads. Comply with the following:
1. Shop assemble work to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
 2. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
 3. Form work true to line and level with accurate angles and surfaces.
 4. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
 5. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
 6. Connections: Fabricate work with welded connections unless otherwise indicated.
 7. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove flux immediately.
 - b. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
 8. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 9. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Take field measurements prior to preparation of shop drawings and fabrication. Do not delay job; allow for cutting and fitting if field measurement not practical.
- B. Form work true to line with sharp angles and edges. Weld continuously, grind flush and make smooth on exposed surfaces.
- C. Install work plumb and level with hairline joints and ground flush welds.
- D. Separate dissimilar metals with protective coatings.
- E. Touch up damaged coatings with shop primer and galvanize repair paint.
- F. Paint items scheduled in accordance with painting section.

END OF SECTION

SECTION 05 51 00 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Fabricated steel stairs.
 - 2. Coordination for railings.
 - 3. Shop coatings.
- C. Intent:
 - 1. Conventional carbon steel railings, pickets and the like whether wall or stair mounted are intended to be provided by this fabricator but are specified in other sections, when required as part of the project.
 - 2. Stairs at exterior or in damp locations such as boiler rooms are to be hot dipped galvanized.
 - 3. Stairs, galvanized or not, are to be shop coated. Provide final finish top coating if indicated.
- D. Stair types / tread style required:
 - 1. Concrete-filled pan.
- E. Related Requirements:
 - 1. Section 05 52 10 - [Carbon] Steel railings.

1.2 SUBMITTALS

- A. Product Data: For metal pan stairs and the following:
 - 1. Prefilled metal-pan-stair treads.
 - 2. Paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Base drawings on field measurements.
- C. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified engineer licensed in the jurisdiction of the project.
 - 1. Provide engineering calculations.

1.3 QUALITY ASSURANCE

- A. Reference Standards include the latest editions of:
 - 1. Code of Standard Practice for Steel Buildings and Bridges
 - 2. Standard Code for Welding in Building Construction of the American Welding Society.
 - 3. NAAMM Pipe Railing Manual
 - 4. NAAMM Metal Stairs Manual
 - 5. Steel Structure Painting Manual, Volumes 1 and 2
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- C. Structural Performance: In accordance with applicable Building Code.

PART 2 - PRODUCTS

2.1 FABRICATOR-ENGINEERED STEEL STAIRS AND HANDRAILS - GENERAL

- A. Provide stairs complying with the following: Use welding for joining pieces together, unless otherwise shown or specified. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and

tight, and make connections between parts light- proof tight. Provide continuous welds, ground smooth where exposed.

- B. Construct stair and handrail units to conform to sizes, geometries and arrangements as shown by the Contract Documents and approved shop drawings. Construct entire assembly to support live loads as required by governing codes unless higher loading is specified or shown. Provide metal framing, hangers, columns, struts, clips, brackets, bearing plates and other components as required for the full support and bracing of stairs and platforms. Erect stair and handrail work to line, plumb, square, and true, with runs registering level with floor and platform levels.

2.2 CONCRETE-FILLED METAL PAN TREAD-RISER UNITS

- A. Structural steel sheets, to conform to configuration shown. Provide thicknesses of structural steel sheet for components required to support total design loading.
- B. Construct riser and tread as a single, formed shape, with steel angle supporting brackets welded to stringer and tread- riser units.

2.3 STAINLESS STEEL TREAD UNITS

- A. Manufacturers: Subject to compliance with specifications, provide units from the following:
 - 1. McNichols.
 - 2. Erdle.
 - 3. Accurate Perforating.
 - 4. Karnel Inc.
 - 5. SlipNOT Metal Safety Flooring.
- B. Basis of design: SlipNOT FlexGrip.
- C. Product description: A manufactured metal "Z" shaped plate with tread, riser, and nosing with anti-slip coating.
 - 1. Material: Type 304 or 316 stainless steel.
 - 2. Hole Size: As indicated on drawings.
 - 3. Plate Hole and Margin Spacing: As indicated on drawings.
 - 4. Size: As indicated on the drawings.
- D. Anti-slip treatment on stainless steel: Equal or better than the following:
 - 1. Surface Texture: Architect selected from Grade 1, Fine or Grade 2, Medium.
 - 2. Surface: Anti-slip stainless steel surface consisting of a random hatch matrix.
 - 3. Surface Hardness, Rockwell C Scale, ASTM E 140 and E 384: Minimum of 55.
 - 4. Bond Strength, Surface to Substrate, ASTM C 633: Minimum of 4,000 psi.
 - 5. Coefficient of Friction, Anti-Slip Surface: Minimum of 0.6.
 - 6. UL Listed: Slip-resistant.
 - 7. Approval: FDA and USDA.
- E. Provide angle brackets for welding or fastening tread to stringer, as shown.

2.4 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Metals and fasteners shall conform to the latest edition of the specifications or manufacturer's standards and as given below.
- C. Typical material types and standards:
 - 1. Steel Plates, Shapes, and Bars: ASTM A 36.
 - 2. Cold-Formed Steel Tubing: ASTM A 500.
 - 3. Hot-Formed Steel Tubing: ASTM A 501.
 - 4. Steel Pipe: ASTM A 53, standard weight (Schedule 40).
 - 5. Rolled Steel Floor Plate: ASTM A 786.
 - 6. Cold-Rolled Structural Steel Sheet: ASTM A 611, Grade A.

7. Hot-Rolled Structural Steel Sheet: ASTM A 570, Grade 30.
8. Cold-Rolled Steel Sheet: ASTM A 366.
9. Hot-Rolled Steel Sheet: ASTM A 569.
10. Galvanized Steel Sheet: ASTM A 653, G 90; Grade A coating designation.
11. Fasteners: Plated fasteners, ASTM B 633, zinc-coated.
12. Grout: Factory-packaged, nonshrink, nonmetallic, ASTM C 1107.

2.5 MISCELLANEOUS MATERIALS

A. Coatings & Finishes:

1. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - a. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
2. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
3. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
4. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
5. Concrete Materials and Properties: Normal-weight, air-entrained, ready-mix concrete, minimum 28-day compressive strength of 3000 psi (20 MPa) unless otherwise indicated.
6. Nonslip-Aggregate Concrete Finish: Factory-packaged dry shake, abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials. Available product:
 - a. MasterTop 120SR, formerly "Frictex NS" aluminum oxide aggregate passing 8-16 mesh as manufactured by MasterBuilders; <https://www.master-builders-solutions.basf.us/>.
7. Finish stairs after assembly.

- B. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated.

2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

2.7 STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.

2.8 STAIR RAILINGS

- A. Comply with applicable requirements in Section 05 52 10 - [Carbon] Steel railings

PART 3 - EXECUTION

3.1 INSTALLING METAL STAIRS

A. Comply with the following:

1. Take field measurements prior to fabrication, where possible. Form to required shapes and sizes with true, straight edges, lines and angles. Provide light-tight, hairline joints.
2. Coordinate with work of other sections; provide inserts and templates as needed. Install work plumb and level with uniform appearance.
3. Stairs: Control access to and use of stair systems. Do not permit use of stairs until stairs and railing systems are complete and ready to assume design loading. Do not permit overloading of stair systems. Make connections lightproof tight by welding or bolting; conceal fastenings as much as possible. Grind flush and smooth all exposed welds. Fill pans with 3000 psi concrete with welded wire fabric and provide broom finish.

3.2 EXISTING WORK

- A. Existing work: Remove and re-install or re-locate existing stair fabrications as required to complete the work. Drill, tap, or weld existing assemblies as required to complete the work and to attach existing work to new work.

3.3 INSTALLING RAILINGS

- A. Comply with applicable requirements in Section 05 52 10 - [Carbon] Steel railings

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION

SECTION 05 52 10 - STEEL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related documents: All of the Contract Documents, including the Drawings, the General and Supplementary Conditions and Division 1 General Requirements apply to the work of this Section.
- B. Section includes, without limitation, providing
 1. New steel hand & guard rail assemblies.
 2. Modifying and coating existing hand and guard rail assemblies.
 3. Interior work.
 4. Exterior work.
 5. Prime coating finishes.
 6. Finish coating finishes.
 7. Engineering.
- C. Related work includes, without limitation:
 - Section 01 73 60 – Fire prevention precautions for hot work.
 - Section 03 30 00 – Concrete:
 - Section 05 08 50 – Hot dip galvanizing:
 - Section 09 90 10 – Painting:

1.2 SUBMITTALS

- A. Submit under provisions of Division 1 and as follows:
 1. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
 2. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
 3. Engineering Calculations: Provide calculations stamped by a professional engineer registered in the project jurisdiction work of this section. Comply with section 01 45 50 Engineering by Contractor.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Handrail and Railing Structural Performance:
 1. Comply with requirements of State Code for railing assembly, wall rails, and attachments to resist concentrated and uniform loading of components without permanent deformation and with structural performance per ASTM E985.
 2. Comply with applicable requirements of ADA and ANSI-117.1.
- C. Reference Standards include the latest editions of:
 - Standard Code for Welding in Building Construction of the American Welding Society.
 - NAAMM Pipe Railing Manual
 - Steel Structure Painting Manual, Volumes 1 and 2

1.4 PERFORMANCE REQUIREMENTS

- A. Provide railing assemblies complying with building code and the following, using the more stringent requirements and leaving railings free of permanent deformation:
 1. Railings uniform load: 50 lbf/ft.
 2. Railing concentrated load: 250 lbf applied to hand/guard rails in any direction.
 3. Railing infill concentrated load: 50 lbf applied horizontally to area of 1 sq. ft. sq. m).

4. Uniform, infill and concentrated loads: Not assumed to act concurrently.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Carbon Steel Pipe, Bar and Tube Railing Systems:
 1. Steel Pipe, Galvanized Finish: ASTM A 53.
 2. Steel Pipe, Black Finish: ASTM A 53.
 3. Steel Tubing: ASTM A 500 or A 501.
 4. Steel Plates, Shapes and Bars: ASTM A 36.
 5. Gray Iron Castings: ASTM A 48, Class 30.
 6. Malleable Iron Castings: ASTM A 47, Grade 32510.
 7. Interior Finish: Primed.
 8. Exterior Finish: Galvanized and shop primed.
- B. Auxiliary Materials:
 1. Nonshrink Nonmetallic Grout: CE CRD-C621.
 2. Interior Anchoring Cement: Hydraulic expansion cement.
 3. Exterior/Interior Anchoring Cement: Erosion-resistant hydraulic expansion cement.
 4. Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79, compatible with topcoats. Apply within 12 hours of hot dip galvanizing.
 5. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 6. Galvanizing Repair Paint: SSPC - Paint 20.
 7. Bituminous Paint: Asphalt mastic, SSPC - Paint 12.

2.2 HOT DIP GALVANIZING

- A. Refer to sections 05 08 50.

2.3 EXISTING PRODUCTS

- A. Re-use existing sound products that are clearly of sufficient strength.

2.4 STAIR RAILINGS, GUARDRAILS AND HANDRAIL FABRICATION

- A. Comply with the following:
 1. Provide steel pipe railings as shown, consisting of handrails at open side (including intermediate rails or infill) and handrails at walls. Fabricate standard size pipe and bar stock as shown.
 2. Use welding for joining pieces together, unless otherwise shown or specified. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight, and make connections between parts light- proof tight. Provide continuous welds, ground smooth where exposed.
 3. Construct handrail units to conform to sizes, geometries and arrangements as shown by the Contract Documents and approved shop drawings. Construct entire assembly to support live loads as required by governing codes unless higher loading is specified or shown. Provide metal framing, hangers, brackets, and other components
 4. Provide stair and/or hand railings as shown, consisting of handrails at open side (including intermediate rails or infill) and handrails at walls. Fabricate standard size pipe and bar stock as shown.
 5. Adjust railings prior to securing in place to insure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction. Secure posts and rail ends to building construction by coring, or through- bolting of flange as indicated. Railings against walls shall have brackets mounted with toggle bolts at unit masonry walls, secured into blocking at gypsum board walls. At hollow masonry walls use specified epoxy anchoring system. At solid masonry use 1/2" or heavier expansion bolts. Provide solid, continuously welded and/or embedded plates where required or shown.
 6. Exterior Finish: Galvanized and shop primed for field painting by others.

7. Interior Finish: Shop primed for field finish painting by others.
8. Handrails and supports shall be provided in special sizes and shapes where required to complete this installation.
9. Expansion Joints: At straight runs of pipe railing and handrails, provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6" of posts.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the provisions of Section 01 70 00 - including requirements related to:
 1. Inspection and examination. Tolerances and measurement.
 2. Approvals, inspections and filed quality control.
 3. Layout. Adjusting.
 4. Cleaning. Protection.

3.2 PREPARATION

- A. Take field measurements prior to fabrication, where possible. Form to required shapes and sizes with true, straight edges, lines and angles. Provide light-tight, hairline joints.
- B. Ensure exterior work has been hot dipped galvanized and prime painted.

3.3 REPAIRING & RE-WORKING EXISTING CONSTRUCTION

- A. Install materials and systems in accordance with approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.
 1. Remove, cut, replace or re-work existing materials.
 2. Join new and existing work seamlessly. Weld assemblies together and grind work smooth so that new joint between new and existing work is apparent. Remove all traces of welding, grinding and cutting and leave work ready for painting.
 3. Where work has been ground to bare metal apply zinc rich primers within 1 hour of exposing raw metal, ensuring that no rust has developed before coating surfaces.

3.4 INSTALLATION

- A. Install materials and systems in accordance with approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.
- B. Railings: Provide sizes, profiles and dimensions indicated. Provide mitered joints at 90 degree turns and smooth sweeps at bends. Provide wall returns, end caps, brackets, fittings, and toe boards.
- C. Coordinate with work of other sections; provide inserts and templates as needed. Install work plumb and level with uniform appearance.
- D. Restore damaged finishes and protect work.

END OF SECTION

SECTION 06 10 60 - WOOD BLOCKING & WOOD TREATMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related documents: All of Contract Documents, including Drawings, the General and Supplementary Conditions and Division 1 General Requirements apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Dimension lumber wood blocking.
 - 2. Wood panel blocking.
 - 3. Wood nailers, furring, strapping, sleepers and cants.
 - 4. Priming, back-painting, and treating of field cuts.
 - 5. Rough hardware.
 - 6. Backerboards for electrical and telephone equipment.
 - 7. Wood fire retardant and preservative treatments.
- C. Scope/extent includes, without limitation:
 - 1. Roof blocking.
 - 2. Exterior rainscreen blocking / strapping when shown to be wood.
 - 3. MEP, telephone, cable, and low voltage backer panels.
 - 4. Blocking for fixtures, grab bars, trim, and the like.
 - 5. Treated plywood and dimension lumber blocking to meet universal design or installation requirements.
 - 6. Wood curbs for roof-top components.
 - 7. All blocking in fire rated assemblies to be fire retardant treated.

1.2 SUBMITTALS

- A. Product Data: Submit treatment manufacturers' and suppliers information on at least the giving species, grades, actual sizes and moisture contents, finishes, and treatments as applicable

1.3 QUALITY STANDARDS

- A. Comply with the following:
 - 1. Lumber Standards and Grade Stamps: PS 2/16, American Softwood Lumber Standard and inspection agency grade stamps.
 - 2. Construction Panel Standards: PS 1, U.S. Product Standard for Construction and Industrial Plywood; APA PRP-108.
 - 3. APA Design/Construction Guidelines.
- B. Provide the following:
 - 1. Official grade mark on lumber.
 - 2. Mark of treating company certifying type of treatment applied on fire retardant treated and pressure preservative treated lumber and plywood.
 - 3. American Plywood Association trade mark indicating type, grade and class of plywood panel.

1.4 PRODUCT DELIVERY AND STORAGE

- A. Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood, and provide air circulation within stacks.

PART 2 - PRODUCTS

2.1 LUMBER & PLYWOOD

- A. Moisture content: 15% max. for 2" or less nominal thickness, except as noted .
- B. Surfacing: Use S4S material (surfaced four sides) free of warp, wanes and defects, unless specified otherwise.

- C. Blocking species: No. 2 or better Douglas or Hem-Fir, or #2 Spruce Pine Fir, or, where plywood is indicated, use CDX waterproof glue APA exterior plywood.
- D. 12 gage electrogalvanized sheet metal may be substituted for blocking at metal stud walls if sufficient strength is developed to support actual and code-mandated loads. Refer to other sections for requirements.
- E. Blocking layout and size: Continuous and solid, fire retardant 3/4 inch plywood or fire retardant 2x4 or larger where additional support is required.
- F. Provide blocking in addition to any indications on the drawings as follows:
 - 1. Millwork attached to walls or ceilings.
 - 2. Equipment attached to walls or ceilings.
 - 3. At grab bars.
 - 4. Handrail brackets.
 - 5. Wall hung lavatories.
 - 6. At cabinets, and counter brackets.
 - 7. At shelving and drapery track.
- G. Provide firestopping as follows:
 - 1. At ceiling lines and at 8'-0" height if ceiling is higher.
 - 2. To close of all framing spaces connecting floors.
 - 3. As required by code.
- H. Provide fire retardant treated lumber where indicated, meeting the requirements for such plywood as given below. Provide fire retardant treated wood products as shown or required by code.
 - 1. I-2 Occupancies: Fire retardant treat all wood products.
- I. Furring: Solid wood sized to match the condition.
- J. Interior tsrapping shall be 1/2 " x 3" nom. solid wood stock.
- K. Exterior strapping blokcin shall be 1/3/4 " x 4" nom. solid wood stock, pressure treated.
- L. Bridging shall be 1" x 3" or approved galvanized steel cross bridging at intervals not to exceed 8'-0". Do not nail bottoms of bridging until subflooring is installed.

2.2 PLYWOOD

- A. General: Provide only APA grade stamped softwood plywood meeting requirements of U.S. Dept. of Commerce PS-1 in thickness shown and in grades and strengths recommended by APA for specific locations and uses. Where indicated, provide preservative or fire retardant treatment.
- B. Exposure: Exposure 1 or better.
- C. Plywood backer panels:
 - 1. Material: APA C-D Plugged Exposure 1 with exterior glue
 - 2. Pressure treatment: Fire retardant.
 - 3. Coatings: Fire retardant paint, 6 sides, applied before installation.
 - 4. Coating color: As shown or directed, if not, black.
 - 5. Thickness: As indicated, if not, 0.75 inches.

2.3 ROUGH HARDWARE

- A. Furnish and install all bolts, nuts, expansion shields, lag screws, toggle bolts, wood screws, nails, flat cap metal nailing discs, staples, power driven anchors and other rough hardware as required. Use stainless steel for treated wood.

2.4 FIRE & PRESERVATIVE TREATMENT OF LUMBER & PLYWOOD

- A. Manufacturers: Subject to compliance with specifications, provide Fire retardant treatment products equal or superior to:
1. Hickson "Dricon"
 2. Hoover "Pyro-guard 3rd Generation Fire Retardant Treatment"
 3. Products shall be certified paintable or stainable.
- B. Pressure Applied Preservative Treatment [PT]:
1. Material: ACQ – Alkaline Copper Quat, AWPA Standards P26, 27, 28, & 29.
 2. Treatment Standard: AWPA C2 for lumber and C22 for panels.
 3. Retention level: 0.25 lbs. per cubic foot; or
 4. Moisture content: Kiln dried to 19% before delivery to job site.
 5. Treated products shall conform to American Wood Preservers Bureau Standard LP-2 and be so stamped on each piece delivered.
 6. Coordinate preservative treatment with roofing materials to ensure compatibility.
 7. Fasteners used with PT: Hot dipped galvanized or stainless steel.
 8. Use of electroplated fasteners: Not permitted.
 9. Usage: Where shown and all plywood and lumber, exterior and interior, having direct contact with concrete or masonry and all blocking, nailing strips, curbs, wood battens and other wood embedded in or in contact with roofing.
 10. Coatings: Coat concealed blocking to intended to abut sheet metal other than stainless steel with application of bituminous paint.
 - .1) Acceptable manufacturer: Osmose Inc. – Wood Preserving division, Borate preservative treatment [DOT type.]
 - .2) Pressure-treated with waterborne preservatives, to comply with AWPA P5 and AWPA C31 for structural lumber. Dry after treatment to 19% max. moisture content for lumber and 15% for plywood.
 - .3) Treat field cut ends with Osmose DOT, 10% solution.
 - .4) Note: This treatment requires protection from moisture until construction is enclosed and heated. Provide protections necessary.
- C. Fire Retardant Treatment [FRT]:
1. UL listed treatment adequate to achieve Class I rating with flame spread equal to 0-25 when tested in accordance with ASTM E84 and show no evidence of significant progressive combustion when test is continued for an additional 20 minutes. Provide treatments compatible with locations - interior or exterior.
 2. Provide fire retardant treated wood products as shown or required by code .
- D. Fire Retardant Plywood:
1. Class A material conforming to ASTM E-84, NFPA 255, UL 723.
 2. Provide certification by manufacturer of conformity to standards.
 3. Provide fasteners meeting manufacturers approval and requirements.
 4. Acceptable manufacturer: Koppers "Non-Com"
- E. Water-Repellent Preservative: NWWDA tested and accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.
- F. Extent for wood to be preservative treated: As shown and as follows:
1. Treat above-ground wood exposed to deterioration by moisture
 2. Wood in contact with the ground or fresh water.
 3. Wood in contact with concrete or masonry
- G. Extent for wood to be fire retardant treated: As shown and as follows.
1. Exposed or semi-exposed wood in fire rated assemblies and in spaces having limited flame spreads for exposed combustibles.
 2. Blocking concealed in fire rated assemblies
 3. Where required by code.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the provisions of Section 01 70 00 - especially requirements related to:

1. Inspection and examination.
2. Tolerances and measurement.
3. Approvals, inspections and filed quality control.

3.2 MISCELLANEOUS CARPENTRY INSTALLATION - GENERAL REQUIREMENTS

- A. Construct work plumb, level, and true, with tight, close fitting joints, securely attached and braced to surrounding construction all in a first-class workmanlike manner. Counter-bore for bolt heads, nuts, and washers where required to avoid interference with other materials.
- B. Unless otherwise indicated, wood nailers, furring, strapping, etc., less than 2 in. nominal thickness shall be secured to back-up material by use of appropriate fasteners located 4 in. from ends and spaced not greater than 16 in. o.c. along lengths of members. Type and length of fastening devices shall develop sufficient anchorage to back-up material.
- C. Where nailing or power-driving into concrete or masonry, avoid puncturing conduits, pipes, ducts, etc. embedded in such work.
- D. Where anchorage to steel structural members is indicated, steel members will be prepared to receive anchor bolts, etc., as indicated, by structural steel trade.
- E. Apply two coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber, in accordance with AWWPA M4.
- F. Power-driven fasteners used on concrete surfaces or at rough window and door openings shall be used in accordance with manufacturer's recommendations, especially in regard to edge distance, curbs or at rough window and door openings.
- G. Do not space fasteners more than recommended or approved distances apart spacing and comply with applicable building codes, APA guide lines and best practices of the trade and the following:
 1. CABO NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in the IBC and Table R602.3(1), "Fastener Schedule for Structural Members," whichever is heavier and more frequent.
- H. Universal and barrier free design: Whether or not shown on the drawings, provide blocking for grab bars and other barrier free assemblies. Include the following:
 1. Future grab bars for so-called group 1 and group 2 bathrooms:
 - a. Water closets: Blocking adjacent to and behind water closets installed from 32 to 38 inches above finish floor; and 6 inches beyond water closet each side or to corner.
 - b. Showers: Blocking from 6 to 48 inches above finish floor, full width, length of stall @ Group 1, to 60" above floor @ Group 2.
 2. Indicated grab bars: As shown, if not, as above.
 - c. Adjustable counters: Full height recommended for simplify, floor to ceiling plywood blocking.

3.3 INSTALLATION OF BLOCKING AND NAILERS

- A. Blocking: Locate blocking to facilitate installations of finish materials, fixtures and specialty items.
- B. Attach Blocking as follows:
 1. In metal stud partitions: Screw attach through stud flanges.
 2. At masonry: With oval head toggle bolts and washers or with epoxy tube and sleeve systems.
 3. At concrete: With expansion shield bolts.
 4. At steel: With flat head bolts/nuts or approved power actuated fasteners.
- C. Blocking shall be approved material capable of supporting items such as grab bars with a load of 250 lbs. for 5 minutes or more if so required by code. Provide fire retardant treated materials where indicated.
- D. Blocking members shall be of the sizes indicated on the drawings not less than 3/4" plywood or lumber 3-1/2" wide unless otherwise noted on the drawings. Blocking members shall be secured with minimum of 5/16" galvanized steel bolts of sufficient length to provide a minimum of 3" of embedment in concrete or as required when bolting into steel members and as shown.

- E. Bolts shall be located not over 2'-0" on centers and within 4" of end joints. End joints and intermediate joints shall be in alignment. Intermediate joints shall be spliced. Counterbore wood so that washer and nut, and end of bolt are recessed below the top surface of curbs and blocking. In no case shall there be less than two bolts per length in any member.
- F. Nailers for wood trim and finish shall be provided and secured to the masonry, concrete, wood framing or other receiving surfaces as the work progresses. Nailers shall be not less than 1" nominal thickness and of such other dimensions and profiles as are required or shown.

3.4 INSTALLATION OF FIRE BLOCKING & TREATED WOOD

- A. Fire block assemblies as shown and at locations as follows:
 - 1. Furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. using solid wood blocking or noncombustible materials accurately fitted to spaces.
 - 2. Concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c.
 - 3. Where fire blocking is not inherent in framing system, provide closely fitted solid wood blocks of same width as framing members, 2-inch nominal thickness.
 - 4. Spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 - 5. Concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- B. Apply two coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber, in accordance with AWPA M4.
- C. Install pressure and fire retardant treated wood where shown on drawings and specified in this section.

3.5 INSTALLATION OF FURRING AND STRAPPING

- A. Furring and strapping at masonry walls to receive drywall shall be 16" o.c. unless otherwise shown. All furring and strapping shall be double nailed, secured to masonry or concrete with masonry nails.
- B. All furring and strapping shall be shimmed and blocked to assure plumb and level furred wall surfaces.

3.6 INSTALLATION OF BACKER / UTILITY PANEL MOUNTS

- A. Provide and install fire retardant plywood backings for surface mounted electric panel boards, meter mounts, protection cabinets, motor control panels and the like. Boards shall be rigidly built and securely fastened to wood-furred strapping at walls in approved manner. See Electrical Drawings for locations of devices which require mounting on backerboards. Provide plywood backings for Telephone and Protection (Security) panels.

3.7 CLEAN UP & PROTECTION

- A. Clean up work areas daily, remove packaging, debris, sawdust and scraps, and dispose of properly.
- B. Repair or replace work of other trades damaged or soiled as a result of work of this Section.
- C. Protect substrates, underlayments, finishes and other work subject to damage until installation of work by the next trade.

END OF SECTION

SECTION 06 16 10 - WOOD SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Wood sheathing.
 - 2. Sheathing joint and penetration treatment.
- C. Related Requirements:
 - 1. Section 06 10 50 - Wood blocking wood treatments.
 - 2. Section 06 16 20 - Gypsum sheathing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative and fire retardant.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: At fire rated assemblies, provide materials and construction identical to tested assemblies, including:
 - 1. UL's "Fire Resistance Directory."
 - 2. GA-600, "Fire Resistance Design Manual."

2.2 WOOD PANEL PRODUCTS - GENERAL

- A. Comply with the following:
 - 1. Plywood: DOC PS 1.
 - 2. Treated plywood: Refer to Section 06 08 00.
 - 3. Oriented Strand Board: DOC PS 2. [Permitted only if shown on drawings.]
 - 4. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
 - 5. Factory mark panels to indicate compliance with applicable standard.

2.3 WALL SHEATHING

- A. Plywood Wall Sheathing: Exterior, Structural I. sheathing.
 - 1. Span Rating: Not less than 32/16. Nominal Thickness 16" stud spacing: As shown, if not, not less than 15/32 inch.
 - 3. Nominal Thickness 24" stud spacing: As shown, if not, not less than 19/32 inch
 - 3. Size: As required by application. Install vertically unless otherwise indicated. .

2.4 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural 1.
 - 1. Span Rating: As shown, if not, Not less than 42/20.
 - 2. Nominal Thickness: Not less than 5/8 inch
- B. Sheathing below horizontal roofing insulation: Refer to Division 07.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall] sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A or Type 304 stainless steel].
- B. Nails, Bradss: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 - 1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- F. Masonry substrates: Where sheathing is applied directly to masonry or over insulation applied to masonry, use Tapcon type masonry fasteners of type, gage and length recommended manufacturer. Drill pilot holes where recommended by manufacturers. Manufacturers include:
 - 1. Tapcon.
 - 2. Hilti.
 - 3. Simpson.
- G. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.6 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 or ASTM D 3498] that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 EXECUTION, GENERAL

- A. Comply with the provisions of Section 01 70 00 - especially requirements related to:
 - 1. Inspection and examination.
 - 2. Tolerances and measurement.
 - 3. Approvals, inspections and filed quality control.
 - 4. Layout.
 - 5. Adjusting.
 - 6. Cleaning.
 - 7. Protection.

3.2 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
 - C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
 - D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
 - E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
 - F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
 - G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.
- 3.3 AIR / INFILTRATION / WEATHER BARRIERS
- A. Coordinate with work of applicable sections.
- 3.4 WOOD STRUCTURAL PANEL INSTALLATION
- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
 - B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION

SECTION 06 16 20 - GYPSUM SHEATHING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing: Gypsum sheathing assemblies.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Tolerances: Not more than 1/16-inch difference in true plane at joints between adjacent boards before finishing. After finishing, joints shall be not be visible. Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level and proper relation to adjacent surfaces in finished work.
- C. Fire Resistance for Fire-Rated Assemblies: ASTM E 119.
- D. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship and level of finish.
- E. Performance: Fire, structural, and seismic performance meeting requirements of building code and local authorities.

PART 2 PRODUCTS

2.1 EXTERIOR GYPSUM SHEATHING COMPONENTS

- A. Gypsum wall sheathing: 5/8 inch thick board, type X where required, meeting ASTM C 1177.
 - 1. Subject to Architect's written approval and documentation by Contractor showing extent, 1/2 inch non-rated sheathing may be used in areas of existing wall to be renovated or patched.
- B. Manufacturers: Subject to compliance with requirements, provide:
 - 1. Basis of design: G-P Gypsum Corporation; Dens-Glass Gold.
 - 2. CertainTeed Corporation; GlasRoc.
 - 3. National Gypsum Company.
- C. Sheathing Tape:
 - 1. Material: Self-adhering glass-fiber tape,
 - 2. Width: 2 inches or more.
 - 3. Threads/inch: 10 by 10 or 10 by 20.
 - 4. Type: As recommended by manufacturers for use with silicone emulsion sealant.
 - 5. Characteristics: For use in sealing joints in glass-mat gypsum and with a history of successful in-service use.
- D. Fasteners: #6 minimum, type S bugle head or S-12 wafer head, steel drill screws, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1. For light gage non-load bearing steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
 - 2. For load bearing steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions with exterior face exposed and the following:
 - 1. Fasten gypsum sheathing to framing with screws
 - 2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
 - 4. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
 - 5. Space fasteners as recommended but not more than specified below.

- B. Screw spacing: Screw-attach boards at each stud, channel or furring as follows:
 - 1. Perimeter: 6 inches on center.
 - 2. Field: 8 inches on center.
 - 3. For ceilings and soffits: 6 inch on center field and perimeter.
 - 4. Locate screws between 0.375 and 0.625 inch from sheathing panel ends and edges.

- C. Seal sheathing joints according to sheathing manufacturer's written instructions and the following:
 - 1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.
 - 2. In the event of conflict, use the more weather proof method, in the opinion of the Architect.

- D. Provide fire-rated systems where indicated and where required by authorities having jurisdiction.

- E. Deflection joints: Isolate sheathing from building structural deflection with sealant joints. Coordinate with air barrier installation. Fill joint with backer rod and sealant. Do construct assemblies to permit board to be crushed by deflections.

- F. Seal the following with backer rod and sealant in compliance with requirements of Sealant Section in Division 7:
 - 1. Deflection joints.
 - 2. Penetrations.
 - 3. Expansion joints.
 - 4. Where recommend by board manufacturer as good or best practice.

- G. Install boards vertically, centered over studs. Do not allow unsupported butt-to-butt joints and joints that do not fall over framing members. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

- H. Install trim in strict compliance with manufacturer's instructions and recommendations.

- I. Repair surface defects. Leave ready for other coatings or wall treatment.

END OF SECTION

SECTION 06 41 16 - PLASTIC LAMINATE FACED ARCHITECTURAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Plastic laminate custom architectural casework.
 - 2. ADA and FHA accessibility requirements.
- C. Related requirements, without limitation, include:
 - 1. Section 06 10 60 Wood blocking, wood treatments.
 - 2. Section 12 36 25 Plastic laminate countertops

1.2 QUALITY ASSURANCE

- A. All material provided shall be graded in accordance with the following standards:
 - 1. Softwood lumber: U.S. Dept. of Commerce PS20.
 - 2. Softwood plywood: U.S. Dept. of Commerce PS1.
 - 3. Hardwood lumber: Comply with National Hardwood Lumber Association (NHLA) rules.
 - 4. Hardwood plywood: Comply with PS-51, and ANSI/HPVA HP-1-2004 American National Standard for Hardwood and Decorative Plywood
 - 5. Forest Stewardship Council: FSC 1.2 - Principles and Criteria.
- B. All lumber provided shall bear an official grade mark specifying the species or species grouping, grade, grading agency, mill number or name and condition of seasoning at time of manufacture. However, omit grade marks from surfaces which will be exposed and which will receive a transparent or opaque finish.
- C. Softwood plywood panels shall bear the appropriate American Plywood Association grade mark indicating type, grade and class of the panel.
- D. Finish Carpentry Standards:
 - 1. The "Quality Standards" of the Architectural Woodwork Institute shall apply and by reference are hereby made a part of this specification. Any reference to Premium or Custom in this specification shall be as defined in the latest edition of the AWI "Quality Standards."
 - 2. AWI Quality Marking: Mark each assembled unit of architectural woodwork with manufacturer's identification and grade mark evidencing compliance with indicated AWI quality grade. Locate grade mark on surfaces which will not be exposed after installation. For other items requiring field assembly, a certification of compliance may be substituted for marking of individual pieces.
- E. Field Dimensions:
 - 1. Verify actual dimensions of areas to receive shop fabricated woodwork by taking field dimensions.
 - 2. Show field dimensions on final shop drawings.
 - 3. Build shop fabricated work to fit field conditions.
- F. Fire-Retardant Marking and Treatments: Comply with Section 06 08 00.
- G. Comply with applicable provisions of standards accessibility requirements affecting the project, including:
 - 1. State Architectural Access Board regulations but only as they apply to types of baths and kitchens required for this project.

1.3 SUBMITTALS

- A. Comply with provisions of Division 1 and submit:
 - 1. Shop Drawings: Submit shop drawings on all items of finish carpentry and architectural woodwork. Show all significant details of materials, construction, and installation. Office Samples: Submit samples of all

woodwork and millwork materials and sample portions of fabricated items to Architect for approval. Samples shall be approximately 12 inches square, and shall include each wood species which is to receive transparent finish at job site, and each finish to be applied at factory. Sample finish applied on one side and one edge.

3. Product Data: Submit manufacturer's specifications and installation instructions for each item of factory-fabricated woodwork.
4. Fire-Retardant Materials: Include manufacturer's instructions for handling, storing and installation of fire-retardant treated material.
5. Quality Certification: Submit manufacturer's (Fabricator's) certification, stating that the fabricated work complies with quality grades and other requirements indicated.
6. Certification: Include certification that fire-retardant treated materials comply with requirements indicated.

1.4 PRODUCT DELIVERY AND STORAGE

- A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.
- C. Store all materials off the floor, fully protected from damage of all types.

1.5 JOB CONDITIONS

- A. Conditioning: Installer shall advise persons or companies having responsibility for temporary facilities of temperature and humidity requirements in areas to receive finish carpentry. Do not install finish carpentry until required temperature and relative humidity have been stabilized and will be maintained in installation areas.
- B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within acceptable industry standard tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity condition.

PART 2 - PRODUCTS

2.1 FIRE RETARDANT TREATMENTS

- A. Where required by code, provide fire retardant treated materials meeting Class A conforming to ASTM E84.

2.2 MATERIALS – GENERAL

- A. Provide materials complying with the following:
 1. Solid lumber: AWI Section 100, and per specified grades, if not indicated, Premium.
 2. Hardboard: AHA A135.4.
 3. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 4. Particleboard: [ANSI A208.1, Grade M-2] [Straw-based particleboard complying with requirements of ANSI A208.1, Grade M-2, except for density].
 5. Softwood Plywood: DOC PS 1.
 6. Thermoset Decorative Panels: Comply with LMA SAT - 1.

2.3 PLASTIC LAMINATE COVERED CASEWORK

- A. Comply with the following:
 1. Grade: Provide casework conforming to AWI "Premium Grade" requirements, Section 400.

2. Construction: Provide casework conforming to AWI "Full Flush Overlay" details as shown in AWI publication Architectural Casework Details. Cases shall be frameless type.
3. Plastic Laminates: As specified.
4. Finish all exposed, semi-exposed and interior surfaces with laminate. Provide backing sheets on opposite faces.
5. Provide loose splashes with six sides covered with laminate.
6. Drawer construction: Multiple dovetail construction with applied drawer front.
7. Casework joinery: Fabricate countertops and casework to have fewest possible seams. Locate seams where shown on shop drawings and approved by Architect. Do not use exposed fasteners or connectors. Use concealed bolts to hold seams and joints hairline, lightproof tight.
8. Exposed surfaces: Covered with "face" laminate.
9. Dust panels: Provide plywood dust panels in work.
10. Blocking and Brackets: Loading capacity shall be as follows:
 - a. Shelves: 50 lbs. per linear foot.
 - b. Countertops: 50 lbs. per linear foot plus a 250 lb. concentrated load at center span.
11. Accessibility: Comply with requirements of Section 12 35 30 for accessibility, removal fronts, other ADA, Mass AAB requirements.

2.4 MISCELLANEOUS MATERIALS

- A. Furring: Fire-retardant treated wood strapping to support panels or casework where required by code or shown.
- B. Firestopping & retardant treatments: Firestop between furring with "Thermafiber" mineral fiber fire safing insulation. Provide fire retardant treatments where required by code, authorities having jurisdiction and to prevent concealed spaces in excess of 96 inches horizontally or vertically allowing spread of concealed flame or fire.

2.5 MDF CORE MATERIALS

- A. Medium-density fiberboard: Substrates required to be medium density fiberboard shall comply with ANSI a208.2, grade MD-exterior glue and contain no added formaldehyde and not exceed required formaldehyde out-gassing limits.

2.6 PLASTIC LAMINATE MATERIALS

- A. Plastic Laminates: Provide high pressure plastic laminates meeting NEMA LD-3, as manufactured by Formica Corporation, by Wilsonart, by Nevamar or equal. Provide plastic laminate in general purpose grade or forming grade for special shapes. Solid color to be selected by Architect from manufacturer's standard range of color.
- B. Laminates grades: General Purpose H-5 [.050"] for horizontal surfaces; VF-3 [.030"] for vertical surfaces; HF-4 [.042"] for post-forming surfaces; and .020" for backing surfaces.
- C. Color core laminates: Provide through color laminates where indicated. Provide horizontal grade at horizontal surfaces and exposed verticals subject to damage such as open cubbies and exposed door edges.
 1. Basis of design: Formica ColorCore 2.
- D. Where stainless channel reveals or trim are required, and stainless laminate edges would show, provide solid metal units. Acceptable vendors include:
 1. C.R. Laurence Co., www.crlaurence.com/.
 2. Julius Blum & Co., www.juliusblum.com/.
- E. Adhesives: as recommended by laminate manufacturer. Use waterproof type at utility, food preparation, sink area, vanity and where ever laminate may come in contact with water vapor or liquid.
- F. All exposed surfaces shall be covered with "face" laminate.
- G. PVC edging: At the Architect's sole discretion and approval, PVC edging may be used. Edging shall be the heaviest grade available suitable for office work applications.
- I.

2.7 CASEWORK HARDWARE AND ACCESSORY MATERIALS

- A. General: Provide cabinet hardware and accessory materials associated with work.
- C. Refer to Section 06 41 25 Hardware for architectural casework
- B. Hardware Standards: Except as otherwise indicated, comply with ANSI A 156.9 "American National Standard for Cabinet Hardware". Quality Level: Type 2 (institutional), unless other wise indicated.
- C. Typical Cabinet Door & Drawer Hardware: Provide hinges, catches and pulls of types indicated, to accommodate each door size and style.
 - 1. Hinges: Blum or Grass or Stanley self-closing, 170 degree opening, type as required by frame and construction type. In general provide 3 way adjustment..
 - 2. Cabinet Door and Drawer Pulls - As shown; if not shown - 4" wire pulls , 1/4" diameter min.
 - 3. Drawer slide system as manufactured by Accuride, full extention, clear zinc coated,
 - a. Box drawers 30 inches wide & less: Series 3132SC self closing.100 lbs capacity.
 - 4. Adjustable shelf hardware: Knappe & Vogt pin system.
 - 5. Touch latches: Glynn Johnson GJ-B
 - 6. Door Silencers: Glynn Johnson GJ-65.

2.8 ROUGH HARDWARE AND NAILS

- A. Provide all rough hardware required to complete the work using concealed fastenings wherever possible. In general, concealed fastenings shall be bright steel, except that at exterior areas they shall be galvanized steel, non-ferrous, or stainless steel. All exposed fastenings in all locations shall be non-ferrous or stainless steel as selected or approved in each case by the Architect.

2.9 BACKPRIMING & SEALING MATERIALS

- A. Work that is shop fabricated and not accessible for field priming or sealing shall be primed and/or sealed under this section.
- B. Use materials compatible with final finishes and the requirements of section 09900.

2.10 SHOP FINISHES

- A. Provide shop finishes for all work of this section complying with the requirements for opaque and transparent finishes specified in section 09 90 10. Work for opaque finishes is to be primed. Work for transparent finishes is to be sealed only when no practical alternative to complete shop finishing is available; all other work for transparent finish is to be fully finished in the shop. Touch up defects in final shop finishes under the work of this section.
- B. Transparent shop finishes shall match doors. The intent of the work is that all transparent finish of casework, paneling, counters, trim, and the like match the transparent finish of the doors. Provide the coordination necessary to achieve this result.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the surfaces to receive the work of this Section before proceeding with installation. Do not proceed with installation until all unsatisfactory conditions which would impair the work have been corrected. Notify the construction manager in writing of the conditions which would impair the proper and timely completion of the work. Starting work constitutes acceptance of conditions.

3.2 PREPARATION

- A. Condition work to average prevailing humidity conditions in installation areas prior to installing.

- B. Deliver concrete inserts and similar anchoring devices to be built into substrates, well in advance of time substrates are to be built.
- C. Prior to installation, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.3 FABRICATION

- A. Finished work shall be dressed and sanded until free from machine and tool marks, abrasions, raised grain, or other defects on surfaces exposed to view. Construction and workmanship shall conform to, or exceed, the requirements of "Premium Grade" as defined in the latest edition of the AWI "Quality Standards."
- B. Joints shall be tight and so formed as to conceal shrinkage. Mortise and tenon joints shall be set in glue under pressure. Shop miters four inches or greater shall be glued and doweled or locked with metal splice. Miters less than four inches shall be glued and splined with the spline concealed.
- C. All exposed sides and ends of plywood shall be edged with solid strip of matching hardwood, at least 1/2 inch thick, and the full width of the plywood edge. Miter edge strips at corner.
- D. All nails in finished work shall be blind nailed wherever possible and surface nails shall be set and filled with matching plastic wood.
- E. Woodwork shall be properly framed, closely fitted and accurately set to the required lines and levels and shall be rigidly secured in place.
- F. All finish work shall be sandpapered at field joints and where required by installation and shall be left in perfect condition for finishing.

3.4 PRIMING & SEALING

- A. Seal backs and concealed portions of shop coated work.

3.5 INSTALLATION -- GENERAL

- A. Install work plumb, level, true and straight with no distortions. Shim as required using concealed shims.
- B. Install fabricated work to AWI 01700, meeting the requirements for the specified grade.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Secure work to anchors or blocking built-in or directly attached to substrates. Secure to grounds, strapping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.
- E. Casework: Install without distortion so that panels, doors and drawers fit properly, accurately, and fully aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

3.6 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

- A. Comply with Division 01 and the following:
 1. Repair damaged and defective work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace cabinets.
 2. Clean hardware, lubricate and make final adjustments for proper operation.
 3. Clean exposed and semi-exposed surfaces. Touch- up shop-applied finishes to restore damaged or soiled areas.

EW COMMUNITY CENTER ALTERATIONS & ADDITIONS | East
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4. Repair or replace work other trades damaged or soiled by the work of this Section.
5. Protect work during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.
6. Keep work areas clean by daily sweeping and disposal of scrap ,sawdust and debris.

END OF SECTION

SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Modified bituminous sheet waterproofing.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Warranty: Submit manufacturer's standard warranty. Include labor and materials to repair or replace defective materials.
 - 1. Warranty Period: 5 years.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Testing: Flood testing of horizontal applications.
- C. Environmental limitations: Comply with manufacturer recommendations.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Modified Bituminous Sheet: Not less than 60-mil thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil thick, polyethylene film with release liner on adhesive side
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Hydrotech, Inc.; VM 60.
 - b. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
 - c. Grace, W. R. & Co.; Bituthene 3000 or 4000, as required..
 - d. Henry Company; Blueskin WP 200.
 - e. Meadows, W. R., Inc.; SealTight Mel-Rol.
 - f. Tremco; Tremproof 560. [20 mils butyl 40 mils fabric]
 - 2. VOC: Where required, formulate product for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction. Where regulations are not clear, provide Low VOC products.
 - g. American Permaquik Inc.; PQ 7100.
 - 3. Physical Properties:
 - a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
 - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch) movement; ASTM C 836.
 - e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
 - f. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D 5385.
 - g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
 - h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

1. Accessories: Primers, surface conditioners, termination bars, and protection board.

2.2 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing. Comply with the following:
 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
 2. Primer: Liquid primer recommended for substrate by manufacturer of sheet waterproofing material. Use water borne type where required.
 3. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.
 4. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.
 5. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.
 6. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.
 7. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.
 8. Metal Termination Bars: Aluminum bars, approx 1 by 1/8 inch thick, predrilled at 9-inch centers.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with other work.
- B. Restore damaged components and test waterproofing for leaks. Clean and protect work from damage.

END OF SECTION

SECTION 07 21 02 – RIGID FOAM THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Foam-plastic board insulation.
- C. Related Sections:
 - 1. Division 07 – Other thermal insulations.
 - 2. Section 07 21 03 – Batt & Blanket Thermal Insulation.
 - 3. Section 07 21 30 – Foam gap insulation.
 - 4. Section 07 26 10 – Vapor retarders.
 - 5. Section 07 84 00 – Fire and smoke stopping insulation.
 - 6. Division 07 - Membrane roofing insulation.
 - 7. Section 09 81 10 – Acoustical insulation & accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation (XPS): ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Pactiv Building Products.
 - e. Approved equal.
 - 2. Configuration:
 - a. Thickness: As shown, not less than R 5.0 per inch or better.
 - b. Edge: Lap or square, as shown, if not shown, square.
 - 3. Type IV, 25 psi (173 kPa). Typical, including, as applicable, vertical and interior slabs with normal loading.

2.2 POLYISOCYANURATE FOAM-PLASTIC BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dow Chemical Company (The). (Thermax)
 - 2. Firestone Building Products, Firestone Building Products; Enverge CI Foil Exterior Wall Insulation
 - 3. Johns Manville, (AP Foil-faced Foam Sheathing).
 - 4. Rmax, Inc. (Thermasheath-3)
- B. Configuration:
 - 1. Thickness: As shown, not less than R 6.0 per inch.
 - 2. Edge: Lap or square, as shown, if not shown, square.
- C. Material characteristics:
 - 1. Composition: Foil-Faced, Polyisocyanurate Board Insulation: ASTM C1289, Type I, Class 1 or 2, Grade 3 or better.
 - 2. Maximum flame-spread and smoke-developed indexes: ≤ 25 and ≤ 450 , respectively, per ASTM E84.
 - 3. Minimum Compressive Strength ≥ 25 psi when tested per ASTM D1621
 - 4. Minimum Tensile Strength ≥ 1000 when tested per ASTM C209
 - 5. Minimum Flexural Strength ≥ 40 psi when tested per ASTM C203
 - 6. Water Vapor Transmission ≤ 0.03 perms per inch when tested per ASTM E96
 - 7. Water Absorption Maximum $\leq 1\%$ by volume when tested per ASTM C209
 - 8. Dimensional Stability, Maximum $\leq 0.05\%$ length and width, and $\leq 3.5\%$ thickness when tested per ASTM D2126.
 - 9. Blowing agent: CFC-, HCFC- and HFC-free with zero Ozone Depletion Potential (ODP)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
- E. Other cavity and penetration preparation requirements:
 - 1. Air seal all penetrations through the ceiling including plumbing, wiring, seams between top plate and drywall and all other gaps or holes, with the appropriate air sealing materials or insulation itself.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.
 - 2. For slabs on grade of habitable spaces, or educational spaces, extend insulation under entire slab.

3.4 INSTALLATION OF INSULATION FOR FRAMED & WALL CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation.

3.5 PROTECTION

- A. Protect installed insulation[and vapor retarders] from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07 21 03 – BATT & BLANKET THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Glass-fiber blanket insulation.
 - 2. Mineral-wool insulation.
- C. Related Sections:
 - 1. Division 07 – Other thermal insulations.
 - 2. Section 07 21 02 – Rigid Foam Thermal Insulation.
 - 3. Section 07 21 30 – Foam gap insulation.
 - 4. Section 07 26 10 – Vapor retarders.
 - 5. Section 07 84 00 – Fire and smoke stopping insulation.
 - 6. Division 07 - Membrane roofing insulation.
 - 7. Section 09 81 10 – Acoustical insulation & accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- C. Research/Evaluation Reports: For foam-plastic insulation, from [CC-ES].

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET & BATT INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corporation.
 - 2. Guardian Building Products, Inc.
 - 3. Johns Manville.
 - 4. Knauf Insulation.
 - 5. Owens Corning.
 - 6. Approved equal.
- B. Standards: Comply with the following for types of insulation indicated.
 - 1. ASTM C 665; Type I, Class A (unfaced)
 - 2. ASTM C 665; Type II, Class C (kraft faced)
 - 3. ASTM C 665; Type III, Class A (FSK-25 foil faced)
 - 4. ASTM C 665; Type III, Class B (foil faced)

- C. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- D. High density glass fiber insulation:
 - 1. Manufacturers: subject to compliance with specifications, provide one of the following:
 - a. Eco-Touch, Owens Corning.
 - b. EcoBatt-Knauf.
 - c. High Performance Fiber Glass Building Insulation-CertainTeed.
 - d. Approved equal.
 - e. Note: Certain manufacturers label these products: "HD"; use those to meet performance.
 - 2. Standards: Meet or exceed the following:
 - a. Unfaced insulation: ASTM C665, Type I, Class A.
 - b. Kraft-faced insulation: ASTM C665, Type II, Class C.
 - 3. Usage: Where shown, including between exterior wall studs and in "cathedral ceilings.
 - 4. R values: As shown.
 - 5. Thickness: to meet indicated R values.
 - 6. Performance: Insulation capable of meeting the following:
 - a. Wall applications: R=13 in 3.5 inches minimum.
 - b. Wall applications: R=20 in 5.5 inches minimum.
 - c. Cathedral ceiling applications: R=38 in 10.25 inches.
 - 7. Facing: As indicated if not, unfaced.
- E. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
 - 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
 - 2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
- E. Other cavity and penetration preparation requirements:
 - 1. Air seal all penetrations through the ceiling including plumbing, wiring, seams between top plate and drywall and all other gaps or holes, with the appropriate air sealing materials or insulation itself.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
5. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
 - a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.4 SPINDLE ANCHOR INSTALLATION

A. Install as recommended by manufacturer, if not, as follows:

1. Secure spindle with general purpose liquid adhesive applied to a clean, dust free surface.
2. Apply spindle to a cleaned, dry, smooth surface. Remove any oil, rust, loose paint dust or the like before applying fastener
3. Apply sufficient adhesive to base of fastener.
4. Firmly press fastener against cleaned surface and slightly twist the fastener to force adhesive through base plate holes.
5. Impale insulation over point of fastener.
6. Secure insulation with a self locking washer.
7. Bend or remove remaining point.

3.5 PROTECTION

A. Protect installed insulation and accessory or adjacent assemblies from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07 21 30 - FOAM GAP INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Foamed-in-place gap insulation.
 - 2. Sill sealers.
- C. Extent: Where shown and:
 - 1. Fill all gaps in building thermal envelope not addressed by the sections and including:
 - 2. Envelope joints, seams, and penetrations.
 - 3. Openings or gaps between door and window assemblies.
 - 4. Utility penetrations.
 - 5. Rim and band joist junctions.
 - 6. Spaces behind tubs and showers on exterior walls.
 - 7. At penetrations and holes in thermal envelope.

1.2 REFERENCED CODES AND STANDARDS

- A. All references to codes, specifications and standards referred to herein shall become a part of this section as though written out, and shall mean, and is intended to be the latest edition, amendment, and/or revision of such reference unless otherwise specified.
 - ASTM - American Standards for Testing and Materials.
 - NRCA - National Roofing Contractors Association.

1.3 SUBMITTALS

- A. Submittals: Conform to requirements of Division 1 and submit:
- B. Manufacturer's Data Sheets: Provide data on product characteristics, performance criteria limitations and insulation values.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to project site in manufacturer's original packaging. Clearly identify manufacturer, contents, brand name, applicable standard, and R-value.
- B. Store materials off ground. Protect against weather, condensation, and damage; immediately remove damaged material from site.

1.5 SEQUENCING/SCHEDULING

- A. Coordinate and cooperate for installation of each type insulation specified with respective trades, particularly work specified under Section 09 29 00 Gypsum Board, whose work is affected in order to complete the work specified herein.

1.6 DESIGN REQUIREMENTS

- A. Materials properties or classes shall meet or be determined by the following ASTM standards:
 - 1. ASTM C-518: Thermal Resistance (R) values.
 - 2. ASTM E-96: Permeance of facing and/or insulating material

PART 2 - PRODUCTS

2.1 SPRAY FOAM GAP INSULATION

- A. Manufacturers:
 - 1. Basis of design: Todol Products, Pur Fill IG.
 - 2. Dow Chemical.
 - 3. Hilti.

4. Approved equal.

- B. Material: Sprayed-in-place expanding urethane foam with the following characteristics:
1. Materials: One-component, water-cure closed cell polyurethane containing no urea-formaldehyde and no CFCs ; maximum 100% expansion.
 2. Thermal Performance: Approximately R6 per inch.
 3. Burn Characteristics: ASTM E 84, flame spread less than 25, smoke development less than 210, fuel contribution 0.
 4. Water Absorption: Hydrophobic.
 5. Closed-Cell Formulation: 80% per ASTM D 2856.
 6. Expansion rate: As recommended by manufacturer for application:

2.2 FOUNDATION SILL SEALER

- A. Provide resilient foam sill sealer between bottom to sill plates and top of bearing surfaces. Sill sealers shall not be less than 0.50 inches less wide than sill plate.
- B. Acceptable air leakage prevention products include:
1. WEATHERMATE™ SILL SEAL a flexible polyurethane foam gasket, by Dow Chemical.
 2. Reflectix Sill Sealer by Reflectix Inc, a ribbed polyethylene foam gasket.
 3. GreenGuard Sill Sealer by GreenGuard, a ribbed polyethylene foam gasket.

2.3 VAPOR RETARDERS

- A. Refer to Section 07 26 10 or applicable sections with integral vapor barriers.

PART 3 - EXECUTION

3.1 ACCEPTANCE OF SURFACES

- A. Starting work under the section shall be construed as accepting of all surfaces as being satisfactory, and any defects in this work resulting from the accepted surface shall be corrected by this applicator without additional cost to the Owner.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Foam Gap Testing: Test installation to verify and ensure frames of doors and windows and the like remain plumb, plane and true, free of warp, bow or twisting or misalignment.
- C. Do not use foams which exert undue or excessive pressure on assemblies.
- D. Spray-Applied Foam Gap Insulation
1. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.
 2. After insulation is applied, make flush with face of studs or framing elements by using method recommended by foam gap insulation manufacturer.
 3. Ensure foam insulation is exposed to atmospheric moisture to ensure cure.
 4. Fill gaps and joints in several layers by application of small foam strings no deeper than 2 inches.
 5. Apply foam in continuous bead without voids or breaks. Do not overfill gaps and allow foam to expand.
- E. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation.
- F. Install sill sealers continuously under sill stud plates.
- G. Install insulating sealants to complete installation and provide a continuous, seamless thermal barrier.
- H. Where assemblies have been displaced, warped, bowed or otherwise degraded, remove foam and ensure assemblies return to proper alignment. Replace all work which is not in proper, acceptable condition.

3.3 CLEAN-UP

- A. This installer shall remove all equipment, materials and debris from the work and storage areas and leave those areas in clean, undamaged and acceptable condition.

END OF SECTION

SECTION 07 26 10 – VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Vapor retarders membranes.
 - 2. Accessories and system components.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's literature including installation instructions, use restrictions and limitations.
- B. Mock-Up/Field Samples: Prior to installation, provide mock up of each type of system proposed for use for approval. Accepted mock-ups may be incorporated into the work unless otherwise noted.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Division 01.

PART 2 - PRODUCTS

2.1 FABRICATOR / MANUFACTURER

- A. Acceptable manufacturers and fabricators include: As indicated below.

2.2 USAGE

- A. As indicated; if not shown, as given below:
- B. At walls and ceilings: At interior side of exterior walls and ceilings unless indicated to the contrary, provide vapor barriers in full wall length and width pieces, without joints wherever possible.
 - 1. Not required at assemblies with integral vapor retarders or which a functional vapor retarders such as insulated gasketed metal panels.
- C. At slabs-on-grade: Below slabs, provide vapor barriers in full length and width pieces, with fewest joints possible. Furnish and install under Section 07 26 11 where included in project manual.
- H. Vapor barrier – Provide where shown; where not shown provide at warm side of exterior walls and ceilings having unfaced fiber batts or fiber spray and equal to the following:
 - 1. Usage: As above.
 - 2. Material: 2 mil nylon Polyamide “adjustable perm” vapor retarder.
 - 3. Product: “MemBrain” by CertainTeed or approved equal.

2.3 ACCESSORIES

- A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- B. Vapor retarder (barrier) device box cover:
 - 1. Provide pre-fabricated units at electrical, mechanical or low voltage boxes and devices or assemblies which will adversely affect or interfere with vapor retarder continuity. Acceptable products include:
 - a. Lessco Air-Vapor Barrier Box; see www.lessco-airtight.com/.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Comply with requirements of Division 01 and 01 70 00.

- B. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION

- A. Strictly comply with retarder manufacturer's printed instructions, approved submittals and the following:
 1. Apply materials within manufacturer's requirements for temperature and weather conditions.
 2. Do not apply to wet or frozen substrates.
 3. Do not allow contamination with dust or dirt.
 4. Extend vapor retarder to extremities of areas to be protected from vapor transmission.
 5. Secure in place with adhesives or other anchorage.
 6. Locate seams at framing members, overlap, and seal with tape.
 7. Seal completely at edges, perimeter and penetrations.

END OF SECTION

SECTION 07 26 11 - UNDER SLAB VAPOR RETARDER

PART 1 - GENERAL

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
 - B. Section includes, without limitation, providing:
 - 1. Vapor retarders under slabs-on-grade.
 - C. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 03 30 00 - Cast-In-Place Concrete.
- 1.2 SUBMITTALS
- A. Product Data: For each type of product indicated.
- 1.3 DELIVERY, STORAGE, AND HANDLING
- A. Protect materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Grace Construction Products.
 - 2. Raven Industries Inc.
 - 3. Stego Industries, LLC.
- 2.2 VAPOR BARRIER
- A. Vapor Barrier shall have the following qualities:
 - 1. Permeance of less than 0.01 perms per ASTM F 1249 or ASTM E 96.
 - 2. ASTM E 1745 Class A.
 - 3. Thickness: As shown, if not, 10 mil.
 - 4. Material: Multi-layer plastic extrusion of high grade prime, virgin, polyolefin resin.
 - 5. Basis-of-Design: Stego Wrap Vapor Barrier by Stego Industries LLC.
 - B. Accessories:
 - 1. Seam Tape:
 - a. Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96.
 - b. Basis-of-Design: Stego Tape by Stego Industries LLC.
 - 2. Vapor Proofing Mastic:
 - a. Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96.
 - b. Basis-of-Design: Stego Mastic by Stego Industries LLC.
 - 3. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.
 - 4. Perimeter/edge seal: Manufacturer standard components, including:
 - a. Stego Crete Claw
 - b. Stego Term Bar
 - c. StegoTack Tape (double-sided sealant tape)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.3 INSTALLATION

- A. Install vapor retarder membrane in accordance with ASTM E1643 and manufacturer's instructions.
- B. Unroll vapor retarder membrane with longest dimension parallel to direction of slabs-on-grade concrete pour.
- C. Lap vapor retarder membrane over footings and seal to foundation walls in accordance with manufacturer's recommendations.
- D. Lap vapor retarder membrane joints a minimum of 6 inches and seal with seam tape.
- E. Seal vapor retarder membrane penetrations by applying penetration seal or by constructing boots from vapor retarder membrane and seam tape, and as follows:
 - 1. For interior forming applications, avoid use of non-permanent stakes driven through vapor retarder. Use blunt-end and/or threaded nail stakes (screed pad posts) and insert into manufacturer recommended component. Ensure peel-and-stick adhesive base is fully adhered to vapor retarder.
 - 2. If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
 - 3. Use reinforcing bar supports with base sections to eliminate or minimize potential for puncture of vapor retarder.
- F. Repair damaged areas by cutting patches of vapor retarder membrane, extending 6 inches, minimum, beyond damaged area. Seal patch perimeter with seam tape.

3.4 PROTECTION

- A. Protect installed vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

SECTION 07 27 26 - FLUID APPLIED AIR BARRIERS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Provide air and moisture barriers, vapor permeable type.
- C. Extent: As shown, if not, treat the following:
 - 1. Gypsum sheathing.
 - 2. Pre-installed anchors.
 - 3. Applied components such as nailing flanges both with transition primer and air barrier membrane.
 - 4. Other indicated surfaces.

1.2 SUBMITTALS

- A. Comply with Division 01 and submit the following:
 - 1. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
 - 2. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction at foundation, walls, roof, connections, and relationship with adjacent construction.
 - 3. Samples: Submit two representative samples of each material specified.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations and the following:
 - 1. Applicable provisions of Mass CMR 780, Chap 13, 1304.3 Air leakage, for surfaces and penetrations as well as provisions of local state code.
- B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 PERFORMANCE STANDARDS [STPE TYPE]

- A. Meet the following standards:
 - 1. Water-Resistive Barrier (WRB): Fluid applied, Silyl Terminated Polyether (STPE)
 - 2. STPE air barrier can be applied to damp surfaces
 - 3. Application Temperature: 10 °F to 122 °F (-12 °C to +50 °C)
 - 4. Service Temperature: -40 °F to +300 °F (-40 °C to +149 °C)
 - 5. Rain Ready Time: 1hr @ 70 °F, 4hrs @ 40 °F
 - 6. Water Vapor Permeance (ASTM E96):
 - a. Method A: 12 perms @ 20 mils
 - b. Method B: 19 perms @ 20 mils
 - 7. Water Resistance (AATCC TM127): Pass
 - 8. Surface Burning Characteristics (ASTM E84):
 - a. Flame Spread Index: 20, Class A
 - b. Smoke developed: 10, Class A
 - 9. UV resistance:
 - a. Accelerated Weathering (ASTM G154): >5000 hours
 - b. UV resistance during construction: 12 months
 - c. Permanent UV exposure under open joint cladding

10. VOC Content, max (SCAQMD): <30g/l Method 24

2.2 MATERIALS

- A. Air-bloc all weather stpe fluid applied vapor permeable air barrier (basis of design):
1. UV and fire resistant, single-component, moisture cure Silyl Terminated Polyether (STPE) water-resistive air barrier designed to provide a vapor permeable air and water barrier when applied on above-grade wall assemblies, having the following typical properties given below:
 2. Water-Resistive Barrier (WRB): Fluid Applied, Silyl Terminated Polyether (STPE)
 3. STPE air barrier can be applied to damp surfaces
 4. Color: Black
 5. Recommended Film Thickness: 20 mils WFT/DFT
 6. Solids Content: >98%
 7. Application Temperature: 10 °F to 122 °F (-12 °C to +50 °C)
 8. Service Temperature: -40 °F to +300 °F (-40 °C to +149 °C)
 9. Rain Ready Time: 1hr @ 70 °F, 4hrs @ 40 °F
 10. Water Vapor Permeance (ASTM E96):
 - a. Method A: 12 perms @ 20 mils
 - b. Method B: 19 perms @ 20 mils
 11. Air Permeance:
 - a. Material (ASTM E2178): 0.02 L/s.m.2 @75Pa
 - b. Air Leakage – Assembly (ASTM E2357): Pass
 12. Elongation (ASTM D412): 350%
 13. Tensile Strength (ASTM D412): 100 psi
 14. Nail Sealability (AAMA 711-07 (ASTM D1970 modified): Pass
 15. Water Resistance (AATCC TM127): Pass
 16. Surface Burning Characteristics (ASTM E84):
 - a. Flame Spread Index: 20, Class A
 - b. Smoke developed: 10, Class A
 17. Fire Testing (NFPA 285): Complies in various assemblies
 18. UV Resistance:
 - a. Accelerated Weathering (ASTM G154): >5000 hours
 - b. UV resistance during construction: 12 months
 - c. Permanent UV exposure under open joint cladding
 19. VOC Content, max (SCAQMD): <30g/l Method 24

2.1 ACCESSORY MATERIALS

- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.
1. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
 2. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- (0.43-mm-) thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance value of 37 perms (2145 ng/Pa x s x sq. m).
 3. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50- to 65-mil- (1.3- to 1.6-mm-) thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.
 4. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
 5. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."
 6. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections. Install over entire area, tightly fitting around penetrations and at perimeters.
- B. Protect installed air and moisture barriers.

END OF SECTION

SECTION 07 41 15 - STANDING SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Standing seam sheet metal roof panels.
 - 2. Sheet metal work built into or integral part of metal roofing.
 - 3. Gutter and downspout metal work built into or integral part of metal roofing.
 - 4. Accessories shown or required.
- C. Extent: Where shown.
- D. Related work includes, without limitation:
Section 07 62 00 – Sheet metal flashing and trim:

1.2 SUBMITTALS

- A. Comply with Division 1 General Requirements and submit for approval:
 - 1. Product Data: Manufacturer's literature including material specifications, use restrictions and limitations.
 - 2. Shop drawings: Large scale drawings for fabrication, installation and erections including plans, elevations, details, anchorages, connections and accessories along with head, rake, sill and joining details. Provide templates for work installed by others.
 - 3. Verification: Submit final samples of selected products. Include samples showing full variation of color and finish expected.
 - 4. Maintenance Data: Provide recommended maintenance procedures.
 - 5. Certification: Certify submitted materials comply with requirements.

1.3 QUALITY ASSURANCE

- A. Manufacturer qualifications: A firm with at least five years experience in required work and providing a specifically formulated and marketed water vapor reduction and alkalinity control system of unchanged design and installation history of 5 years or more.
- B. Sheet Metal Roofing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or indicated on Drawings.
- C. Installer qualifications: Meet at least the following:
 - 1. Experienced with product preparation and application.
 - 2. A firm with at least 5 years experience with similar applications.

1.4 PRODUCTS REQUIREMENTS

- A. Comply with product requirements, delivery storage and handling provisions of Division 1.

1.5 WARRANTY

- A. Contractor & Applicator: Provide, at no additional cost, written 10-year warranty that installation will be free of defects such as defects beyond normal wear and tear.
- B. Special Warranty: Warranty form at end of this Section in which Installer agrees to repair or replace components of sheet metal roofing that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, rupturing, cracking, or puncturing.
 - b. Wrinkling or buckling.
 - c. Loose parts.
 - d. Failure to remain weather-tight, including uncontrolled water leakage.
 - e. Deterioration of metals, metal finishes, and other materials beyond normal weathering, including non-uniformity of color or finish.

- f. Galvanic action between sheet metal roofing and dissimilar materials.
- g. Damage to roofing system by winds of less than 90 miles per hour.

PART 2 - PRODUCTS

2.1 PRODUCT PERFORMANCE

- A. Comply with:
 - 1. UL rating for 1-90.
 - 2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.

2.2 MANUFACTURERS

- A. Intent: To match existing.
- B. Subject to compliance with specifications:
 - 1. AEP Span; a BlueScope Steel company.
 - 2. Architectural Building Components.
 - 3. Architectural Metal Systems; a Nucor company.
 - 4. Petersen Aluminum Corporation.
 - 5. Englert, Inc.
 - 6. Berridge Manufacturing Company.

2.3 MATERIALS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Design intent: Structural panels without substrate and attached to metal framing.
- B. Sheet Metal Roofing: Comply with the following:
 - 1. Intent: To match existing.
 - 2. Seam Type: Standing seam.
 - 3. Metal: Aluminum - Standard: ASTM B 209, alloy 3003-H14, 2-coat 70 percent fluoropolymer, 0.040 inches thick.
- C. Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated.
- D. Auxiliary Materials:
 - 1. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal roofing and remain watertight.
 - 2. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
 - 3. Cleats, expansion cleats backing plates, closure strips
- E. Gutters & Downspouts:
 - 1. Where provided by manufacturer, provide gutters and downspouts shown. Comply with requirements of *Section 07 71 23 - Manufactured Gutters & Downspouts*.

2.4 FABRICATION

- A. General: Custom fabricate sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions (panel width and seam height), geometry, metal thickness, and other characteristics of installation. Fabricate sheet metal roofing and accessories in shop to greatest extent possible. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate work and comply with requirements below:
 - 1. Standing-Seam Roofing: Form standing-seam panels with finished seam height shown, if not, of 1-1/2 inches (38 mm).

- C. Form exposed sheet metal and accessories without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
- D. Seams: Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- E. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces of accessories exposed to view.
- F. Fabricate cleats and attachment devices of sizes recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the provisions of Section 01 70 00.

3.2 FACTORY-FABRICATED SHEET METAL ROOFING INSTALLATION

- A. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering metal temper and reflectivity. Provide uniform, neat seams with minimum exposure of d sealant. Fold back sheet metal to form hem on concealed side of exposed edges unless otherwise indicated.
 - 1. Install cleats to hold sheet metal panels in position. Attach each cleat with at least two fasteners to prevent rotation.
 - 2. Space cleats not more than 12 inches (300 mm) o.c. Bend tabs over fastener head.
 - 3. Provide expansion-type cleats for roof panels that exceed 30 feet (9.1 m) in length.
 - 4. Seal joints as required for watertight construction. For roofing with 3:12 slopes or less, use cleats at transverse seams.
 - 5. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 6. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."
- B. Flood test for installation for leakage. Restore damaged finishes and protect work.

END OF SECTION

SECTION 07 42 16.1 - FORMED WALL & SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section Includes:
 - 1. Exposed-fastener, lap-seam metal wall panels.
 - 2. Concealed-fastener, lap-seam metal wall panels.
 - 3. Metal liner panels.
- C. Extent: As shown.
- D. Intent: To match existing work.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
 - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 - 7. Review temporary protection requirements for metal panel assembly during and after installation.
 - 8. Review of procedures for repair of metal panels damaged after installation.
 - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Samples: For each type of metal panel indicated with factory-applied finishes.
 - 1. Include Samples of trim and accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Provide the following:
 - 1. Qualification Data: For Installer.
 - 2. Product Test Reports: For each product, for tests performed by a qualified testing agency.
 - 3. Field quality-control reports.
 - 4. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical metal panel assembly not less than 30 square feet, including corner, soffits, supports, attachments, and accessories.
 2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 2. Warranty Period: **Two** years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: **30** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Match existing. If data not available, comply with provisions below.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference:
 - a. 6.24 lbf/sq. ft. (300 Pa)].
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces].

2.2 LAP-SEAM WALL & SOFFIT PANELS

- A. Intent is to match existing, where exact match is not possible, comply with provisions below.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alcoa Inc.
 - 2. ATAS International, Inc.
 - 3. Berridge Manufacturing Company.
 - 4. CENTRIA Architectural Systems.
 - 5. MBCI; a division of NCI Building Systems, L.P.
 - 6. Morin; a Kingspan Group company.
 - 7. PAC-CLAD Petersen; a division of Carlisle
- C. Panel configuration: Factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- D. Flush-Profile, butt joint, concealed-fastener metal wall and soffit panels:
 - 1. Basis of Design: As shown, if not, Carlisle "PAC-CLAD Flush & Reveal Wall Panels"
 - 2. Formed with vertical panel edges: Yes.
 - 3. Intermediate stiffening ribs symmetrically spaced: Manufacturer standard.
 - 4. Profile between panel edges: Flat pan.
 - 5. Joint between panels: Flush.
 - 6. Panel Coverage: As shown, if not 12 inches.
 - 7. Panel Height: As shown, if not, 1.0 inch.
- E. Corrugated-Profile, lap joint, exposed-fastener metal panels:
 - 1. Basis of Design: As shown, if not, Carlisle "PAC-CLAD R-36".
 - 2. Formed with vertical panel edges: Yes.
 - 3. Fasteners: Exposed, color and finish matched.
 - 4. Joint between panels: Lap.
 - 5. Rib spacing: 6 inches on center.
 - 6. Panel Coverage: As shown, if not 36 inches.
 - 7. Panel Height: As shown, if not, 0.75 inch.
 - 8. Closure strips: Required.
- F. Material: Aluminum Sheet, coil-coated, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - 1. Thickness: 0.040 inch.

2. Surface Finish: Smooth, flat.
3. Exterior Finish: Section 05 08 00 Type 4. [Three-coat fluoropolymer]

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: Where shown or required, ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

- A. As specified, see Section 05 08 00, and to match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners for aluminum panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 5. Flash and seal panels with weather closures at perimeter of all openings.
- E. Watertight Installation:
1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
- 3.4 FIELD QUALITY CONTROL
- A. Comply with the following:
1. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 2. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
 3. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
 4. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
 5. Prepare test and inspection reports.
- 3.5 CLEANING AND PROTECTION
- A. Comply with:
1. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated. On completion of installation, clean finished surfaces as recommended by manufacturer. Maintain in a clean condition during construction.
 2. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
 3. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 54 26 – ADHERED TPO MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Adhered thermoplastic polyolefin sheet roofing.
 - 2. Vapor retarder.
 - 3. Roof insulation.
 - 4. Walkway pads.
- C. Related Sections include the following:
 - 1. Division 6 Section "Blocking" for wood nailers, curbs, and blocking; and wood-based, structural-use roof deck panels.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings and counter flashings.
 - 3. Division 7 Section "Joint Sealants."
 - 4. Division 25 Section "Plumbing Specialties" for roof drains.

1.2 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in this Section.
- B. TPO: Thermoplastic polyolefin.

1.3 REFERENCED CODES AND STANDARDS

- A. All references to codes, specifications and standards referred to herein shall become a part of this section as though written out, and shall mean, and is intended to be the latest edition, amendment, and/or revision of such reference unless otherwise specified.
 - AA - Aluminum Association.
 - AAMA - Architectural Aluminum Manufacturer's Association.
 - ASTM - American Standards for Testing and Materials.
 - FM - Factory Mutual Engineering Corporation.
 - FS - Federal Specification.
 - SMACNA - Sheet Metal & Air Conditioning Contractors National Assoc., Inc.
 - UL - Underwriters Laboratories, Inc.

1.4 U.L., FM LISTING AND REGULATORY REQUIREMENTS

- A. Underwriter's Laboratories, Inc. (U.L.) Class A Fire Hazard Classification, Class 1 Construction.
- B. Factory Mutual Engineering Corporation (FM) [aka FM Global] requirements:
 - 1. Applicable assemblies: At least, Roofing, base flashings, and component materials.
 - 2. FM Standards: FM Global 4450 or FM Global 4470 as part of a roofing system.
 - 3. FM Listing: "RoofNav" for Class 1 or noncombustible construction, as applicable.
 - 4. Roof Assembly Classification/ Listing per Loss Prevention Data Sheet 1-28:
 - a. "RoofNav" for Class 1 or noncombustible construction as applicable.
 - b. Fire classification: 1A.
 - c. Windstorm classification [in pounds per square foot of uplift]: As specified below.
 - d. Hail-resistance rating: SH.
- C. In addition, follow local, state and federal regulations, safety standards and codes. When a conflict exists, use the stricter documents.

- D. All materials used in the roofing system must be FM approved and must have been tested together as part of a complete roofing assembly.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Install sheet membrane roofing and base flashing that are watertight; will not permit the passage of liquid water; and will withstand wind loads, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.
- C. FM Listing: Provide sheet membrane, base flashings, and component materials that meet requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.
 - 1. Roofing system shall comply with the following:
 - a. Fire/Windstorm Classification: Class 1A-120.
- D. Roofing System Design: Provide a single-ply roofing system that complies with roofing system manufacturer's written design instructions and with the following:
 - 1. SPRI's "Wind Design Guide for Adhered Roofing Systems."
 - 2. Roofing material with a Solar reflective index equal or greater than 78.

1.6 SUBMITTALS

- A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.
- B. Shop Drawings: Include plans, sections, and details of the following:
 - 1. Layout and thickness of insulation.
 - 2. Base flashings and membrane termination details.
 - 3. Flashing details at penetrations.
 - 4. Tapered insulation layout, thickness, and slopes.
 - 5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
 - 6. Insulation fastening patterns for corner, perimeter, and field-of-roof location as required to withstand wind uplift conditions.
 - 7. Tie-in with adjoining air barrier.
- C. Samples for Verification: Of the following products:
 - 1. Square of sheet roofing, of color specified, including T-shaped side and end lap seam.
 - 2. Square of roof insulation.
 - 3. Square of walkway pads.
 - 4. Length of metal termination bars.
 - 5. 6 insulation fasteners of each type, length, and finish.
 - 6. 6 roof cover fasteners of each type, length, and finish.
 - 7. Locations of temporary daily stop of work.
- D. Wind load calculations: Submit basic wind uplift calculations for field, perimeter and corners, per requirements of FM Global Data Sheet 1-28 requirements.
- E. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system.
- F. Manufacturer Certificates: Signed by roofing manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of meeting requirements.
- G. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

- H. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of components of roofing system with requirements based on comprehensive testing of current product compositions.
 - 1. Research/Evaluation Reports: Evidence of roofing system's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
- I. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.
- J. Warranty: Sample copy of roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty. Warranty shall provide for a wind speed as specified or more.
- K. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project for at least 5 years and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product.
- B. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and slopes indicated.
 - 4. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing materials are a part.
- C. Preinstallation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.
 - 1. Meet with Owner; Architect; Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Parties shall review and resolve all issues regarding specifications, roof plan, membrane and metal flashing details and U.L. and FM requirements.
 - 3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review loading limitations of deck during and after roofing.
 - 6. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
 - 7. Review governing regulations and requirements for insurance, certificates, and inspection and testing, if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.
 - 10. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.8 TESTING OF FASTENERS

- E. Field testing of fasteners will be required. Fasteners within each roof area for purposes of securing insulation and membrane shall be tested for minimum pull-out resistance as listed below. Provide not less than 2 pull-out locations determined at pre-roofing conference. A report of the findings shall be forwarded to the Architect. Testing shall be performed by the fastener manufacturer without additional cost.

Deck Type	Min. Pull-Out Resistance in Pounds
Structural concrete, 3,000 psi or greater:	800
Light weight insulation concrete:	360
Wood plank and plywood:	360

1.9 PRODUCT REQUIREMENTS / DELIVERY, STORAGE AND HANDLING / COMPATIBILITY

- B. Comply with Division 1, delivery storage, handling, product requirement and product compatibility provisions and the following:
1. Storage area shall be shaded, ventilated and maintained at a temperature recommended by the materials manufacturer, and shall be located away from all sources of excess heat, sparks or open flame. Containers of liquid material shall not be left open at any time in the storage area.
 2. Deliver work under this section to site in ample time to avoid delay in job progress and at such times as to permit proper coordination.
 3. Separate modified bitumens from materials such as EPDM and plasticizers affected by petroleum based materials and solvents.
 4. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 5. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
 6. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

1.11 WARRANTY

- A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Roofing Manufacturer's Warranty: Submit a written warranty, without monetary limitation, signed by roofing system manufacturer agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:
1. Warranty Period: 15 years minimum. Provide price for providing 30 year warranty.
 2. Extended wind speed: Provide extended wind speed warranty for wind gust speeds as specified below. Attention is directed to installers that manufacturers review and approval is required before installation of the extended wind speed.
- F. Extended wind speed coverage: Provide extended wind speed warranty coverage to not less than 110 miles per hour.
1. At time of bidding, advise Owner in writing of additional or reduced cost of warranties for the following wind speeds:
 - a. 110 to 90 miles per hour.
 - b. 110 to 120 miles per hour.
- C. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including membrane roofing, sheet flashing, roof insulation, fasteners, and vapor retarders, if any, for the following warranty period:
1. Warranty Period: 2 years from date of Substantial Completion.
- D. In-place field sample mock-up: Provide 100 square foot or larger installation in a corner demonstrating all assembling and installation conditions. Include penetrations, horizontal to vertical joints and the like.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide sheet roofing products by one of the following:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Thermoplastic Polyolefin (TPO) Sheet:

- a. Carlisle Syntec Systems; Carlisle Corp.
- b. Firestone Building Products Co.
- c. Johns Manville Co.
3. Polyisocyanurate Board Insulation: Use membrane manufacturer board where required by warranty.
 - a. Apache Products Co.
 - b. Atlas Roofing Corporation.
 - c. Celotex Corp. (The).
 - d. GAF Materials Corp.
 - e. NRG Barriers, Inc.

2.2 THERMOPLASTIC POLYOLEFIN SHEET [TPO]

- A. Reinforced Thermoplastic Polyolefin Sheet: Uniform, flexible elastomer sheet formed from a thermoplastic polyolefin, reinforced, of the following thickness, exposed face color, and physical properties:
 1. Acceptable Product: Carlisle "Sure-Weld TPO".
 2. Thickness: 60 mils, nominal.
 3. Exposed Face Color: As selected or shown, if not, White
 4. Physical Properties: Provide reinforced thermoplastic polyolefin sheets with the following properties as determined per ASTM test method indicated:
 - a. Minimum Breaking Strength: 225 lbf (1 kN); ASTM D 751, grab method.
 - b. Minimum Elongation at Break: 25 percent typical; ASTM D 751.
 - c. Tearing Strength: 55 lbf (245 N) minimum; ASTM D 751, Procedure B.
 - d. Resistance to Heat Aging: No reduction in breaking strength, elongation at break, and tearing strength after 168 hours at 240 deg F (116 deg C); ASTM D 573.
 - e. Ozone Resistance: No cracks after 168 hours' exposure of 50 percent elongated sample at 100 deg F (38 deg C) and 100-pphm (100-MPa) ozone; ASTM D 1149, Procedure B, specimen wrapped on 3" mandrel.
 - f. Water Absorption: Less than 4 percent mass change after 168 hours' immersion at 158 deg F (70 deg C); ASTM D 471.
 - g. Weather Resistance: No cracks or crazing after 4000 hours' exposure to xenon-arc; ASTM G 26.
 - h. Solar reflectance index: Provide a minimum SRI of 78, per ASTM E1980.

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing material.
 1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, thickness, and color as sheet membrane.
- C. Bonding Adhesive: Manufacturer's standard bonding adhesive.
- D. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.
- E. Metal Termination Bars: Manufacturer's standard aluminum bars, approximately 1 inch (25 mm) wide, roll formed and prepunched.
- F. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch (25 mm) wide by 0.05 inch (1.3 mm) thick, pre-punched.
- G. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FM 4470, designed for fastening sheet to substrate, and acceptable to roofing system manufacturer.
- H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, seam calk, termination reglets, and other accessories recommended by roofing system manufacturer for intended use.
- K. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FM 4470, designed for fastening thermal barrier to substrate.

2.4 UNDERLAY & INSULATION COVER [AKA RECOVER] BOARD

- A. Underlay board [aka fire/thermal barrier]: Where shown on drawings, provide:
1. Type X, ASTM C36, glass mat faced board fire-tested, gypsum board meeting the following:
 2. DensDeck, or if required for application, Dens Deck Prime.
 3. Approved equal.
 4. Thickness: As shown, if not, 0.625 inch thick or more.
 5. Usage: As shown, if not, directly attached to structural deck or sheathing.
 6. Not required for flat solid decking such as poured in place concrete slabs.
- B. Insulation Cover [aka "Recover Board"]: Provide roof board fire-tested, high density polyisocyanurate with glass-mat facers and a pre-primed surface on one side acceptable to manufacturer and equal to and meeting the following:
1. Carlisle SecurShield HD
 2. Johns Manville Invinsa FR
 3. Firestone Isogard HD
 4. Hunter Panels H-Shield DS
 5. Thickness: 0.50 inch.
 6. Mechanically fasten to provide indicated warranty and wind speed rating.
 7. Fiber board: Not an acceptable substitute.
 8. Use only products acceptable to roofing manufacturer and capable of provide required warranties.

2.5 VAPOR BARRIER

- A. Provide vapor barriers if shown, or if part of assembly required by manufacturer for warranty.
- B. Vapor barrier shall be U.L. approved reinforced air vapor retarder meeting perm rating of 0.05 or better, and UL requirements for application on project decks. Provide non-slip, peel and stick sheets secured to glass mat faced board from one of the following:
1. Carlisle VapAir Seal 725TR.
 2. Firestone V-Force Vapor Barrier membrane.
 3. Soprema Soprapap'R vapor barrier.
- C. Provide manufacturer's recommended primers and roofing adhesives for application of barrier, manufactured free of asphalt compounds and designed for deck application matching project conditions.

2.6 INSULATION MATERIALS

- A. General: Provide preformed roof insulation boards that comply with requirements, selected from manufacturer's standard sizes and of thicknesses indicated.
1. Provide preformed, tapered insulation boards where indicated for sloping to drain. Fabricate with the following taper:
 - a. 1/4 inch per 12 inches (1:48) minimum, unless otherwise indicated – typical slope.
 - b. 1/2 inch per 12 inches (1:48) minimum, at roof drainage crickets
 2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated or specified, whichever is greater.
- B. Required R rating: As shown, if not, R = 30 minimum.
- C. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents to comply with ASTM C 1289, classified by facer type as follows:
1. Facer Type: Type II, felt or glass-fiber mat on both major surfaces.
 2. Facer Type: Type IV, cellulosic-fiber insulating board, ASTM C 208, Type II, Grade 2, 1/2 inch (12.7 mm) thick on 1 major surface and a felt or glass-fiber mat on the other.

2.7 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FM 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

- C. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric mat, water permeable and resistant to ultraviolet degradation, type and weight as recommended by roofing system manufacturer for application.

2.8 WALKWAYS

- A. Walkway Pads: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch (5 mm) thick, of materials acceptable to roofing system manufacturer.
 - 1. Usage: Where shown and around roof top equipment requiring maintenance and roof egress and ingress pathways.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.
- B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.
- C. Verify that wood nailers are in place and secured and match thicknesses of insulation required.
- D. Concrete deck substrates: Do not proceed with installation until after the minimum concrete curing period recommended by roofing system manufacturer. Test substrates and submit results in writing along with manufacturer maximum recommended moisture recommendations.
 - 1. Moisture Testing/ chloride testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - 2. Moisture meter testing: Comply with ASTM F2170-02 Probe Test for Determining relative humidity. Use Wagner Rapid RH probes, unless otherwise approved.
- E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of the roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 UNDERLAY / FIRE-THERMAL BARRIER

- A. Install thermal barrier with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt thermal-barrier boards together.
 - 1. Secure thermal barrier to top flanges of steel deck according to recommendations of FM's "Approval Guide" for specified Windstorm Resistance Classification.
 - 2. Secure thermal barrier to top flanges of steel deck using at least 1 fastener for each 4 sq. ft. (0.38 sq. m) and at least 2 fasteners per board.
- B. Install slip sheet over deck before application of insulation.

3.4 VAPOR-RETARDER INSTALLATION

- A. Install laminate-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively. Bond vapor retarder to deck as follows:
 - 1. For self-adhesive types: Prime substrate, roll into place, free of bubbles, fish mouths and wrinkles.
 - 2. Tape laps and edges where recommended by manufacturer.

- B. Completely seal vapor retarder at terminations, obstructions, and penetrations.

3.5 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated and to Shop Drawings.
- D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches (50 mm) or greater, install required thickness in 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
 - 1. Provide insulation to minimum R value indicated on drawings. Where not indicated, provide a minimum R value as specified.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
 - 2. Loosely Laid Insulation: Loosely lay insulation units.
- G. Attached Insulation: Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m) and allow primer to dry. Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature and at a rate required by insulation manufacturer.
 - 1. Installers may use manufacturer's approved attachment method such as Sure-Seal FAST Adhesive where manufacturer makes a product specifically for the application in question.
 - 2. Verify bond and uplift capacity complies with requirements before proceeding. Check field, perimeter and corner conditions.
- H. Attached Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type indicated.
- I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck according to roofing system manufacturer's written instructions.
- J. Compliance and verification:
 - 1. Secure, fasten or attach insulation according to requirements of FM's "Approval Guide" for specified Windstorm Resistance Classification and the insulation and roofing system manufacturers' written instructions.
 - 2. Verify bond and uplift capacity complies with requirements before proceeding. Check field, perimeter and corner conditions.

3.6 RECOVER BOARD INSTALLATION

- A. Install board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt boards together.
 - 1. Secure board to structural substrate according to recommendations of FM's "Approval Guide" for specified Windstorm Resistance Classification, but not less than the following:

3.7 ADHERED SHEET INSTALLATION

- A. Install thermoplastic sheet over area to receive roofing according to roofing system manufacturer's written instructions. Unroll sheet and allow to relax for a minimum of 30 minutes.
 - 1. Install sheet according to ASTM D 5036.
- B. Start installation of sheet in presence of roofing system manufacturer's technical personnel.
- C. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

- D. Apply bonding adhesive to substrate and underside of sheet at rate required by manufacturer and allow to partially dry. Do not apply bonding adhesive to seam area of sheet.
 - 1. Apply a solid mopping of hot roofing asphalt, at a rate required by roofing system manufacturer, to substrate and install fabric-backed sheet. Keep seam area and remainder of sheet free of asphalt.
- E. Mechanically fasten sheet securely at terminations and perimeter of roofing.
- F. Apply roofing sheet with side laps shingled with slope of roof deck where possible.
- G. Spread sealant bed over deck drain flange at deck drains and securely seal roofing sheet in place with clamping ring.
- H. Install adhered thermoplastic sheet and auxiliary materials to tie in to existing roofing.

3.8 SEAM INSTALLATION

- A. Clean seam areas, overlap sheets, and weld side and end laps of sheets and flashings according to manufacturer's written instructions to ensure a watertight seam installation. Weld seam as follows:
 - 1. Weld Method: Hot air.
- B. Test lap edges with probe to verify seam weld continuity. Apply seam calk to seal cut edges of sheet membrane, after weld is confirmed
- C. Repair tears, voids, and lapped seams in roofing that does not meet requirements.
- D. Clean membrane after roof top construction is complete.

3.9 FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrate according to roofing system manufacturer's written instructions.
- B. Minimum flashing height: 8 inches.
- C. Apply bonding adhesive to substrate and underside of flashing sheet at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- D. Flash penetrations and field-formed inside and outside corners with sheet flashing as recommended by manufacturer.
- E. Clean seam areas, overlap sheets, and firmly roll flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- F. Test lap edges with probe to verify seam weld continuity. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- G. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.
 - 1. At vertical applications higher than 36 inches, provide battens to secure membrane. Over lap batten with succeeding sheet and heat weld seam.

3.10 WALKWAY PAD INSTALLATION

- A. Walkways: Install walkway pads in locations indicated. Heat weld or adhere walkway pads to substrate with compatible adhesive according to roofing system manufacturer's written instructions. Periodically space walkway pads several inches apart to provide break for future re-roofing or repairs.
- B. Provide walk way pads at elements on membrane surface such as photo-electric arrays, sleepers or underdeck pedestals.

3.11 FIELD QUALITY CONTROL

- A. Verify field strength of seams a minimum of twice daily, according to manufacturer's written instructions, and repair seam sample areas.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
 - 1. Notify Architect or Owner 48 hours in advance of the date and time of inspection.

3.12 FIELD TESTING

- A. Comply with the following:
1. Test or probe seams using qualified personnel authorized by roofing manufacturer. Perform testing of field auto-welded and hand made seams.
 2. Perform destructive seam test at beginning of each day and whenever welding process is interrupted.
 3. Retain samples on site date, location, time, and unique conditions labeled for review by the architect/engineer.
 4. Arrange for a representative of roofing manufacturer to visit site during mockups, pre installation meeting, and twice during construction. Manufacturer shall confirm that roofing system is being installed in accordance with manufacturer's specifications, requirements and recommendations applicable to site, region and project.
 5. Obtain and submit manufacturer's written report.
 6. Conduct fastener pull-out tests in accordance with ANSI/SPRI FX-1, current edition. Conduct at least 5 tests on each fastener proposed for use on the project in each different type of substrate.
 7. For adhered insulation systems, perform a bonded uplift test to sheet membrane installation.
 8. Flood testing: Test at least 3 drains by plugging drain and flooding a 100 square foot area for 48 hours; followed by an infrared survey of completed roof assembly. Notify Architect at least 72 hours before testing. Submit test results.
 9. Thermal anomalies: If flood testing or infrared scans indicate possible leakage or moisture, follow-up with test cuts into roofing assembly. Replace wetted materials and defective work at no cost to Owner.

3.13 PROTECTING AND CLEANING

- A. Protect sheet membrane roofing from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair sheet flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures required by manufacturer of affected construction.

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING & TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Sheet metal flashing and trim.
 - 2. Standards and requirements for flashing furnished and installed by others.
- C. Related work
 - 1. Division 07 - Membrane roofing.
 - 2. Division 07 41 - Metal Panel Systems

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
- C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In general, provide manufactured products, where not practical shop fabricate work. Acceptable manufactures include:
 - 1. Beach Sheet Metal Co., Inc.; Berger Building Products, Inc.; Englert, Inc.; Fiberweb Clark/Hammerbeam Corp.; Hohmann & Barnard, Inc.; National Sheet Metal Systems, Inc.; Nervastral Inc.; Petersen Aluminum Corp.; Quickflash Weatherproofing Products, Inc.; Sandell Construction Solutions; SBC Industries Flashings; or approved equal.

2.2 APPLICATIONS

- A. Applications are as shown.

2.3 MATERIALS

- A. Provide materials shown, but complying with the following minimum gages, composition and types:
 - 1. Metal: Sheet aluminum.
 - a. Standard: ASTM B 209, alloy 3003,
 - b. Thickness As shown, if not, 20 gauge (.0359 inch).
 - c. Exposed Finish [visible]: Prefinished 2-coat 70 percent fluoropolymer
 - d. Concealed Finish: Clear anodized or prefinished 2-coat 70 percent fluoropolymer
 - 2. Metal: Extruded aluminum.
 - a. Standard: 6063-T52, prefinished 2-coat 70 percent Fluoropolymer, 0.080 inches for primary legs of extrusion.
 - 3. Flexible Sheet Membrane Flashing: WR Grace "Perm-A-Barrier" with P3000 primer.

4. Laminated Composition Sheet Flashing: 5 ounce copper sheet laminated between 2 layers of bituminous impregnated Kraft paper or saturated fabric. Furnish and install under Section 04 01 05.
- B. Auxiliary Materials:
1. Solder compatible with metal.
 2. Bituminous isolation coating.
 3. Mastic and elastomeric sealants.
 4. Reglets and metal accessories.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Follow recommendations of SMACNA Sheet Metal Manual. Allow for expansion. Isolate dissimilar materials.
- B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- C. Restore damaged components and finishes. Clean and protect work from damage.

END OF SECTION

SECTION 07 71 15 - MANUFACTURED ROOF EDGES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general Contract provisions, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation providing: manufactured roofing edges, including.
 - 1. Fascias.
 - 2. Fascias commonly called "gravel stops".
 - 3. Copings.
 - 4. Custom colors.
- C. Related Work includes, without limitation:
 - 1. Section 06 10 60 – Wood blocking wood treatments.
 - 2. Section 06 10 50 – Wood blocking.
 - 3. Section 07 62 00 – Sheet metal flashing and trim.
 - 4. Section 07 92 00 - Joint sealers
- D. Extent:
 - 1. Where shown.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's data, installation instructions, recommendations and restrictions.
- B. Shop Drawings: Large scale shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction. Include plans, elevations, locations, profiles, joints, seams, anchorages and accessories.
- C. Samples: 12 inches long, full size, with selected finish and color[s].

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions, and Division 01.
- B. Insurance Requirements: FM approval or acceptance.
- C. Warranty:
 - 1. Copings: Lifetime of building or not less than 25 years w, category 5 wind resistance up to 215 miles per hour, no blow off, leak, or roof membrane failure due to roof edge.
 - 2. Fascias: 20 years, up to 110 miles per hour, no blow off, leak, or roof membrane failure due to roof edge.
 - 3. Factory finish: Comply with requirements of Section 05 08 00 – Factory applied metal coatings.

PART 2 - PRODUCTS

2.1 MANUFACTURED ROOF EDGES

- A. Manufactures: Subject to compliance with specifications:
 - 1. Metal Era Inc., www.metalera.com/.
 - 2. MM Systems Corporation, www.mmsystems.com/.
 - 3. W.P.Hickman Co, www.wph.com/.
 - 4. Architectural Products Co., www.archprod.com/.
- B. Manufactured roof edge:
 - 1. Basis of design: Metal-Era Perma-Tite 200 Fascia.

2. Performance: ANSI/SPRI ES-1 Standard to design pressure of 160 lbs./square foot.
 3. Fascia cover material: 0.063 aluminum.
 4. Concealed waterdam cleat material: Continuous G-90 galvanized steel, 24 gage.
 5. Spring clips: As shown, if not, 24 gage to match waterdam cleat, spacing per manufacturer and performance criteria.
 6. Corners: Factory welded, each leg 12 inch long minimum.
 7. Joint detail: Concealed splice plate of matching material, finish and color behind butt joints.
 8. Height: As shown, if not, 1 inch above roof, and 6 inch leg.
 9. Finish: See below, using color indicated, if none, custom color.
- C. Manufactured parapet coping:
1. Basis of design: Metal-Era "Perma-Tite Gold Coping"
 2. Performance: ANSI/SPRI ES-1 Standard to design pressure of 290 lbs./square foot. Uplift not less than UL 1-90. Complies with Dade County "High Velocity Hurricane Zone of the Florida Building Code".
 3. Coping cover material: 0.063 formed sheet aluminum.
 4. Lengths: Manufacturer standard, but not less than 120 inches.
 5. Anchor/Support Cleat: 16 gauge pre-punched galvanized cleat with stainless steel spring mechanically locked to cleat; width and spacing to meet manufacturer standards and comply with performance criteria.
 6. Corners: Factory welded, each leg 12 inch long minimum.
 7. Joint detail: Concealed splice plate of matching material, finish and color behind butt joints. Splice plate width: Not less than 8 inches.
 8. Face height and width: As shown, if not, 4 inch leg, matching wall width.
 9. Finish: See below, using color indicated, if none, custom color.
- D. Shop finishes: As shown, if not, Type 4 [Kynar] with custom color per Section 05 08 00 Factory applied metal finishes.
- E. Joint sealants: Neutral cure silicone with +100 and -50 per cent dynamic movement range and no minimum joint size. Color to match adjacent metal as approved by Architect. Prime joints per manufacturer recommendations.
- F. Fasteners: Length and type recommended by manufacturer for application; material 304 or 316 stainless steel. At fascias only, and where accepted by manufacturer and in compliance with tested assemblies, galvanized ring shank roofing nails may be used.
- G. Concealed sealant tape: ASTM C1281 Preformed tape sealants for glazing applications. Use butyl glazing tape, not shimmed.
- H. Scuppers: Shop fabricate and integrate into roof edge assemblies to match.
1. Segment along roof edge: 12 inches long minimum.
 2. Outlet width: As shown, if not, 6 inches.
 3. Projection for surface: As shown, if not, 4 inches.
 4. Adjacent roof edge end closures: Required.
 5. Roof membrane hold down bar: Required.
 6. Drip edge: Required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with performance requirements, manufacturers' instructions and recommendations and the following:
1. Coordinate installation with roofing system to ensure weathertight performance.
 2. Inspect substrate, blocking nailers and the like.
 3. Perform pull out test to verify adequate holding capacity.
 4. Anchor securely to structure to withstand inward and outward loads.
 5. Isolate dissimilar metals to prevent galvanic corrosion.
 6. Locate seams and joints symmetrically and uniformly.
 7. Assemble work to accommodate thermal expansion and contraction.
 8. Provide back up plates beneath joints.
 9. Make all exposed or semi-exposed work to match exposed finishes and colors.

10. Do not damage, abrade, or harm surfaces of the work.
 11. Provide a continuous waterproof seal between roof edges and exterior wall below.
- B. Restore damaged finishes and surface damage so repair work is invisible or replace with new, acceptable work.
- C. Clean surfaces, leave looking as new, free of any marks, prints or the like.

END OF SECTION

SECTION 07 71 23 - MANUFACTURED GUTTERS & DOWNSPOUTS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general Contract provisions, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation providing:
 - 1. Extruded or rolled aluminum gutters & downspouts.
 - 2. Custom joints and connections.
- C. Material type: Extruded or roll formed as selected by Contractor, unless material type is shown on drawings.
- D. Related Work includes, without limitation:
 - 1. Section 07 62 00 Sheet metal flashing & trim.
 - 2. Division 07: Gutters and downspouts provided by metal roofing or metal wall panels.
 - 3. Allowances & Alternates: **OCCASIONAL**
 - 1. Work of this section is affected by Alternates: Refer to Division 1.
 - 2. Work of this section includes allowances: Refer to Division 1 and this section.
- E. Material type: Extruded or roll formed as selected by Contractor, unless material type is shown on drawings.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
- C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Heavy duty extruded gutter and downspout system:
 - 1. Manufacturers:
 - a. SAF [Southern Aluminum Finishing] Metal Fabrications; <https://www.saf.com/>.
 - b. Seamless Aluminum Group; <http://seamlessaluminium.ie/>.
 - c. Approved fabricator using stock dies and shop fabrication.
 - d. Approved equal.
 - 2. Extruded materials:
 - a. Extruded aluminum type: 6063 T5 temper.
 - b. Thickness: As shown, if not 0.125 inch.
 - c. Joints: Welded, invisible, not apparent; fabricated as given below.
 - 3. Roll formed materials:
 - a. Cornice temper.
 - b. Thickness: As shown, if not 0.32 inch.
 - c. Joints: Solvent adhesive welded. No joints permitted over doors or windows, not joints permitted in straight lengths of 30 feet or less.

4. Sizes: As shown; calculated gutter size even if size is shown on drawings and confirm dimensions with Architect before ordering. Calculate downspout size.
5. Aluminum Finish:
 - a. Fluoropolymer, 3-coat, for extruded.
 - b. Manufacturer-applied, baked on enamel for roll formed or 2 coat kynar coil stock coating.
6. Shape: As shown, if not, SMACNA Figure type B or F.

2.2 FABRICATION

- A. Shop fabricate work to the greatest extent possible. Fabricate work to be truly straight, plumb, level and square, and to provide the best possible watertight, weatherproof performance with expansion provisions in running work.
- B. Provide work to sizes, shapes, and profiles indicated on approved shop drawings. Comply with referenced standards. Minimize oil-canning, buckling, tool marks and other defects.
- C. Make work with uniform, watertight joints. Make seams as inconspicuous as possible.
- D. Isolate dissimilar materials with isolation coating or other permanent separation acceptable to the Architect.
- C. Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 240 in. long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
- D. Downspouts: Fabricate to cross section indicated, complete with mitered, welded elbows. Furnish with metal hangers and anchors, from same material as downspouts. Downspouts shall be one continuous unit without joints.
- E. Welding – for extruded assemblies:
 1. Weld in concealed locations to greatest extent possible.
 2. Minimize distortion or discoloration of finish.
 3. Remove weld spatter and welding oxides from exposed surfaces.
 4. Weld or braze joints and seams continuously.
 5. Grind, fill, and dress to produce smooth, flush, exposed surfaces.
 6. Provide joints are not visible after finishing is completed.

2.3 ACCESSORIES

- A. Provide connecting boots where downspouts do not terminate over catch basin or gravel drainage bed. Coordinate boot type, material and connections with site work components.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with accessory manufacturers' instructions and recommendations. Coordinate installation with roofing system to ensure weathertight performance. Anchor securely to structure to withstand inward and outward loads.
- B. Isolate dissimilar metals to prevent galvanic corrosion.

END OF SECTION

SECTION 07 72 10 – SNOW GUARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Snow guards.
- C. Related Sections include the following:
 - 1. Division 7 – Steep sloped roofing sections

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details. Indicate dimensions, plans, elevations, sections, details, and attachments to other Work.

1.3 QUALITY ASSURANCE

- A. Standards: Comply with the following:
 - 1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
 - 2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Berger Building Products Corp.
 - 2. Sieger Snow Guards, Inc.
 - 3. Sno-Gem, Inc.
 - 4. Snojax, Inc.
 - 5. Vermont Slate and Copper Services, Inc.
 - 6. Zaleski Snow-Guard and Roofing Specialties Inc.

2.2 SNOW GUARDS

- A. General: Prefabricated, noncorrosive units designed to be installed without penetrating roof and complete with predrilled holes, clamps, or hooks for anchoring. Provide guards shown, if not, as follows:
 - 1. Plastic Type: Polycarbonate, designed for attachment to roof surface using silicone or polyurethane elastomeric sealant or adhesive tape, as recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories and assemblies. Ensure elements are waterproof and weathertight. Anchor roof accessories securely to supporting structural substrates..
 - 1. Snow Guards: Unless otherwise indicated, locate snow guards at 18 inches (450 mm) o.c. horizontally, and at every other course vertically, beginning 24 inches (600 mm) up from gutter. Stagger snow guard location by 9 inches (225 mm) between courses.
- B. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION

SECTION 07 84 00 - FIRE/SMOKE STOPPING

PART 1 GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation providing: Firestopping.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Submit for approval test reports.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers regularly engaged in installing firestopping systems. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Fire Performance: UL 2079, ASTM E 814, and local regulations.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Materials and components of an approved firestop system shall be the products of a single manufacturer and shall not be inter-mixed.
- B. Manufacturers of firestopping materials, subject to compliance with specifications:
 - 1. A/D Fire Protection Systems, Inc.
 - 2. Hilti Construction Chemicals, Inc.
 - 3. Nelson Firestop Products
 - 4. RectorSeal Corporation (The)
 - 5. Specified Technologies Inc.
 - 6. 3M Fire Protection Products
 - 7. Tremco
 - 8. United Stated Gypsum Company
- C. Manufacturers of firesafing mineral wool materials, subject to compliance with specifications:
 - 1. Johns Manville "Mineral Wool Safing".
 - 2. Rockwool International; "Roxul Safe"
 - 3. Thermafiber, Inc.; an Owens Corning company, "Thermafiber Safing", aka "Cavity Complete".
 - 4. Or equal recommended by the Firestopping manufacturer and as approved by the Architect.

2.2 MATERIALS

- A. Manufacturer's firestop materials shall conform to UL-1479 and ASTM E-814 and as follows:
 - 1. Minimum performance: 2000 degree F melt point and 6 pounds per cubic foot.
 - 2. Self-extinguishing damming materials: As specified by the manufacturer, as part of the designated firestop system.
 - 3. Firestop material containing solvents which attack plastics: Not permitted.
 - 4. Firestop materials: Suitable and compatible with penetrating items including surrounding materials.
 - 5. Exposed firestop materials: Paintable, finished with similar surface treatments on adjacent surfaces.
 - 6. Minimum shelf life: 2-year and not be used expired nor within 4 months of expiration.
 - 7. Firestopping materials include, without limitation:
 - a. Intumescent wrap strips,

- b. Firestop mortars, putty,
- c. Non-intumescent caulks and sealants,
- d. Prefabricated firestop devices,
- e. Mineral wool.
- f. Materials used in tested assemblies.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Review extent of work with authorities having jurisdiction and obtain approval of installation thicknesses and methods.
- B. Sequence work to avoid need for removal of firestopping by work of other trades.
- C. Comply with manufacturer's instructions and recommendations. Securely anchor insulation with safing clips. Install firestopping without gaps or voids.
- D. Safing insulation installation: Comply with the following:
 - 1. Install firestopping insulation per architectural wall section CC-SS-12 and the technical bulletin regarding perimeter fire containment joint design (ASTM E2307) at www.CavityComplete.com or other approved technical bulletin.
 - 2. Penetration Application: Cut safing insulation slightly larger than opening and compression fit into opening, leaving no voids.
 - 3. Construction Joint Application: Compression fit safing insulation into joint opening, leaving no voids.
- E. Protect, inspect and repair work until final acceptance.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation providing:
 - 1. Joint sealers.
 - 2. Joint fillers.
 - 3. Confirmation of adhesion.
- C. Extent:
 - 1. Where shown.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
 - 1. Include manufacturer's full range of color and finish options if additional selection is required.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Field-Constructed Mock-Ups: Each joint type.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Exterior Joints in Vertical Surfaces, Silicone:
 - 1. Manufacturers: Dow Corning; GE Silicones; Tremco; or approved equal.
 - 2. Materials: Two component silicone sealant.
- B. Exterior Joints in Vertical Surfaces, Urethane:
 - 1. Manufacturers: Pecora Corp.; Sika Corp.; Sonneborn; Tremco; or approved equal.
 - 2. Materials: Two-component urethane sealant.
- C. Exterior Joints in Vertical Surfaces, Preformed Compression Seals:
 - 1. Manufacturers: Watson-Bowman Acme Corp.; or approved equal.
 - 2. Materials: Preformed precompressed foam sealant.
- D. Exterior Joints in Horizontal Surfaces, Urethane:
 - 1. Manufacturers: Pecora Corp.; Sandell Construction Solutions; Sika Corp.; Sonneborn; Tremco; or approved equal.
 - 2. Materials: Self-leveling urethane sealant, ASTM C 920.
- E. Exterior Joints Immersed in Water, Polysulfide:
 - 1. Manufacturers: W. R. Meadows; Pecora Corp.; Sonneborn Building Products; or approved equal.
 - 2. Materials: Two-part polysulfide, for water immersion, ASTM C 920.
- F. Exterior Paving Joint Fillers, Bituminous:

- A. Material type: Extruded or roll formed as selected by Contractor, unless material type is shown on drawings.
 - 1. Manufacturers:
 - 2. Materials: Bituminous fiber.

- G. Interior Joints, Limited Movement, Acrylic:
 - 1. Manufacturers: Bostik; Pecora Corporation; Polymeric Systems, Inc.; Sonneborn Building Products; Tremco; or approved equal.
 - 2. Materials: Acrylic-emulsion, ASTM C 834.
 - 3. VOC Content: Less than 50 g/L.

- H. Metal Panel Sealants:
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
 - 2. Joint Sealant: ASTM C 920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by system manufacturer.
 - 3. Concealed lap and hook joints in sheet metal flashing and trim. Single Component Non-Curing Sealants: Tremco Butyl Sealant.

- I. Interior Joints, Sanitary Silicone:
 - 1. Manufacturers: Dow Corning; GE Advanced Materials; Tremco; or approved equal.
 - 2. Materials: One-part mildew-resistant silicone sealant, ASTM C 920.
 - 3. VOC Content: Less than 50 g/L.

- J. High temperature sealant: one-component room-temperature-vulcanizing RTV acetoxycure high temperature silicone sealant
 - 1. Manufacturers: DAP, #M, Carlisle, Alvin Products, or approved equal.
 - 2. Basis of design: Carlisle High-Temp 100% Silicone Sealant

- K. Colors:
 - 1. Closely match at least of one of adjacent surfaces.

- L. Colors:
 - 1. Closely match at least of one of adjacent surfaces; colors shall be selected by Architect.

- M. Joint Backing Materials
 - 1. Acceptable manufacturers include:
 - a. Backer Rod Manufacturing & Supply Co. ["Mile High Foam"]
 - b. Dow Chemical Co.
 - c. Williams Products Co.
 - d. Woodmont Products Co.
 - 2. Joint backer: Compressible polyethylene foam rod or other compatible non-waxing, non-extruding, non-staining resilient material in dimension 25 percent to 50 percent wider than joint width as recommended by sealant manufacturer for conditions and exposures indicated. Unless otherwise noted, provide closed cell non-absorptive material.
 - 3. Joint backing for general use at joints in horizontal surfaces shall be 2 rows of butyl rubber or neoprene foam rods in contact with one another and compressed to approximately 2/3 original width when in place.
 - 4. Provide miscellaneous materials of type that will not bleed through sealant, discolor surface, or produce deleterious effects. Select size to provide profile concave to the rear of the sealant, and equipped with a bond-breaking film.

3.1

PART 3 EXECUTION

INSTALLATION

JOINT SEALANTS

- A. Examine substrate; report unsatisfactory conditions in writing. Beginning work means acceptance of substrates.
- B. Provide sealants in colors as selected from manufacturer's standards.
- C. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections. Clean and prime joints, and install bond breakers, backer rods and sealant as recommended by manufacturers.
- D. Depth shall equal width up to 1/2 inch wide; depth shall equal 1/2 width for joints more than 1/2 inch wide.
- E. At exterior and interior assemblies, provide backer rod and sealants to allow vertical movement at deflection track heads. Coordinate work with other trades such as sheathing assemblies and air barrier assemblies installation.
- F. Cure and protect sealants as directed by manufacturers. Replace or restore damaged sealants. Clean adjacent surfaces to remove spillage.

END OF SECTION

SECTION 08 11 10 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section includes:
 - 1. Steel doors and frames.
- C. Steel doors and frames shall refer to doors or frames conventionally called "hollow metal". Steel and hollow metal are used interchangeably in this section.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- A. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
- C. Product test reports.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Standards: ANSI/SDI-100, Recommended Specifications for Standard Steel Doors and Frames.
- C. Performance Standards:
 - 1. Fire-Rated Assemblies: NFPA 80, and acceptable testing agency listing.
 - 2. Thermal-Rated Assemblies at Exterior: ASTM C1363 and C518.
 - 3. Sound-Rated Assemblies at Mechanical Rooms: ASTM E 1408, and ASTM E 413.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door; ASSA ABLOY.
 - 2. Mesker Door Inc.
 - 3. Pioneer Industries.
 - 4. Republic Doors and Frames.
 - 5. Steelcraft; an Allegion brand.
 - 6. Approved equal.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits [as applicable] indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide assemblies with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
 2. Temperature-Rise Limit: Where indicated and At vertical exit enclosures and exit passageways], provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 - a.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- C. Thermally Rated Door Assemblies: When tested according to ASTM C 518, provide door assemblies with U-factor of not more than: 0.29 deg Btu/F x h x sq. ft.
3. 0.38 deg Btu/F x h x sq. ft. (2.16 W/K x sq. m)]

2.3 STEEL DOORS & FRAMES

- A. Interior Steel Doors:
1. Manufacturers: Amweld Building Products; Ceco Door Products; Curries Co.; Mesker Door; Steelcraft Manufacturing; or approved equal.
 2. Material: Minimum 18-gauge steel sheet.
 3. Thickness: 1-3/4 inches.
 4. Finish: Factory primed and field painted. Indicated doors and doors associated with water or pump or mechanical equipment shall also be hot dipped galvanized.
- B. Accessories:
1. Sightproof stationary louvers.
 2. Glazing stops.
 3. Silencers.
- C. Interior Steel Frames:
1. Manufacturers: Amweld Building Products; Ceco Door Products; Curries Co.; Mesker Door; Steelcraft Manufacturing; or approved equal.
 2. Material: Minimum 16-gauge steel sheet.
 3. Corners at framing: Mitered or coped.
 4. Corners at masonry: Weld and grind smooth so joint is invisible.
 5. Height: As shown.
 6. Masonry coursing: Provide 4 inch heads where shown.
 7. Type at dry wall: Drywall slip-on.
 8. Type: For doors 42 wide and wider, provide fully welded frames.
 9. Glass stops: As shown, square type, flush or concealed fasteners.
 10. Borrowed light frames: Match door frames, provide 4 inch high base sill unless otherwise shown.
 11. Finish: Factory primed, baked-on and field painted. Indicated doors and doors associated with water or pump or mechanical equipment shall also be hot dipped galvanized.
- B. Exterior Steel Doors:
1. Manufacturers: Amweld Building Products; Presray Critical Containment Solutions, a Division of Pawling Corp.; Steel Door Institute; Steelcraft Manufacturing; Windsor Republic Doors; or approved equal.
 2. Material: Minimum 16-gauge galvanized steel sheet.
 3. Door Thickness: 1-3/4 inches, thermally insulated.
 4. Finish: Factory primed and field painted.
 5. Finish: Factory finished.
 6. Accessories:
 - a. Sightproof stationary louvers, if shown.
 - b. Glazing stops.
 - c. Silencers.
 7. Provide thermally improved doors with maximum U-value of BTU/hr./square foot degree F (ASTM C1363) for all

exterior doors and elsewhere as noted, as follows:

- a. Unglazed: 0.29.
- b. Insulating core material: Polyurethane.

C. Exterior Steel Frames:

1. Manufacturers: Amweld Building Products; Steel Door Institute; Steelcraft, Div. of IR Security Technologies; Windsor Republic Doors; or approved equal.
2. Material: Minimum 16-gauge galvanized steel sheet.
3. Corners: Mitered or coped.
4. Type: Welded.
5. Finish: Factory primed [after galvanizing] and field painted.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. Hollow-Metal Frames: Comply with SDI A250.11 or NAAMM-HMMA 84.
 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 2. Fire-Rated Openings: Install frames according to NFPA 80.
 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 4. Solidly pack mineral-fiber insulation inside frames.
 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 1. Non-Fire-Rated Steel Doors: Comply with [SDI A250.8] [NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated].
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 08 53 13 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Vinyl framed windows.
- C. Window unit types: As shown.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide windows capable of complying with performance requirements indicated and comply with the following:
 - 1. Minimum size required by AAMA/NWWDA 101/I.S.2.
 - 3. Energy code requirements: Provide units equal or superior to the following.
 - a. Thermal transmittance: **0.25** Btu/sq. ft. x h x deg F or below, per NFRC 100 maximum whole window U factor.
 - b. Solar heat gain coefficient SHGC: **0.40** NFRC 200 maximum whole-window
 - 4. AAMA/NWWDA Performance Requirements: Provide windows of the performance class and grade indicated that comply with AAMA/NWWDA 101/I.S.2.
 - a. Performance Class:
 - 1) For casements: DP40, C-40.
 - 2) For fixed units: DP50, F-C50.
 - 3) For single hung: DP35, H-35.

1.3 SUBMITTALS

- A. Comply with Division 01 and submit:
 - 1. Product Data: For each type of product.
 - a. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for vinyl windows.
 - 2. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
 - 3. Samples: For each exposed product and color specified, 2 by 4 inches in size.
 - 4. Product Schedule: Use same designations indicated on Drawings.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An installer acceptable to vinyl window manufacturer for installation of units required for this Project.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.

- b. Glazing Units: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Harvey Building Products.
 2. Quaker Windows Products Co.
 3. Paradigm Window Solutions.
 4. Jen-Wen Windows & Doors
- B. Basis of design: Subject to compliance with specifications: Jen Wen Premium Vinyl Window, Fixed

2.2 VINYL WINDOWS

- A. Operating Types: As shown.
- B. Frames and Sashes: Impact-resistant, UV-stabilized PVC complying with AAMA/WDMA/CSA 101/I.S.2/A440.
1. Finish: Integral color, as selected from available finishes.
 2. Casing sections: Provide flat casing unless otherwise shown.
 3. Drywall Returns: Provide ½ inch drywall return.
 4. Sill extensions: As require and shown.
 5. Siding attachment options: Provide options as shown and required, including so-called "Florida Flange".
 6. Minimum construction criteria:
 - a. Thickness, casement: Nominal 0.080 inch (2mm) thickness
 - b. Thickness, hung, and fixed: Nominal 0.070 inch (1.8mm) thickness
 - c. Corners: Miter cut and fusion welded.
 7. Sash size: As shown, if not, 41.5 x 53.5 inches.
- C. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.
1. Kind: Fully tempered where indicated on Drawings.
- D. Insulating-Glass Units: ASTM E 2190, certified through IGCC as complying with requirements of IGCC.
1. Glass: ASTM C 1036, Type 1, Class 1, q3.
 - a. Tint: As shown, if not, clear.
 - b. Kind: Fully tempered where indicated on Drawings or required by code.
 2. Lites: As shown.
 3. Filling: Fill space between glass lites with argon.
 4. Low-E Coating:
 - a. Pyrolytic on second surface.
- E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- F. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish:
 - a. As selected by Architect from manufacturer's full range.
- G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

2.3 INSECT SCREENS

- A. General: At operable units, fabricate insect screens to fully integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

2.4 FABRICATION

- A. Fabricate vinyl windows in sizes indicated. Include a complete system for assembling components and anchoring windows. Comply with the following:
1. Glaze vinyl windows in the factory.
 2. Weather strip each operable sash to provide weathertight installation.
 3. Mullions: Provide mullions and cover plates, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units. Provide manufacturer's standard finish to match window units.
 4. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.

PART 3 - EXECUTION

3.1 EXAMINATION INSTALLATION & COMPLETION

- A. Examine openings, substrates, structural support, anchorage, and conditions, for compliance with requirements for tolerances and conditions affecting performance..
- B. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components and comply with installation requirements in ASTM E 2112.
- C. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, in proper relation to wall flashing and adjacent construction to produce weathertight construction.
- D. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
1. Keep protective films and coverings in place until final cleaning.
 2. Remove and replace sashes if glass damaged during construction period.
 3. Protect window surfaces from damage until acceptance.

END OF SECTION

SECTION 08 80 10 - EXTERIOR GLASS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Exterior glass and glazing.
- C. Related work:
 - 1. Factory glazed products.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
- C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- D. Warranty: Submit manufacturer's standard warranty. Include labor and materials to repair or replace defective materials.
 - 1. Laminated Glass: Manufacturer's 5-year warranty.
 - 2. Coated Glass: Manufacturer's 10-year warranty.
 - 3. Insulating Glass: Manufacturer's 10-year warranty.
- E. Energy calculations: Submit calculations showing entire assemblies comply with energy code requirements.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Glazing for Fire-Rated Assemblies: Glazing for assemblies that comply with NFPA 80.
- C. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.
- D. Glazing Publications:
 - 1. GANA Publications: GANA's "Glazing Manual." and "Laminated Glass Design Guide."
 - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines."
 - 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- E. Structural and seismic performance: Comply with applicable requirements of ASCE/SEI 7-10 [American Society of Civil Engineers / Structural Engineering Institute] and its "Minimum Design Loads for Buildings & Other Structures" and requirements of authorities having jurisdiction.
- F. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General: Glass shall comply with ASTM C - 1036 latest unless otherwise specified. Type and thickness as shown or specified.
- B. Float Glass: Type I, Class 1, Quality q3, thickness as required by code or for strength with 1/4" minimum, unless otherwise noted or scheduled.
- C. Laminated Glass: Clear, plain, heat strengthened or fully tempered laminated regular and safety glass with polyvinyl butyral [PVB] interlayer.. Unless otherwise required by building and life safety codes, provide standard flat ASTM 1036 float glass for laminating. Unless otherwise shown, provide 0.25 inch thick units.
1. Standard: Comply with ASTM C 1172.
 2. Material: Clear, plain, heat strengthened or fully tempered laminated regular and safety glass with polyvinyl butyral [PVB] interlayer.
 3. Characteristics: Materials having a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 4. Type: Unless otherwise required by building and life safety codes, provide standard flat ASTM 1036 float glass for laminating.
 5. Thickness: Unless otherwise shown, or required by fabricator structural calculation, provide 0.25 inch thick units.
 6. Color & pattern: Where shown on drawings, provide units with frosted or colored interlayer in patterns or extent shown.
- D. Tempered Glass: Glass for Tempering: Float, Type I, Class 1, Quality q4
1. Sizes and Cutting: Prior to tempering or heat strengthening, cut glass to required sizes as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with glass manufacturer's recommendations. Do not cut or treat edges in the field. Thickness: as required by code but 3/16" minimum.
 2. Standard: Provide glass complying with ASTM C - 1036 latest and meeting the requirements of ANSI Z97.1. Wherever possible locate tong marks along an edge which will be concealed in the glazing system. Do not exceed maximum warpage in any direction as listed in the latest printed literature of glass manufacturer.
 3. Heat soak tempered glass.
 4. Provide safety labeling.
- E. Type: Insulating spandrel glass units, tempered laminated at locations as required by Code.
- F. Type: High-performance insulating glass units with low-e coating, tempered at locations as required by code and as follows:
1. Sizes as required.
 2. Bite: Minimum 1/2 in. bite to perimeter frame,
 3. Thickness: 1 inch overall and as follows:
 - a. 0.25 inch inner pane.
 - b. 0.50 inch airspace x Argon filled.
 - c. 0.25 inch outer pane.
- G. Color/Tint: As selected. Clear.
- H. Vision, reflective, color-enriched, Low E glass, tint and performance shall match characteristics of basis of design glass indicated below:
1. Product Series: SunGuard SuperNeutral Low-E.
 2. Coating: SunGuard SNX 62/27 (#2) [coating on no. 2 surface].
 3. Outboard Substrate: Clear
 4. Inboard Substrate: Clear
 5. Exterior Appearance: Clear
 6. Performance Values: As given below.
 7. Transmission:
 - a. Visible Light Transmission: 62%
 - b. UV Transmission: 06%
 - c. Solar Energy Transmission: 23%

8. Reflectivity:
 - a. Visible Light Out Reflectivity: 11%
 - b. Visible Light In Reflectivity: 12%
 - c. Solar Energy Reflectivity: 41%
9. U-Value
 - a. Winter Nighttime / Argon: 0.24
 - b. Winter Nighttime / Air : 0.29
 - c. Summer Daytime / Air: 0.27
10. Heat Gain
 - a. Relative Heat Gain: 65
 - b. Shading Coefficient: 0.31
 - c. Solar Heat Gain Coefficient: 0.27
 - d. Light-to-Solar Gain: 2.32
- I. Insulating glass seal: Provide a hermetic seal complying with the following:
 1. Materials: Butyl primary and silicone secondary seal.
 2. Configuration: Uniform and continuous.
 3. Secondary seal:
 - a. Extend from exterior face of inner glass pane to interior face of exterior glass pane.
 - b. Free of contaminants or imperfections specified at primary seal
 4. Primary seal:
 - a. Free of fingerprints, dirt, debris or materials affecting seal adhesion or continuity.
 - b. Not reduced to less than 1/8 in. in width at any point along insulating glass perimeter of the insulating glass unit nor 1/32 in. in thickness
 - c. Side of spacer: Not visible through "transparent" layer of thin primary seal.
 - d. Free of voids and continuously bonded to glass surface.
 5. Insulating glass spacer:
 - a. Warm edge type.
 - b. Dessicant: grey, 3 sided moisture barrier.
 - c. Polycarbonate spacer element.
 - d. Color: Architect approved color.
 - e. Acceptable products:
 - .1) Viracon: Viracon Thermal Space VTS.
 - .2) Technoform: TGI Spacer M.
 - .3) Thermosteal Group: Thermoflex Spacer
- J. Spandrel / Coated Glass (SPG):

SPG Type 1. Ceramic coated spandrel glass: ASTM C1048, Condition B - spandrel glass, one surface coated; Type 1-transparent glass flat; Quality Q3 – glazing select and coated with ceramic frit.

 1. Strength: Tempered or heat-strengthened as required by design criteria and fabricator calculations. Provide safety labeling.
 2. Glass type: As shown, if not, tinted float, color as selected.
 3. Tint colors: As shown, if not, as selected.
 4. Opacifying coating: Manufacturer standard baked on ceramic frit coating in solid or pattern as shown on drawings. Unless otherwise indicated provide frit on 3rd surface of insulated units.
 5. Colors: As selected.
- K. Glazing Materials:
 1. Glazing Tapes: Preformed butyl-based elastomeric tape with 100% solids content. Nonstaining, with or without spacer rod, with release paper backing.
 2. Glazing Sealants: One-part silicone, chemically compatible with other sealants and gaskets in the glazing system; Dow 795 Silicone Building Sealant, color to be selected from manufacturer's full range. Other products may be submitted for approval.
 3. Compression gaskets: Type required by application.
 4. Preformed composite glazing assemblies: Provide pre-engineered transition assemblies including of silicone integrated units to be mechanically attached to window, storefront and curtain wall assemblies to create durable seal and connection. Install and attach as recommended by manufacturer.
 - h. Acceptable products: Dow STS or Pecora Silspan.

- L. Setting blocks, spacers:
 - 1. Setting Blocks: silicone-compatible, 4 in. long by minimum 3/16 in. thick, 1/8 in. narrower than glazing pocket width, 80-90 Shore A Durometer.
 - 2. Anti-Walk Blocks: silicone-compatible, 4 in. long, thickness to be 1/8 in. narrower than the space between the glass and vertical mullion, 50-70 Shore A Durometer.

PART 3 EXECUTION

3.1 PREPARATION

- A. Clean glazing channels, stops and rabbets to receive glazing, materials of obstructions and deleterious substances which might impair the work. Remove protective coatings which might interfere with bond of sealants. Comply with manufacturer's instructions for final wiping of surfaces immediately before application of primer and glazing compounds or tapes.
- B. Prime surfaces to receive glazing compounds in accordance with manufacturer's recommendations.

3.2 INSTALLATION

- A. Standards: Unless otherwise shown or specified, comply with recommendations and requirements of the FGMA "Glazing Sealing Systems Manual" and "Glazing Manual". For the installation of tinted glass comply with glass manufacturer's recommendations.
- B. Performance: The installation of each light of exterior glass shall be watertight, airtight, and capable of withstanding temperature changes, wind loading and impact from operation (doors) without failure of any kind including loss or breakage of glass, failure of seal, exudation of sealant and excessive deterioration of glazing materials.
- C. Inspect each piece of glass immediately before installation. Do not install any pieces which are improperly sized or have damaged edges, scratches or abrasion or other evidence of damage. Remove labels from glass immediately after installation.
- D. Locate setting blocks at sill one-quarter of the width in from each end of the glass, unless otherwise recommended by the glass manufacturer. Use blocks of proper size to support the glass in accordance with manufacturer's recommendations.
- E. Provide face shims for all glass sizes larger than 50 united in., to separate glass from stops, except where continuous glazing gaskets or felts are provided. Locate face shims no farther than 24 in. apart and closer than 12 in. to a corner. Place face shims opposite one another. Make bite of spacer on glass a nominal dimension equal to or greater than that required by the manufacturer.
- F. Provide edge blocks, located in glazing rabbet as recommended by the glass manufacturer, to insure against displacement of the glass and against metal to glass contact within the rebate and to ensure permanently adequate bite of the glass within the glazing system.
- G. Set glass in a manner which produces greatest possible degree of uniformity in appearance.
- H. Do not use 2 different glazing materials in the same joint system unless the manufacturer of each material has stated in writing that his material is fully compatible with the other material.
- I. Use suitable protection to limit coverage of glazing materials to the surfaces intended for sealants.
- J. Butt or lap ends of tapes in accordance with manufacturer's recommendations.
- K. Tool exposed surfaces of glazing materials to provide a slight wash away from the glass. Install exposed tapes and gaskets with a slight protrusion above stops in the final compressed condition.
- L. Glaze corners and glass to glass joints with clear tooled silicone.
- M. Set insulating glass units with void between edge of units and glazing channel. Do not glaze insulating glass units with glazing compounds which might have a deleterious effect on the hermetic seal of the units.
 - 1. Set insulating glass units which have one sheet of heat absorbing, tinted or coated glass with clear glass sheet faced to the interior.
- N. Comply with reference standards and the following:
 - 1. Do not glaze units when ambient air temperature is below 40°F or in presence of moisture.
 - 2. Keep glazing rabbet clean and dry during glass installation.

3. Do not allow glass to touch framing system.
4. Inspect each lite of glass prior to installation.
5. Replace chipped or scratched glass.
6. Use suction cups to move lites of glass.
7. Use a "rolling block" to rotate glass.
8. Set glass so s centered in glazing pocket. Provide at least 1/8 inch clearance between sides of glass and vertical frame members, and there is at least
9. Provide at least 1/2 inch bite on glass by exterior stops.
10. Remove labels from glass.

3.3 PROTECTION

- A. Protect glass lites from accidental breakage by installing crossed streamers in front of all glass immediately after completion of glazing work.
- B. Do not apply markers or tape of any kind to glass surface.

3.4 FIELD QUALITY CONTROL

3.5 FIELD QUALITY CONTROL

- A. Fixed Glass – Spot check during construction: Based upon AAMA 502.1 *Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems* and the following procedures: After completion of the first installation of each exterior glazing type and nominal curing of sealants and glazing compounds, test installation for water leaks. Using ordinary city water pressure and a 3/4 inch hose, start applying water at base of glazing and move to upper part checking for leaks as test progresses. Correct any deficiencies observed as a result of test. Test shall be done in the presence of the Architect and glazing system manufacturer's representative.
- B. Operable unit and completed assemblies: Test assemblies under door and window sections as specified. In general operable units and newly installed store fronts, and curtain walls are to be tested under the provisions of
 1. AAMA 502, *Voluntary Specification for Field Testing of Newly Installed Fenestration Products*
 2. AAMA 503, *Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls, and Sloped Glazing.*

3.6 CLEAN UP

- A. Remove all labels, excess glazing compound and sealants from glass. Clean smudges and smears caused by the work of this Section from adjacent finishes and materials.
- B. Repair or replace materials or finishes damaged by the work of this Section.
- C. Remove from job site all glass crates and packaging. Remove all broken glass and properly dispose. Leave work areas neat and clean.

END OF SECTION

SECTION 08 80 20 INTERIOR GLASS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Interior glass and glazing.
- C. Extent:
 - 1. Borrowed lights, sidelights, interior clerestories, decorative glass and transoms not connected to exterior.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
- C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- D. Warranty: Submit manufacturer's standard warranty. Include labor and materials to repair or replace defective materials.
 - 1. Laminated Glass: Manufacturer's 5-year warranty.
 - 2. Coated Glass: Manufacturer's 10-year warranty.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Glazing for Fire-Rated Assemblies: Glazing for assemblies that comply with NFPA 80.
- C. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.
- D. Glazing Publications:
 - 1. GANA Publications: GANA's "Glazing Manual." and "Laminated Glass Design Guide."
 - 2. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines."
 - 1. Each type of glazing.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Glass and Glazing:
 - 1. Manufacturers: AFG Industries; ACH Glass Operations (formerly Visteon); Cardinal IG; Libby Owens Ford; Pilkington; Viracon; or approved equal.
 - 2. Type: Single glass units, tempered at all interior locations.
 - 3. Thickness: As shown, if not, 0.25 inch.
 - 4. Tint: As shown or scheduled, if not, clear.
 - 5. Auxiliary Materials:

- a. Compression gaskets.
- b. Elastomeric glazing sealants.
- c. Preformed glazing tapes.
- d. Glazing gaskets.
- e. Setting blocks, spacers, and compressible filler rods.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Inspect framing and report unsatisfactory conditions in writing and comply with the following:
 1. Comply with GANA "Glazing Manual" and manufacturer's instructions and recommendations. Use manufacturer's recommended spacers, blocks, primers, sealers, gaskets and accessories.
 2. Install glass with uniformity of pattern, draw, bow and roller marks.
 3. Install sealants to provide complete wetting and bond and to create a substantial wash away from glass.
 4. Remove and replace damaged glass and glazing. Wash, polish and protect all glass supplied under this section.

END OF SECTION

SECTION 08 80 25 FIRE RESISTANT GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Fire resistant glazing.
 - 2. Installation in new and existing assemblies.
- C. Extent: As shown.
- D. Related work: Division 08 doors.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
- C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- D. Warranty: Submit manufacturer's standard warranty. Include labor and materials to repair or replace defective materials.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
 - 1. Glazing for Fire-Rated Assemblies: Glazing for assemblies that comply with NFPA 80.
 - 2. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.
 - 3. GANA Publications: GANA's "Glazing Manual." and "Laminated Glass Design Guide."
- B. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship.
 - 1. Each type of glazing.
- C. Warranty: See submittals.
 - 1. Glass: Manufacturer's 5-year warranty.
 - 2. Gel filled assemblies: 10 year warranty.
- D. Reference standards and requirements: Comply with or meet the following provisions:
 - 1. Provide listed and labeled products, as determined by a recognized testing agency.
 - 2. Comply with positive pressure testing per NFPA 257 or UL9 per NFPA 80 hose stream tests.
 - a. Exception: Fire protection rating of 20 minutes or less is exempt from hose stream test.
 - 3. Provide certified labeling indicating testing agency, test standard, permitted uses, status of hose stream test, status of 450 degree F temperature rise limitation and fire resistance rating in minutes.

PART 2 PRODUCTS

2.1 MANUFACTURERS FOR FIRE RATED GLASS & GLAZING

- A. Subject to compliance with requirements, provide products from the following:

1. Technical Glass Products [TPG] Fire Rated Glass
 2. Pilkington North America.
 3. SAFTI First, Fire Rated Glazing and Framing Solutions.
 4. VETROTECH Saint-Gobain [PyroSwiss and/or Keralite Ultra 180]
 5. Approved equal.
- B. Basis of design:
1. Vetrotech, "Keralite-Ultra", a fire-rated clear safety ceramic glass, used subject to compliance with requirements and specifications, at indicated minute applications

2.2 MATERIALS

- A. General glass standards: Comply with requirements of Section 08 80 20 – Interior Glass, but including:
1. CFR 1201, Category II.
- B. Fire rated glass characteristics and configuration:
1. Usage, extent: As shown.
 2. Products:
 - a. Protection rated tempered glass.
 - b. Laminated glass with intumescent interlayers.
 - c. Transparent Ceramic glazing
 3. Construction: Proprietary products with multiple glass type in layers.
 4. Glass composition: nearly colorless, wireless, float clear glass.
 5. Thickness: As specified. required by rating. If not indicated by rating or herein, 0.75 inch.
 6. Fire rating: As scheduled or specified. if not, 120 minutes.
 7. Impact resistance: ANSI Z97.1 and CPSC CFR 1201, Category I and/or II.
 8. Types:
 - a. Fire-rated glazing as vision lights in fire-rated door assemblies.
 - b. Fire-rated glazing as vision lights in sidelights, transoms and borrowed lites in fire rated frames.
 - c. Fire-rated glazing as vision lights in rated transparent wall and window wall assemblies.
 - d. Fire-rated glazing as vision lights in high hazard assemblies.
 9. Fire Rating: As required for application and shown on drawings.
- C. Keralite ULTRA, Fire and Safety-Rated Laminated Glass: Glass-ceramic fire and impact safety-rated laminated glazing material for use in fire rated door, window, transom and borrowed lite assemblies. Reduces radiant heat transfer. In compliance with NFPA 80 Temperature Rise Door requirements. For use in interior or exterior applications. Provide units with the following properties:
1. Thickness: 3/4 inch (18 mm).
 2. Weight: 6.0 lbs/sf (29 kg per sq. meter).
 3. Approximate Visible Light Transmission: 83 percent.
 4. Finish: As selected by Archirext including: Standard and Sandblasted.
 5. Impact Safety Performance: ANSI Z97.1 and CPSC 16CFR1201 (CAT I & II).
 6. Labeling: Each lite shall be labeled with a permanent logo including the name of product, manufacturer, testing laboratory (Underwriters Laboratories), fire rating period and safety glazing standards.
 7. Fire Rating Testing: Fire rating tested and listed by Underwriters Laboratories; tested in accordance with UL 9, UL 10C, NFPA 252, NFPA 257, ASTM E 2010, and ASTM 2074.
- D. Fire rated glazing sealants:
1. Manufacturers:
 - a. Dow Corning Corp.
 - b. GE Construction Sealants.
 - c. Tremco Inc.
 - d. Approved equal.
 2. Materials: Provide tested, labeled products used as part of rated assemblies, including:
 - a. Compression gaskets.
 - b. Elastomeric glazing sealants.
 - c. Preformed glazing tapes.

- d. Glazing gaskets.
- e. Setting blocks, spacers, and compressible filler rods.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Inspect framing and report unsatisfactory conditions in writing and comply with the following:
 - 1. Comply with materials and systems in tested assemblies.
 - 2. Comply with GANA "Glazing Manual" and manufacturer's instructions and recommendations. Use manufacturer's recommended spacers, blocks, primers, sealers, gaskets and accessories.
 - 3. Install glass with uniformity of pattern, draw, bow and roller marks.
 - 4. Install sealants to provide complete wetting and bond and to create a substantial wash away from glass.
 - 5. Remove and replace damaged glass and glazing. Wash, polish and protect all glass supplied under this section.

3.2 SCHEDULE

- A. Refer to drawings, where not shown, provide FPGL-Type # as follows:
 - 1. Type 1: 20 minute fire protection rated glass and glazing without hose stream test – tempered glass
 - 2. Type 2: 45 minute fire protection rated tempered glass and glazing – laminated ceramic glazing.

END OF SECTION

SECTION 08 80 30 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Unframed mirrors.

1.2 QUALITY ASSURANCE

- A. Installation Standard: Mirror Division of North American Glass Association [GANA] Installation Guidelines: <http://www.mirrorlink.org/tech/installation/index.htm> .

1.3 GUARANTEES AND CERTIFICATIONS

- A. Warranty install at least for a period of 5 years from date of substantial completion.

1.4 SUBMITTALS

- A. Manufacturer's Data: Submit standard printed data.
- B. Shop drawings: Show representative sizes, thickness and details of each type of layout.
- C. Samples: Submit 6" x 6" minimum size samples of each type of mirror, sealant and clips. Provide sealant samples 12 in. long installed between samples of the materials to be glazed, fully cured. Samples will be reviewed for color and texture only. Compliance with all other requirements is the responsibility of the Contractor and Manufacturer.

1.5 PRODUCT DELIVERY AND STORAGE

- A. Comply with requirements of Division 1, and the manufacturer, and GANA recommendations and the following:
 - 1. Protected from weather, staining, damage, excess heat, flame, sparks, sunlight, moisture, strong solvents, and condensation.
 - 2. Keep in closed containers till installation.
 - 3. Use clean glove when handling, and rolling blocks and suction cups when moving mirrors.
 - 4. Protect faces and edges from scratches, and abrasion.

PART 2 - PRODUCTS

2.1 MIRRORS

- A. Standard Mirror Glass: Acceptable characteristics for unframed adhered mirrors:
 - 1. Glass: Type I, Class 1, of the following quality: ASTM C1036 Quality q1, if less than 25 sq. ft. Quality q2, if more than 25 sq. ft. Subject to review and acceptance by Architect ASTM C1503-01 maybe used for mirror quality in lieu of C1036.
 - 2. Backing: Provide silvering, copper backing and protective coating conforming to FS DD-M-411.
 - 3. Thickness: As shown, if not shown, 0.25 inch.
- B. Adhesive: Provide products acceptable to and approved by mirror manufacturer and compatible with backing, as recommended by manufacturer for the application, and subject to review and approval the following:
 - 1. "Gunther Ultra/Bond, Extra/Build, Premier"; Royal Adhesives & Sealants So.Bend, IN.
 - 2. "Mirror Mastic" Palmer Products Corp, Louisville KY.
 - 3. "PL Mirror Mastic", OSI Sealants, Mentor OH.
 - 4. "Mirror and Insulation Glue" Focuseal Inc. Naples FL.
 - 5. "Arocep Mirror Mastic" Percora Corp. Harelysville PA

- C. Hardware/Setting:
1. Setting Blocks: Clear silicone.
 2. Retaining hardware: Provide work as shown, if not shown, approved units as selected and noted below:
 - a. Clips: Padded "J" clips in brushed or polished Stainless steel.
 - b. Track: Continuous padded "J" track, brushed or mirror polished stainless steel.
 - c. Rosettes and through fasteners: Not acceptable for use.
- D. Edge Sealing: Seal edges after cutting and edge finishing with or approved equal:
1. "Gunther Seal Kwik" as above.
 2. "S209 Mirror Edge Sealant" Sprayway Inc Addison IL.
- E. Joint sealants: In general, do not fill joints. Where shown, use material approved in writing by mirror manufacturer. Do not use acidic cure silicone sealants.
- F. Fabrication: Unless otherwise shown, comply with the following:
1. Edges: Flat polished.
 2. Corners: Square.
 3. Seams: Only where approved by Architect and up to 8x10 feet without seams.
 4. Horizontal seams: Not permitted unless shown.
 5. Penetrations: Cut and fit to provide for penetrations, outlets, switches and the like. Conceal mirror edges with mirror plates or mirror escutcheons.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Standards: Comply GANA, manufacturer instructions and recommendations, and the following:
1. Field cutting & fitting: Do not field cut unless except at minor or incidental conditions. If extensive field cutting is required, re-fabricate work. Field cuts shall match shop finished edges. Seal cut edges.
 2. Set up: Install units plumb, plane, and aligned with adjacent walls, soffits, trim and the like. Provide uniform reveals and sightlines at mirror perimeter.
 3. Adhesive: Prepare mirror back and apply adhesive as required for application. Note that application varies depending up adhesive type.
 4. Ventilation: Maintain 0.18 inch free air circulation and ventilation behind mirror.
 5. Countertop/Backsplash installation: Set mirror on setting blocks placed at quarter points. Allow mirror edges and back to ventilate and breath.
 6. Hardware: Provide hardware shown, if not shown, "J" clips or "J track". Position "J" clips at bottom edge quarter points.
 7. Protect glass lites from accidental breakage by installing crossed streamers in front of all glass immediately after completion of glazing work.
 8. Do not apply markers or tape of any kind to glass surface.

3.2 CLEAN UP

- A. Remove all labels, excess glazing compound and sealants from surfaces. Clean mirrors. Repair or replace materials or finishes damaged by the work of this Section. Remove from job site all crates and packaging.
- B. Comply with GANA MD-01-0105, mirror manufacturer's recommendations and the following:
1. Do not use cleaners containing ammonia or vinegar.
 2. Do not spray cleaners directly on mirror. Apply to cleaning cloth, then mirror.
 3. Do not allow water or cleaners to contact mirror edges or back. Dry immediately.
 4. Do not use razors or scrapers to remove labels.

END OF SECTION

SECTION 08 91 10.2 FIXED METAL LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: The Drawings and general provisions of the Contract including the General and Supplementary Conditions and applicable portions of Division 1 - General Requirements, apply to the work of this Section.
- B. Section includes, without limitation providing:
 - 1. Fixed metal wall louvers, horizontal and vertical types.
 - 2. Accessories, subsills

1.2 SUBMITTALS

- D. Comply with Division 01 General Requirements and submit for approval:
 - 1. Product Data: Manufacturer's literature including installation instructions, use restrictions and limitations.
 - a. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
 - 2. Shop drawings: Large scale drawings for fabrication, installation and erections including plans, elevations, details, anchorages, connections and accessories along with head, jamb, sill and joining details. Provide templates for work installed by others. Show:
 - a. Frame profiles and blade profiles, angles, and spacing.
 - b. Weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 - c. Mullion profiles and locations.
 - 3. Field Measurements: Take accurate field measurements before fabrication and indicate same on shop drawings.
 - 4. Office Samples: Provide manufacturers standard finish color range, and if selected sample of custom color. Provide full size corner assembly when so requested.
 - 5. Samples: Submit samples of panel materials, fasteners and misc. accessories.
 - 6. Certification: Certify submitted materials comply with requirements.

1.3 PROTECTION

- A. Protect work of this section and adjacent work from damage from work under this Section. Replace damaged work with new construction at no additional cost to the Owner.

1.4 GUARANTEE

- A. Finish: Submit paint manufacturer's written guarantee for a period of 20 years on finish warranting prompt refinishing or replacement of painted work in the event that finish should

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Construction Specialties, Inc.
 - 2. Anemostat Door Products; www.anemostat.com/.
 - 3. Airolite
 - 4. Approved equal.

2.2 ARCHITECTURAL LOUVERS – STORM PROOF TYPE

- A. Provide types shown, if not, comply with requirements below.
- B. Storm proof [aka storm resistant], fixed, horizontal louver. Architectural louvers:
 - 1. Material: Extruded structural aluminum.
 - 2. Thicknesses:
 - a. Heads, sills, jambs, mullions, frames: 0.080 inch.
 - b. Blades: 0.060 inch thick or more.
 - 3. Heads, sills, jambs, mullions: One piece with integral caulking slot, retaining beads.
 - 4. Subsills: Required.

5. Mullions: Provide sliding interlock.
6. Blades: One piece, drainable, with water stop at stop of blade.
7. Finish: As specified.
8. Depth: 5.00 inch.
9. Angle: Manufacturer recommendation for application.
10. Drainable: Yes.
11. Bird screen: Required.
12. Insect screen: If requested by Architect.
13. Stormproof: Yes.
14. Free area: As shown, if not, at least 45%.
15. Basis of design: As shown, if not, as follows:
 - a. Horizontal: Construction Specialties, Inc. RS-5300 high performance louver
 - b. Vertical: Construction Specialties, Inc. RSV-5700 high performance louver

2.3 FABRICATION

- A. Blades: Extruded aluminum sections of 6063 - T5 alloy, minimum .075" thick.
- B. Supports: All blades to be supported and lined up by means of heavy gauge extruded aluminum blade braces positively interlocked to each blade and secured to structural steel by type 302 stainless steel fastenings. Structural supports to be designed to carry wind pressures not less than code- mandated loads. At corners, blades shall be mitered and continuously heliarc welded.
- C. Blank-Off Panels: Provide 1" thick aluminum faced painted insulated blank-off panels where ducts do not equal louver size.
- D. Bird screen: Provide at all louver areas not having blank-off panels.
- E. Subsills: Provide at all louvers unless indicated not to be provided.

2.4 FINISHES

- A. Finishes (factory applied): Comply with Type 4 per Section 05 08 00 and, if indicated, scheduled, or shown, provide:
 1. Custom colors to match adjacent surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION OF LOUVERS

- A. Install per manufacturer's recommendations and written installation instructions to structural back-up. Where necessary apply bitumin between dissimilar metals.
- B. Comply with manufacturer's instructions and recommendations for installation of the work.
- C. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated and fitted to the structure.
- D. Anchor louvers to the building substructure as indicated on architectural drawings.
- E. Erection Tolerances:
 1. Maximum variation from plane or location shown on the approved shop drawings: 1/8" per 12 feet of length, but not exceeding 1/2" in any total building length or portion thereof (non- cumulative).
 2. Maximum offset from true alignment between two members abutting end to end, edge-to- edge in line or separated by less than 3": 1/16" (shop or field joints). This limiting condition shall prevail under both load and no load conditions.
- F. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly.
- G. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.
- H. Set units level, plumb and true to line, with uniform joints.

- I. Seal louver assemblies to abutting construction per Section 07 92 00.

3.2 CLEAN UP

- A. Remove all scrap materials and clean up working areas daily as the work progresses. Remove all tools, equipment and excess materials at the completion of the work of this Section. Restore or replace work of other trades damaged or soiled by the work of this section.

END OF SECTION

SECTION 09 01 27 - GYPSUM BOARD REPAIR

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: All the Contract Documents, including the Drawings, General and Supplementary Conditions and Division 1 General Requirements apply to the work of this Section.
- B. Section includes, without limitation, providing:
 - 1. Gypsum board repair.
 - 2. Miscellaneous gypsum board infill.
- C. Extent: As shown, if not, existing walls and ceilings disturbed by renovations or indicated to be repaired. Confer with Owner and Architect to identify other repair work before final pricing. Carry allowances if so indicated.
- D. Related work, without limitation includes:
Section 09 10 00 - Non-structural light gage framing: Metal furring, studs and framing required for alterations.

1.2 SUBMITTALS

- A. In accordance with Division 1, submit for approval:
 - 1. Product data of each type to be used.
 - 2. Manufacturers installation instructions and guidelines.
 - 3. Documentation for any required fire rated assemblies.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Deliver, handle, and store materials in accordance with manufacturers' instructions.
- B. Where fire rated assemblies are required, provide evidence of assemblies meeting required ratings in tests performed by nationally recognized organizations such as Underwriters' Laboratories.
- C. Repair performance requirements:
 - 1. Repair work shall be plane and true with adjacent surfaces to a tolerance matching existing plaster or gypsum.
 - 2. Repair textures shall match adjacent existing textures.
 - 3. Unacceptable surfaces shall be re-worked until acceptable.
 - 4. No cracks, joints, ridges, depressions, separations or other defects shall be visible in repair work or immediately abutting work after completion of repair work nor at 365 days after the date of substantial completion
 - 5. The finished surfaces shall appear to be continuous sound gypsum board free of visible repairs after paint or wall coatings are applied when viewed in strong light from a distance of 6 feet.

1.4 PROJECT CONDITIONS

- A. Perform work only when ambient temperature is between 40 degrees F and 85 degrees F.
- B. Warm Weather Requirements: Protect plaster against uneven and excessive evaporation and from excessive ventilation. Apply and cure plaster to prevent dryout during cure period.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD MATERIALS FOR REPAIR

- A. Match existing; where this requirement cannot be met or if existing types cannot be determined or if new types are required, comply with requirements given below.
- B. General: Where shown or scheduled, provide gypsum wall board of each type as specified. Provide in longest lengths available to minimize end-to-end joints.

1. Provide thickness as shown or as required by laboratory test designs to achieve the fire and acoustical ratings shown.
 2. Where indicated UL or FM or NFPA fire rated assemblies require the use of so-called "Type C" firecode color, use that board in place of generic Type X.
 3. At ceilings or horizontal applications use board rated for ceiling use.
- C. Gypsum Wallboard
1. Use: Interior locations, base and exposed layers.
 2. Type: Regular or Fire Resistant (Type X), as shown, if not shown, use Type X or Type C.
 3. Backing: Paper-backed.
 4. Thickness: 5/8" unless otherwise shown.
 5. Edges: Tapered and rounded edge (Type SW).
 6. ASTM Specification: C-1396
- D. Moisture & Mold Resistant [Formerly Water-Resistant gypsum panel]:
1. Use: Painted wallboard at toilet rooms, showers, janitors closets, and all other moist but not wet areas.
 2. ASTM C1396 (Section 5), regular type except where Type X fire-resistant type is indicated or required to meet UL assembly types.
 3. Edges: Tapered.
 4. Thickness: As shown, if not shown 5/8 inch.
 5. Acceptable products: Sheetrock® brand Mold Tough™ Firecode (Type X), Firecode® C Core or ULTRACODE® Core gypsum panels by USG.
- E. Accessories: Provide additional materials of approved types as recommended by manufacturer. to accomplish the work.

2.2 JOINT TREATMENT AND FINISH MATERIALS

- A. General: Provide materials recommended by the manufacturer for the use intended, complying with ASTM C-475, except as noted below.
1. Joint Tape: Fibered paper reinforcing tape.
 2. Joint Compounds:
 3. At moist interior areas provide chemical-hardening type for bedding and filling and ready-mixed all purpose vinyl-type or vinyl-type powder for topping. U.S.G. Durabond, or equal topped with a sandable all purpose final coat is acceptable.
 4. At interior applications provide standard ready mix vinyl-based taping plus topping compound or vinyl-based powder taping plus topping compound.
 5. At moisture resistant gypsum backing board, for joints, cut edges and fastener heads provide special moisture - resistant compound equal to U.S. Gypsum w/r compound (1 coat under tiles, 3 coats other areas).
- B. At exterior, wet or damp locations and conditions use products water resistant exterior grade products.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect substrates, previous related work, and conditions under which work is to be installed and identify defects and deficiencies. Ensure substrates are dry, dust free and compatible with the new work. Starting work constitutes acceptance of conditions.

3.2 GYPSUM REPAIRS

- A. Replace unsound gypsum with new matching system.
- B. Examine existing substrate. Provide miscellaneous new framing and blocking components required to support finish and to replace unsound substrates or framing. Remove loose gypsum to framing reinstall new assemblies with sound work.
- C. Prepare joints at new and existing work to conceal repairs permanently.

- D. Where new partitions meet existing construction, remove existing corner beads to provide a smooth transition.
- E. Adhesive apply gypsum board where required to solid substrate such as masonry or concrete.
- F. Fill holes, cracks and voids while ensuring new work has strong mechanical keys and fully adhered bond to existing surface. Sand and finish surface smooth to existing.
- G. Install gypsum board assemblies true, plumb, level and in proper relation to adjacent surfaces. Install boards vertically. Do not allow butt-to-butt joints and joints that do not fall over framing members.
- H. Tape and Joint Compound: Install gypsum board for tape and 3-coat joint compound finish in compliance with ASTM C 840 and GA 216. Provide finish levels as follows:
 - 1. Concealed from view: Level 3 or better but in compliance with fire ratings.
 - 2. Typical: Level 4.

3.3 COMPLETION

- A. At completion of finish work, clean all beads, screeds, metal trim and edging and leave work ready for following phases. Remove rubbish, debris, excess materials, scaffolding, tools, and equipment from building.
- B. Rough construction to receive mechanically applied work may be left broom clean; all other areas shall be vacuumed free of dust.

END OF SECTION

SECTION 09 10 50 - METAL BLOCKING

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation providing:
 - 1. Concealed metal blocking.
 - 2. At contractor's option, use specified metal blocking in place of wood at building interiors.
- B. Related Work includes, without limitation:
 - 1. Section 06 10 60 - Wood blocking.
- C. Extent: As required, but **do not for use as firestopping**.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Performance: Fire, structural, and seismic performance meeting requirements of building code and local authorities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Steel Studs, Channels & Plates:
 - 1. Material Standard: ASTM C645.
 - 2. Stud Thickness: 25, 22, or 20 gauge (.0329 inch), as required by application, galvanized.
 - 3. Stud Depth, Minimum: 2.5 inches.
 - 4. Cold-rolled Channel: 16 gauge, minimum black corrosion resistant coating.
 - 5. Flat Plates: 16 gage minimum, galvanized; spanning at least 3 supports.
 - 6. Auxiliary Framing Components: non-corrosive fasteners.

PART 3 EXECUTION

3.1 INSTALLATION -GENERAL

- A. Steel Blocking: Connect to framing in compliance with ASTM C 754. Include blocking for items such as railings, grab bars, casework, toilet accessories, window treatment and similar items. Comply with the following:
 - 1. Determine loads and select blocking to support loads and meet safety factor of 3. When in doubt field test assemblies with actual loads.
 - 2. Conceal blocking completely.
 - 3. Do not permit telegraphing or visual bleed-through of blocking through final finish surfaces.
 - 4. Do not interfere with or obstruct other work.
 - 5. Use manufacturer recommended fasteners where they exceed strength of specified fasteners.
 - 6. Alternative methods have equal structural capacity may be used other than specified. Gages and weights specified are minimums and shall not be reduced.

3.2 MINIMUM PERFORMANCE & INSTALLATION REQUIREMENTS

- A. Type 1 - Heavy Loads: Without limitation, grab bars, handrails, wall supported casework and shelving, other heavy loads. Comply with the following:
1. Withdrawal resistance: 200 pounds.
 2. Shear resistance: 250 pounds.
 3. Support: Maximum 8 inch long segments of specified steel channel run horizontally and attached to each side open throat of metal wall studs; overlap channel across entire face of stud flange.
 4. Fastener: 0.25 inch minimum diameter attached through center of channel.
- B. Type 2 - Moderate Heavy Loads. Comply with the following:
1. Withdrawal resistance: 155 pounds.
 2. Shear resistance: 175 pounds.
 3. Support: Toggle bolt through 0.50 inch minimum gypsum board and attached to center of 25 gage minimum metal stud.
 4. Fastener: 0.25 inch minimum diameter toggle bolt.
- C. Type 3 - Moderate Loads. Comply with the following:
1. Withdrawal resistance: 85 pounds.
 2. Shear resistance: 135 pounds.
 3. Support: Toggle bolt through 0.50 inch minimum gypsum board and attached to center of 20 gage minimum metal stud.
 4. Fastener: Type S-12 bugle head \ screw.
- D. Type 4 - Light Loads. Comply with the following:
1. Withdrawal resistance: 85 pounds.
 2. Shear resistance: 135 pounds.
 3. Support: Toggle bolt through 0.50 inch minimum gypsum board and attached to center of 25 gage minimum metal stud.
 4. Fastener: Type S-12 bugle head \ screw.
- E. Type 5 - Very Light Loads. Comply with the following:
1. Withdrawal resistance: 40 pounds.
 2. Shear resistance: 60 pounds.
 3. Support: Toggle bolt through 0.50 inch minimum gypsum board only.
 4. Fastener: 0.25 inch minimum diameter toggle bolt.

END OF SECTION

SECTION 09 28 00 - INTERIOR TILE BACKER BOARD

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing: Interior tile backer board.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Tolerances: Not more than 1/16-inch difference in true plane at joints between adjacent boards before finishing. After finishing, joints shall be not be visible. Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level and proper relation to adjacent surfaces in finished work.
- C. Fire Resistance for Fire-Rated Assemblies: ASTM E 119.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide one of the following systems.
- B. Cement backer board meeting or exceeding the following:
 - 1. Material: Aggregated Portland cement board with woven glass fiber mesh facing.
 - 2. Standard: Complying with ANSI A118.9.
 - 3. Thickness: As shown, if not: 5/8 inch. Match face of adjacent wall substrate surfaces unless otherwise shown.
 - 4. Fire rating assemblies: Comply with requirements of fire tests. Provide mineral rock wool where required for compliance as part of work.
 - 5. Widths & edges: Manufacturer's standard.
 - 6. Product: "Durock" by USG.
 - 7. Fasteners: Only manufacturer recommended cement backer board type. Do not use conventional drywall screws or fasteners.
- C. Fiber glass mat faced treated core gypsum tile backer board:
 - 1. Available product: Georgia Pacific Dens-Shield, USG "Aqua-Tough, in thickness to match adjacent gypsum board.
 - 2. Where tile backer board are intended to be left without tile facing, skim coat entire surface to be exposed with compound material recommended by manufacturer.
 - 3. Fasteners, tape, taping compound: Type recommended by manufacturer for application
- D. Steel Framing for Walls and Partitions: Ensure compliance with the following:
 - 1. Stud Thickness: 20 gauge (.0329 inch), minimum
 - 2. Furring Channel Thickness: 20 gauge (.0329 inch).

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install cementitious cement fiber tile backer board using fiberglass tape and hot dipped galvanized or cadmium plated fasteners. Follow manufacturers installation recommendations and requirements of ANSI A108.11. Install tile backer board where indicated and at all bath tub walls and ceilings.
- B. Provide fire-rated systems where indicated and where required by authorities having jurisdiction. Do not use cement board to achieve fire ratings, unless UL test assembly numbers are provided to Architect for review.
- C. Install boards vertically. Do not allow butt-to-butt joints and joints that do not fall over framing members.
- D. Install trim in strict compliance with manufacturer's instructions and recommendations.
- E. Repair surface defects. Leave ready for finish painting or wall treatment.

END OF SECTION

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Gypsum board components and assemblies.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Tolerances: Not more than 1/16-inch difference in true plane at joints between adjacent boards before finishing. After finishing, joints shall be not be visible. Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level and proper relation to adjacent surfaces in finished work.
- C. Fire Resistance for Fire-Rated Assemblies: ASTM E 119.
- D. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship and level of finish.
- E. Performance: Fire, structural, and seismic performance meeting requirements of building code and local authorities.

PART 2 - PRODUCTS

2.1 GYPSUM DRYWALL BOARD

- A. General: Where shown or scheduled, provide gypsum wall board of each type as specified. Provide in longest lengths available to minimize end-to-end joints.
 - 1. Provide thickness as shown or as required by laboratory test designs to achieve the fire and acoustical ratings shown.
 - 2. Where indicated UL or FM or NFPA fire rated assemblies require the use of so-called "Type C" firecode color, use that board in place of generic Type X.
 - 3. At ceilings or horizontal applications use board rated for ceiling use.
- B. Gypsum Wallboard
 - 1. Use: Interior locations, base and exposed layers.
 - 2. Type: Regular or Fire Resistant (Type X), as shown, if not shown, use Type X or Type C.
 - 3. Backing: Paper-backed.
 - 4. Thickness: 5/8" unless otherwise shown.
 - 5. Edges: Tapered and rounded edge (Type SW).
 - 6. ASTM Specification: C-1396
- C. Gypsum Wallboard / Impact Resistant:
 - 1. Use: As shown, if not, at all at Interior locations, exposed layers only.
 - 2. Type: Fire Resistant (Type X).
 - 3. Abuse rating: Per ASTM C1629, level shown if not, level 1 for surface indentation, Level 2 for abrasion.
 - 4. Face: Paper face with stronger back paper and higher density core than conventional board.
 - 5. Thickness: 5/8" or as shown.
 - 6. Edges: Tapered and rounded edge (Type SW).
 - 7. ASTM Specification: C-1396
 - 8. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
 - 9. Finishing: Conventional methods per manufacturer recommendations.

10. Acceptable product:
 - a. USG Sheetrock ® Mold Tough VHI Firecode X Panel UL Type AR
 11. Acceptable product where paperless board are shown:
 - a. DensAmor Plus Impact resistant panel by Georgia Pacific
- D. Moisture & Mold Resistant [Formerly Water-Resistant gypsum panel]:
1. Use: Painted wallboard at toilet rooms, showers, janitors closets, and all other moist but not wet areas. Do not use behind tile nor at tub surrounds.
 2. ASTM C1396 (Section 5), regular type except where Type X fire-resistant type is indicated or required to meet UL assembly types.
 3. Edges: Tapered.
 4. Thickness: As shown, if not shown 5/8 inch.
 5. Acceptable products: USG Sheetrock® brand Mold Tough™ Firecode (Type X).
 6. Acceptable product where paperless board are shown or required:
 - a. Sheetrock MoldTough (USG)
 - b. Sheetrock MoldTough VHI (USG)
 - c. DensAmor Plus Impact resistant panel by Georgia Pacific
 - d. Finishing: Full skim coat per manufacturer recommendations.
- 2.2 FASTENERS FOR GYPSUM BOARD:
- A. Screws: Comply with ASTM C1002 and ASTM C954 Type "S" at steel, Type "W" at wood and be rustproof, of size, thread, head, and points recommended by manufacturer for applications shown. Generally, provide screws with maximum clamping strength and vibration resistance, 3/8" longer than the assembly being fastened.
 - B. Power driven fasteners for attachment to 20 gage runners at 3000 psi concrete shall be 5/32" diameter, length determined by installer.
 - C. At exterior and wet locations and at tile backer board use hot dipped galvanized, stainless steel or cadmium plated fasteners.
- 2.3 METAL TRIM ACCESSORIES
- A. General: Provide trim accessories of the sizes required for the drywall application shown and specified, fabricated from galvanized steel, and of the following types:
 1. At external corners: Provide 1-1/4" x 1-1/4" galvanized metal corner bead with smooth rigid nose and perforated and knurled metal flanges.
 2. Expansion Control Joints: U.S. Gypsum "093" or approved equal located as shown or at 30' (maximum) intervals in long straight runs. Where locations are not shown on Drawings, obtain Architect's approval of proposed locations.
 3. Edge moldings: Provide perforated and embossed "L" or "J" type casing molding at exposed panel edges and where GWB butts other materials, similar to U.S. Gypsum 200 or 800 series. Moulding equal to U.S. Gypsum Series 400 is not acceptable.
 4. Multiflex tape beads.
- 2.4 JOINT TREATMENT AND FINISH MATERIALS
- A. General: Provide materials recommended by the manufacturer for the use intended, complying with ASTM C-475, except as noted below.
 1. Joint Tape: Fibered paper reinforcing tape.
 2. Joint Compounds:
 3. At moist interior areas provide chemical-hardening type for bedding and filling and ready-mixed all purpose vinyl-type or vinyl-type powder for topping. U.S.G. Durabond, or equal topped with a sandable all purpose final coat is acceptable.
 4. At interior applications provide standard ready mix vinyl-based taping plus topping compound or vinyl-based powder taping plus topping compound.
 5. At moisture resistant gypsum backing board, for joints, cut edges and fastener heads provide special moisture - resistant compound equal to U.S. Gypsum w/r compound (1 coat under tiles, 3 coats other areas).
 - B. At exterior conditions use products water resistant exterior grade products.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Critical work under other sections: Provide under their respective sections and ensure that:
 - 1. Framing is installed with tolerances necessary to produce results required..
 - 2. Blocking for items such as railings, grab bars, casework, toilet accessories, window treatment and similar items are in place, secure and solid.
 - 3. Vapor barriers where required or shown are in place and in good condition.
 - 4. Acoustical sealant at both faces at top and bottom runner tracks, wall perimeters, openings, expansion and control joints are provided for and installed properly.
 - 5. Required thermal insulation is in place.
- B. Install gypsum board assemblies true, plumb, level and in proper relation to adjacent surfaces. Install boards vertically. Do not allow butt-to-butt joints and joints that do not fall over framing members.
- C. Tape and Joint Compound: Install gypsum board for tape and 3-coat joint compound finish in compliance with ASTM C 840 and GA 216, Level 4 finish. Install gypsum board assemblies true, plumb, level and in proper relation to adjacent surfaces. Provide special level finishes as follows:
 - 1. Concealed from view not fire rated: Level 1 or better.
 - 2. Concealed from view fire rated: Level 2 or better but in compliance with fire ratings.
 - 3. Where indicated as well at wall washers style lighting or at semi-gloss or full gloss coatings: Level 5.
 - 4. Surfaces to receive images from video projectors: Level 5.
- D. Provide fire-rated systems where indicated and where required by authorities having jurisdiction.
- E. Where new partitions meet existing construction, remove existing corner beads to provide a smooth transition.
- F. Install trim in strict compliance with manufacturer's instructions and recommendations.
- G. Repair surface defects. Leave ready for finish painting or wall treatment.

END OF SECTION

SECTION 09 30 05 – INTERIOR CERAMIC & PORCELAIN TILING

PART 1 GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation providing: tiling.
 - 1. Ceramic tile.
 - 2. Porcelain tile.
 - 3. Crack isolation membrane.
 - 4. Specialty tile products.
 - 5. Grout and setting materials.
- C. Extent:
 - 1. Where shown.
- D. Related Work includes, without limitation:
 - 1. Division 09 00 00 – Other tiling work.
 - 2. Section 10 28 00 - Toilet & Bath Accessories

1.2 SUBMITTALS

- A. Comply with Division 01 and the following:
 - 1. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
 - 2. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
 - a. Include manufacturer's full range of color and finish options if additional selection is required.
- B. Extra materials: Not less than 2 percent of installed materials.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions. Meet or exceed the following:
 - 1. Tile: ANSI A 137.1.
 - 2. Tile Setting Materials: ANSI A 118 series standard specifications.
 - 3. Tile Installation: ANSI 108 series standard specifications and Tile Council of America, Handbook for Ceramic Tile Installation.
- B. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship.
- C. Slip resistance: Comply with Dynamic Coefficient of Friction [DCOF] AcuTest rating of 0.42 or better.
- D. Tolerances for Tile Work: Install setting beds and apply tile so that final exposed tile surfaces are smooth and true to within the following tolerances:
 - Floors: 1/8 inch in 10 feet max.
 - Walls: 1/8 inch in 8 feet max.
- E. Provide flood testing where waterproofing membranes are required for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Tile: Refer to Finish Legend and Finish Schedule for required tile types.
- B. Subject to compliance with requirements, and indications on Finish Legends, provide products from manufacturers below:
- C. Tile material manufacturers:
 - 1. American Marazzi Tile, Inc.

2. American Olean Tile Co.;
 3. DalTile Corporation; Endicott Clay Products Co.;
 4. Summitville Tiles,
 5. United States Ceramic Tile Co.
 6. Approved equal.
- D. Setting Materials manufacturers:
1. American Olean Tile Co.; Bostik, Inc.; Custom Building Products.
 2. LATICRETE International, Inc.
 3. MAPEI Corp.
 4. ProSpec (formerly Bonsal branded products).
 5. Schluter System LP;
 6. Super-Tek Products, Inc.;
 7. TEC Specialty Construction Brands, Inc.; or approved equal.

2.2 APPLICATIONS / TILE TYPES

- A. Provide applications shown, including:
1. Interior wall tile over gypsum wallboard.
 2. Interior wall tile over tile backer board at wet areas.
 3. Interior floor tile over concrete slab.
- B. Tile types required, as shown or scheduled including:
1. Glazed ceramic tile.
 2. Porcelain tile.
- C. Setting Materials:
1. Mortar setting bed: Provide where required, not at showers. Latex additive
 2. Thin-set mortar: Dry-set Portland cement mortar.
 3. Grout: Latex-Portland cement grout. (Silicone rubber elastomeric grout for pregrouted sheets.)
 4. Crack suppression membrane under tile ANSI A 118.10.
 5. Elastomeric sealants, low VOC type.

2.3 PORCELAIN FLOOR & WALL TILE

- A. Tile type: As indicated on Finish Legend but complying with the following:
1. Size: As shown.
 2. Edge: As selected, if not slight cushion edge,
 3. Performance: Slip and stain resistant floor tile.
 4. Standard: Comply with ANSI A137.1 and provide tiles of:
 - a. Dense, fine-grained, sharply formed face.
 - b. Unless otherwise selected, provide dust-pressed composition.
 5. TCNA rating: Certified as porcelain tile.
 6. ADA: Comply with applicable standards, especially slip-resistance.
 7. Porcelain Enamel Institute [PEI] Resistance to wear: Unless otherwise selected, Group; IV or V, extra heavy, high traffic, commercial, interior/exterior use.
 8. Texture: As shown or scheduled, if not, lightly textured surface.
 9. Trim & shapes: Provide matching trim special conditions.
 10. Wet coefficient of friction: 0.6 or better.
 11. ANSI rating: Impervious.
 12. Absorption range: of 0.5 per cent or less.
 13. Body: Unless otherwise selected, provide full body, homogeneous color and texture through full thickness of tile.
 14. Grout joint: Width recommended by manufacturer is 1/8 inch.

2.4 GLAZED CERAMIC WALL TILE

- A. Provide tile complying with the following:
1. Tile type: plain face all-purpose edge crystalline-glazed wall tile
 2. Size: As shown.
 3. Standard: Comply with ANSI A137.1.
 4. Moisture Absorption: < 20 per cent.

5. Setting grid: Optional; back-mounted.
6. Grout spacers: Required wherever setting grids are not used.
7. Trim: Provide matching trim and shapes for special conditions.
8. Base: Required; where type not indicated, use wall tile material.
9. Manufacturer: As scheduled.
10. Series: As scheduled.
11. Colors: As selected by Architect from full standard range plus not less than 20% feature tile.
12. Usage: Where shown.

- B. See drawings and Owner standards for floor patterns, special conditions at base corners. Patterns shall include not less than 3 colors in custom layout designed by architect.

2.5 SPECIALTY TILE COMPONENTS

- A. Metal Edge strips: Units by Schluter or approved equal:
1. Suitable for application to ensure smooth transitions, including:
 - a. Tile to tile.
 - b. Tile to carpet.
 - c. Tile to resilient flooring

2.6 SEALANT

- A. For all tile sealing work provide white sanitary silicone tile sealant complying with Fed. Spec. TT-S-001543 equal to Tremco "Proglaze", or GE 1702.

2.7 CRACK SUPPRESSANT / WATERPROOFING MEMBRANE

- A. Usage: Where waterproofing or crack suppressant required under tile assemblies not in showers or at tubs.
- B. Provide products meeting or exceeding the following:
1. Material: Self curing liquid rubber polymer.
 2. Reinforcing fabric: Yes.
 3. Application: Capable being installed horizontally, vertically and on ceilings.
 4. Application: Brush or roller.
 5. GreenGuard certified: Yes.
 6. Clean up: With water while fresh.
 7. Color: Black.
 8. Physical Performance standard; ANSI A118.10, meeting criteria below.
 9. Fugus resistance: Pass.
 10. Seam Strength: > 95 lbs/ inch width.
 11. Breaking strength: 2400 psi.
 12. Dimensional stability: No change.
 13. Shear: 280 psi.
 14. Performance: Extra heavy duty rated.
 15. Crack Suppressant: Yes, up to 1/8 inch per ANSI 118.12.
 16. Thickness: 0.02 inch when cured.
 17. Hydrostatic resistance: 120 psi.
 18. Maximum acceptable deflection: L/360
 19. Product: Laticrete 9325 Waterproof Membrane by Laticrete International of Bethany CT or approved equal.
 20. Submit this product and comparable Schulters products and make recommendations to Owner and Architect based upon superior performance and tile installer recommendations. Final system selection by Owner and Architect.
- C. Waterproofing accessories for recesses: Pre-formed, seamless product designed for application; equal to Barwalt Duk Liner; <http://www.barwalt.com/products/accessories/duk-liners/>; or approved equal.

2.8 SLOPED BED / UNDERLAYMENT & LEVELING COMPOUNDS

- A. Cementitious leveling materials: Provide materials suitable for application depending upon conditions such as existing unacceptable slabs, or wood flooring or cut-back mastics. Appropriate products include: "Masco Latex Cement" latex admix", "Mascrete Latex Flooring Cement", "Silflo 200 Self-Leveler" mixed with C-21 Acrylic, all by Silpro Masonry Systems of Ayer MA or comparable products by Ardex Inc. or approved equals. Provide products which can be feathered to zero and either trowel applied or self-leveling.

- B. Sloped bed mortar: Slope mortar beds to drain at not less than 0.25 inch per foot. Use reinforcing metal to approved type where recommended by TCNA or by manufacturer. Product type and performance:
1. Suitable for interior and exterior applications, both wet and dry.
 2. Bonded and non bonded thick bed applications.
 3. Rapid setting
 4. Premixed.
 5. Polymer fortified.
 6. Acceptable use with proposed waterproofing and crack suppressant products.
 7. Designed for ramping and pitching to feather edge, when used with bonded mortar bed assembly with slurry coat.
 8. Available product: Laticrete Quick Cure Mortar Bed or other products having similar performance and designed for sloped/pitched installations.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with Tile Council of America and ANSI Standard Specifications for Installation for substrate and installation required. Comply with manufacturer's instructions and recommendations.
- B. Install crack suppressant membrane in accordance with manufacturer's instructions and recommendations.
- C. Lay tile in grid pattern with alignment grids. Layout tile to provide uniform joint widths and to minimize cutting; do not use less than 1/2 tile units.
- D. Provide sealant joints where recommended by TCNA and approved by Architect.
- E. Grout and cure, clean and protect.

3.2 METHODS FOR INSTALLATION OF INTERIOR FLOOR TILE

- A. Dry-Set Latex-Portland cement mortar: Comply with TCNA guide spec and the following:
1. Method: F125.
 - a. Substrate: Concrete or cured mortar bed.
 - b. Crack isolation membrane: Latex-Portland cement, ANSI 118.2
 - c. Mortar bond coat: Latex-Portland cement, ANSI 118.4.
 - d. Grout: Polymer modified, ANSI A118.7.
 - e. Grout joints: Width indicated, if not, 0.0625 [1/16] inch, using rectified tiles of equal faces and dimensions.
 6. Preparation: Slope subfloors 0.25 inch to drain.
 7. Installation of tile: ANSI A108.5.
 8. Movement joints: Provide per EJ171.
 9. Usage: Where shown, and, tiled floors not subject to direct spray water.
- B. Thin-set with Waterproof membrane: Comply with TCNA guide spec and the following:
1. Method: F122.
 - a. Substrate: Concrete or cured mortar bed.
 - b. Mortar: Latex-Portland cement, ANSI 118.4.
 - c. Grout: Polymer modified, ANSI A118.7.
 - d. Grout joints: Width indicated, if not, 0.0625 [1/16] inch, using rectified tiles of equal faces and dimensions.
 - e. Membrane: ANSI A 108.13
 2. Preparation: Slope subfloors 0.25 inch to drain.
 3. Installation of tile: ANSI A108.5.
 4. Movement joints: Provide per EJ171.
 5. Usage: Where shown, and tiled shower rooms, but not subject to water deluge, tiled bath floor floors.

3.3 INSTALLATION OF WALL TILE – NEW CONSTRUCTION

- A. Thin-set: Comply with TCNA guide spec and the following:
1. Method: W244C – Cementitious backer.
 - a. Substrate: Cement mortar board.
 - b. Mortar: Latex-Portland cement, ANSI 118.4.

- c. Grout: Polymer modified, ANSI A118.7.
- d. Grout joints: Width indicated, if not, 0.0625 [1/16] inch, using rectified tiles of equal faces and dimensions.
- e. Membrane: ANSI A 108.13, required for wet areas, with partial or complete deluge.
2. Preparation: Comply with method, install membrane.
3. Installation of tile: ANSI A108.5.
4. Movement joints: Provide per EJ171.
5. Usage: Where shown, and tiled shower rooms, tiled bath walls.

3.1 INSTALLATION OF WALL TILE – NEW CONSTRUCTION

A. Thin-set: Comply with TCNA guide spec and the following:

1. Method: W223 – Organic adhesive.
 - a. Substrate: Glass mat faced gypsum board with water resistant core.
 - b. Mortar: Organic adhesive, ANSI 136.1.
 - c. Grout: Polymer modified, ANSI A118.7, or if approved, sealant pre-grouted sheets.
 - d. Grout joints: Width indicated, if not, 0.0625 [1/16] inch, using rectified tiles of equal faces and dimensions.
 - e. Not for use at wet areas, with partial or complete deluge.
2. Preparation: Comply with method, install membrane.
3. Installation of tile: ANSI A108.5.
4. Movement joints: Provide per EJ171.
5. Usage: Where shown, and tiled walls.

END OF SECTION

SECTION 09 51 10 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Lay-in mineral fiber panels.
 - 2. Suspension systems.
- C. Related Sections without limitation include:
 - 1. Lighting fixtures and their independent suspension: Division 26 - Electrical.
 - 2. HVAC diffusers: Division 23 – HVAC
 - 3. Gypsum Wallboard: Section 09 29 00

1.2 QUALITY ASSURANCE

- A. Installer: Firm with not less than three years of successful experience in installation of acoustical ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.
- B. Acceptable Manufacturers: As noted in paragraphs related to each product.
- C. Tolerances:
 - 1. Deflection: Suspension system components, hangers, and fastening devices and acoustical units; Maximum deflection 1/360th of the span. Deflection test: ASTM C635, current edition.
 - 2. Allowable tolerance of finished acoustical ceiling systems; level to within 1/8" in 12'.
- D. Flame Spread Ratings:
 - 1. Acoustical Ceilings:
 - a. Maximum flame spread: 0-25 (ASTM E 84)
 - b. Fuel contributed: Class A (Fed. Spec. SS-5-118B)
 - c. Smoke developed: 25 or less (U.L. Label)

1.3 SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's product specifications and installation instructions for panels, trim, and suspension systems. Include certified laboratory test reports and other data as required to show compliance with these specifications. Previously performed test published in manufacturer's literature is acceptable. Include manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performance.
- B. Samples:
 - 1. Submit 2 sets of 12" square samples of each style of ceiling panel. In each set of samples show the full range of exposed color and texture to be expected in the completed work.
 - 2. Submit two sets of 12" long samples of suspension system and edge moldings.
 - 3. Submit two sets of 12" long samples of extruded trim and standard system accessories. Samples shall be and. Provide one radiused section and one 90 degree corner both split to show butted joint with splice plate and corner reinforcement.
- C. Extra stock: 2 per cent of material installed.
- D. Certificates:
 - 1. Furnish certification of fire endurance rating and flame spread index from fire rating organization.
 - 2. Furnish certification that materials and systems conform to specification requirements.

1.4 PRODUCT DELIVERY AND HANDLING

- A. All ceiling system materials shall be delivered in manufacturer's original labeled cartons, indicating brand name, pattern, size, thickness and fire rating, and shall be suitably stored within the building and protected from damage until ready for installation.

1.5 JOB CONDITIONS

- A. Do not install interior acoustical ceilings until space has been enclosed and is weather-tight, until wet-work in the space has been completed and is nominally dry, until work above ceilings has been completed, and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.
- B. Maintain humidity of 60% - 70% in area where acoustical materials are to be installed, 24 hours before, during, and 24 hours after installation.
- C. Maintain uniform temperature in range of 55 to 70 degrees F prior to and during installation.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING SYSTEMS

- A. Provide ceiling systems indicated in Finish Legend. Where none are indicated provide systems indicated below. In the event of conflict, the higher quality shall govern.
- B. ACT – 1 Acoustic Panels: Armstrong High NRC Ultima#1941, Tegular beveled, White. (24 x 24 x 7/8 inch Panels); for Prelude 15/16 inch grid.
- C. ACT – 2 Acoustic Panels: Armstrong High NRC Ultima#1944, Square edge, White. (24 x 48 x 7/8 inch Panels); for Prelude 15/16 inch grid.
- D. ACT – 3 Acoustic Panels: Armstrong High NRC Ultima#1944, Tegular beveled, White. (24 x 48 x 7/8 inch Panels); for Prelude 15/16 inch grid.

2.2 CEILING SUSPENSION MATERIALS

- A. Exposed Suspension System: Provide manufacturer's narrow and standard profile, exposed grid of commercial quality cold rolled, pre-treated, pre-finished electro-galvanized steel grid system complying with ASTM C-635 for Intermediate Duty direct hung double-web with flat (low gloss) off white baked enamel face and black or white interior. Provide grid modules to match ceiling panel sizes.
- B. Provide products that meet or exceed specified requirements from one of the following:
 - 1. Armstrong
 - 2. Chicago Metallic Corp.
 - 3. USG/Donn Corp.
 - 4. National Rolling Mills.
 - 5. Technical Ceiling Systems.
- C. Provide all wall angles and accessories for a complete system in matching finish.
 - 1. Provide factory formed, shop formed or when approved, field formed break metal of approved color to shapes shown.
- D. Performance of system:
 - 1. The Suspension System shall support the ceiling assembly on the drawing, or specified herein, with a maximum deflection of 1/360 of the span, in accordance with intermediate duty classification.
 - 2. The suspension system shall lock together in a positive manner providing pull out values in tension of 300 lbs. or greater. Provide seismic bracing where ceilings exceed threshold size for same.
 - 3. Hanger wires: Galvanized carbon steel, ASTM A641, soft temper, pre-stretched, yield-stress load of at least 3 times design load, but not less than 12 gauge (0.106"). Wires must be sized and spaced to meet the criteria of this Section, and applicable codes. Provide wire in bundles of straight sections and not in coils.
 - 4. Attachment devices: Provide units sized for 5 times design load for direct hung in Table 1 per ASTM C635.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Examine the conditions under which the acoustical ceiling and trim work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner. Notify construction manager in writing of any unacceptable conditions. Starting work in any area constitutes acceptance of conditions in that area.
- B. Layout of ceiling shall comply with the reflected ceiling plans. Ask for Architect's direction if discrepancies or omissions exist in the plan.

3.2 INSTALLATION OF ACOUSTICAL CEILINGS

- A. General: Install materials in accordance with manufacturer's printed instructions and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to the work.
- B. Arrange acoustical units and orient directionally-patterned units (if any) in the manner shown by reflected ceilings plans. Install tile with pattern running in one direction. Where discrepancies in the field do not permit intended installation notify the Architect for direction.
- C. Install suspension systems to comply with ASTM C-636, with main runners 48" o.c. and with hangers near each end and spaced as required to meet the criteria herein specified. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for the substrate, and which will not deteriorate or fail with age or elevated temperatures. Do not splay wire more than 5" in 4 feet vertical drop.
- D. Install manufacturer's standard edge moldings or, if drawn, supply the type indicated, at edges of each acoustical ceiling area, and at locations where edge of units would otherwise be exposed after completion of the work.
- E. Secure moldings to building construction well by fastening with screw-anchors into the substrate, through holes drilled in vertical leg. Space holes not more than 3 inches from each end and not more than 16 inches o.c. along each molding.
- F. Corners shall be neatly and tightly butted or mitered and securely connected to prevent dislocation.
- G. Install acoustical panels in coordination with suspension system with edges concealed by support of suspension members.
- H. Acoustical units: Install in level plane in straight line courses.
 - 1. Place units to bear all around suspension members.
 - 2. Minimum width of border tiles: one-half unit dimension, unless pattern shows otherwise.
 - 3. When units must be cut to less than full size, cut side shall be precisely cut with reveal edge equal to other reveal edge sides.
- I. Air supply and return (and support frames) units shall be installed in the framing at locations designated on the reflected ceiling plans.
- A. Erect system according to manufacturer recommendations to achieve optimum results, approved shop drawings and these specifications. Erect components plumb, plane and true to shapes, lines and radii shown. Joints shall be straight, clean, and hairline, free of gaps, knicks, ragged edges or out-of-alignment elements.
- B. Note: The system has been designed to eliminate the need for field cutting. Obtain written approval before making field cuts.
- A. Inspect existing ceilings to remain. Replace cracked, damaged or soiled tiles with new work to match.

3.3 CLEANING AND PROTECTION

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
- B. Protection of installed materials is specified elsewhere in the General Conditions. Provide information on measures and requirements necessary to protect acoustical ceilings from damage, including damage from excessive

temperature and humidity, so that work will be without damage and deterioration at the time of acceptance by the Owner.

- C. Remove debris, cartons and rubbish from work areas daily as work progresses.
- D. Repair or replace any work of other trades damaged by the installation of the work of this Section.

END OF SECTION

SECTION 09 65 10 - RESILIENT BASE

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitations providing:
 - 1. Resilient wall base.

1.2 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 5 years experience installing resilient flooring.
- B. Verify substrate conditions and suitability by carrying out adhesion tests.
- C. VOC Washington State IAQ Test per ASTM D5116.
- D. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
 - 2. Smoke density: Compliance with code but less than 450 per NFPA 258 / ASTM E 662.
- E. Mock-ups: Mock-ups shall included transition assemblies and components to demonstrate that adjoining surfaces and materials are flush. Provide mock-ups of all material conditions abutting resilient flooring.

1.3 SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's descriptive brochures and installation instructions for each type of resilient flooring and accessory.
- B. Samples Submit 2 chains or boxes of small color samples illustrating entire line of material proposed for base.
- C. After initial color choice has been made by Architect, submit 2 sets of full size samples at least 12 inches long of each type to be used.

1.4 PRODUCT DELIVERY AND STORAGE

- A. Compl with provisions of Product Requirements Division 1 and the following:
 - 1. Unless otherwise directed, store materials in original containers at not less than 70` F for not less than 24 hours immediately before installation.

1.5 JOB CONDITIONS

- A. Areas to receive flooring shall be heated to between 65 degrees F. and 90 degrees F. for at least 48 hours prior to installation. Maintain 65 degree F. temperature continuously during and after installation as recommended by flooring manufacturer, but for not less than 48 hours. Thereafter do not allow ambient temperature to fall below 55 degrees F.
- B. Verify age and extent of cure of masonry or concrete.

1.6 ADDITIONAL MATERIALS

- A. Base: Provide one full box of 100 linear feet minimum or 1/2% of total linear footage installed, whichever is greater, in each style and color of resilient base installed. Provide in manufacturer's original unopened boxes plainly labeled with description of contents. Do not furnish scrap.

1.7 WARRANTY

- A. Warrant products as given below. Provide manufacturer's standard warranty equal to or better than times given below and/or warrant materials as follows:
Wall base: 2 years limited warranty.

PART 2 - PRODUCTS

2.1 VINYL RESILIENT BASE

- A. Refer to Finish Material Legend and provide scheduled units.
- B. Provide 1/8 inch PVC vinyl base at vinyl composition tile, and at locations indicated, complying with Federal Spec SS-W-40a Type II Class 1, Styles A and B of 1st quality, smooth and free of imperfections. Provide base of 100 foot roll material in continuous lengths. Base shall comply with the following:
 - 1. Height: As shown, if not indicated, 4 inches
 - 2. Typical & Carpet Style: Straight toe
 - 3. Style at VCT: Top-set standard cove toe
 - 4. Manufacturer: Johnsonite or Roppe.
 - 5. Typical Color: As selected or shown.

2.2 ACCESSORIES

- A. Sustainable & "Green" products: Use products complying with Sustainable design requirements and meeting manufacturer conditions.
- B. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer. Asphalt emulsions and other non-waterproof types not acceptable. Where manufacturer insists on use of their adhesives for warranties to be effective, use only their products.
- C. Comply with provisions of Division 01 and the following VOC levels:
 - 1. Cove base adhesives: 50 g/L.

PART THREE - EXECUTION

3.1 INSTALLATION OF RESILIENT BASE AND ACCESSORIES

- A. Comply with the following: Section 09 65 50 – Resilient Flooring Installation.

END OF SECTION

SECTION 09 65 14 - RESILIENT LVT VINYL FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: All the Contract Documents, including the Drawings, General and Supplementary Conditions and Division 1 General Requirements apply to the work of this Section.
- B. Section includes, without limitations, providing:
 - 1. Luxury vinyl tile/plank flooring
- C. Related work:
 - 1. Division 3 – Concrete & Cementitious assemblies.
 - 2. Section 09 65 10 – Resilient base.
 - 3. Section 09 65 50 – Resilient flooring installation.

1.2 QUALITY ASSURANCE

- A. Comply with section 09 65 50.

1.3 SUBMITTALS

- A. Comply with provisions of Division 1 and submit the following:
 - 1. Manufacturer's Data: Submit manufacturer's descriptive brochures and installation instructions for each type of resilient flooring and accessory.
 - 2. Samples: Submit 2 chains or boxes of small color samples illustrating entire line of material proposed for flooring and base.
 - 3. After initial color choice has been made by Architect, submit 2 sets of full size samples at least 12 inches long of each type to be used.
 - 4. Mark samples with name of contractor, project identification and area where materials are to be used. Also include the manufacturer's complete identification of his product.

1.4 QUALITY ASSURANCE

- A. Comply with section 09 65 50.

1.5 PRODUCT DELIVERY AND STORAGE

- A. Comply with Product Requirements of Division 1 and the following:
 - 1. Unless otherwise directed, store materials in original containers at not less than 70° F for not less than 24 hours immediately before installation.

1.6 JOB CONDITIONS

- A. Comply with section 09 65 50.

1.7 ADDITIONAL MATERIALS

- A. Sheet goods: Provide one full roll of sheet material or 1% of the total area of resilient floor installed, whichever is greater, of each pattern and color installed, for future maintenance requirements. Furnish extra stock in manufacturer's original unopened rolls plainly marked with product number, shade, pattern and location within Project where installed.
- B. Accessories: Provide 100 linear feet or 1/3% of total linear footage installed, whichever is greater, of each style and color of resilient accessory installed. Provide in original boxes, plainly labeled, and in original uncut lengths. Do not furnish scrap.

1.8 WARRANTY

- A. Warrant products as given below. Provide manufacturer's standard warranty equal to or better than times given below and/or warrant materials as follows:
Sheet goods: Manufacturer's standard.

PART 2 - PRODUCTS

2.1 LUXURY VINYL TILE/PLANK FLOORING – LOW VOC

- A. Provide commercial grade sheet flooring equal or better than criteria given below and as scheduled on drawings.
1. Material: Low VOC
 2. Overall Gage: 0.120 inch thick minimum.
 3. Wear layer: 0.020 inch thick minimum.
 4. Edge treatment: Square.
 5. Surface treatment: Emboss based upon product selected.
 6. Static load: 250 psi minimum.
 7. Standard: ASTM F1700, Class II, Type B, meet or exceed.
 8. Critical Radiant Flux: Meet Class I, 045 watts/sq.cm or less.
 9. Slip resistant: ADA compliant.
 10. Substrate application: Verify manufacturer acceptance.
 11. Tile: Where and size shown.

2.2 ACCESSORIES, UNDERLAYMENT & LEVELING COMPOUNDS

- A. Comply with Section 09 65 50.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the provisions of Section 01 70 00 and Section 09 65 50 - especially requirements related to:
1. Inspection and examination. Tolerances and measurement.
 2. Approvals, inspections and filed quality control.
 3. Layout. Installation.
 4. Polishing. Cleaning.
 5. Protection.

END OF SECTION

SECTION 09 65 20.1 - RESILIENT VCT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general Contract provisions, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitations, providing:
 - 1. Resilient VCT tile flooring indicated in legends.
 - 2. Resilient accessories.
- C. Related sections, without limitation, include:
 - 1. Division 3 – Concrete & Cementitious assemblies.
 - 2. Section 09 65 10 – Resilient base.
 - 3. Section 09 65 50 – Resilient flooring installation.

1.2 QUALITY ASSURANCE

- A. Comply with Section 09 65 50.

1.3 SUBMITTALS

- A. Comply with Division 01 and submit:
 - 1. Manufacturer's Data: Submit manufacturer's descriptive brochures and installation instructions for each type of resilient flooring and accessory.
 - 2. Samples: Submit 2 chains or boxes of small color samples illustrating entire line of material proposed for flooring and base.
 - 3. After initial color choice has been made by Architect, submit 2 sets of full size samples at least 12 inches long of each type to be used.
 - 4. Mark samples with name of contractor, project identification and area where materials are to be used. Also include the manufacturer's complete identification of his product.

1.4 PRODUCT DELIVERY AND STORAGE

- A. Comply with provisions of Product Requirements, Division 1 and the following:
 - 1. Unless otherwise directed, store materials in original containers at not less than 70` F for not less than 24 hours immediately before installation.

1.5 JOB CONDITIONS

- A. Comply with Section 09 65 50.

1.6 ADDITIONAL MATERIALS

- A. Tile: Provide one full box of 40 tiles or 5% of the total area of resilient tile installed, whichever is greater, of each pattern and color installed, for future maintenance requirements. Furnish extra stock in manufacturer's original unopened boxes plainly marked with product number, shade, pattern and location within Project where installed.
- B. Accessories: Provide 100 linear feet or 1/3% of total linear footage installed, whichever is greater, of each style and color of resilient accessory installed. Provide in original boxes, plainly labeled, and in original uncut lengths. Do not furnish scrap.

1.7 WARRANTY

- A. Warrant products as given below. Provide manufacturer's standard warranty equal to or better than times given below and/or warrant materials as follows:
VCT, Rubber & VT: 5 year limited warranty

PART 2 - PRODUCTS

2.1 SCHEDULED TILE

- A. Provide products shown in Finish Legend, if not, indicated provide materials below as given in finish schedule or shown on drawings.

2.2 BIO-BASED COMPOSITION TILE FLOORING

- A. Provide bio-based composition tile [aka "VCT"] as follows:
 1. Size: 12 x 24 x 1/8 inch
 2. Composition: Polyester resin binder, fillers and pigments
 3. Texture color distribution: Uniform through tile pattern and material.
 4. Standard: ASTM F1066 - for size, squareness, thickness, indentation, impact, deflection, through pattern, resistance to chemicals and resistance to heat.
 5. Binder System: No polyvinyl chloride resins, plasticizers and stabilizers permitted.
 6. Product: Armstrong BioStride "Striations" Series or approved equal.
 7. Colors: As selected by architect from manufacturer's full range.

2.3 ADHESIVES

- A. Use only types recommended by manufacturer in writing for application.

2.4 RESILIENT BASE

- A. When indicated on drawings, refer to section 09 65 10

2.5 ACCESSORIES

- A. Refer to Section 09 65 50.

2.6 FEATURE STRIPS & BORDERS

- A. As shown or scheduled, if not, carry contrasting border in each space with resilient flooring.

2.7 UNDERLAYMENT & LEVELING COMPOUNDS

- A. Refer to Section 09 65 50.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Refer to Section 09 65 50.

3.2 CLEAN UP

- A. Remove from the job site and legally dispose of all cartons, cans, and rubbish resulting from the work of this Section.
- B. Restore or replace any finished exposed surface soiled by the work of this Section.

END OF SECTION

SECTION 09 65 25 - RESILIENT STAIR FINISHES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: All the Contract Documents, including the Drawings, General and Supplementary Conditions and Division 1 General Requirements apply to the work of this Section.
- B. Section includes, without limitation, providing:
 - 1. Stair flooring resilient finishes.
- C. Related work:
 - 1. Division 03 – Concrete & Cementitious assemblies.
 - 2. Division 09 – Resilient tile flooring.
 - 3. Division 09 – Resilient flooring installation.

1.2 QUALITY ASSURANCE

- A. Comply with provisions of Section 09 65 50.

1.3 SUBMITTALS

- A. Comply with Division 01 and as follows:
 - 1. Manufacturer's Data: Submit manufacturer's descriptive brochures and installation instructions for each type of resilient flooring and accessory.
 - 2. Samples: Submit 2 chains or boxes of small color samples illustrating entire line of material proposed for flooring and base.
 - 3. After initial color choice has been made by Architect, submit 2 sets of full size samples at least 12 inches long of each type to be used.
 - 4. Mark samples with name of contractor, project identification and area where materials are to be used. Also include the manufacturer's complete identification of his product.

1.4 PRODUCT DELIVERY AND STORAGE

- A. Comply with Division 01 and as follows:
 - 1. Deliver materials to project site in manufacturer's original, unopened containers with labels indicating brand names, colors and patterns and quality designations legible and intact.
 - 2. Do not open containers or remove markings until materials are inspected and accepted.
 - 3. Store and protect accepted materials in accordance with manufacturer's directions and recommendations.
 - 4. Unless otherwise directed, store materials in original containers at not less than 70` F for not less than 24 hours immediately before installation.

1.5 JOB CONDITIONS

- A. Comply with Section 09 65 70.

1.6 ADDITIONAL MATERIALS

- A. Tile: Provide one full box or 5% of the total area of resilient materials installed, whichever is greater, of each pattern and color installed. Furnish extra stock in manufacturer's original unopened boxes plainly marked with product number, shade, pattern and location within Project where installed.

1.7 WARRANTY

- A. Warrant products as given below. Provide manufacturer's standard warranty equal to or better than times given below and/or warrant materials as follows:
Wall base: 2 years limited warranty

VCT, Rubber & VT: 10 year limited wear warranty

PART 2 - PRODUCTS

2.1 VINYL STAIR FLOORING & ACCESSORIES

- A. Acceptable manufacturer: Johnsonite of Chagrin Falls Ohio or approved equal.
- B. Material: First quality, homogeneous resilient PVC vinyl compound with color extending throughout thickness of product. Units shall be free of objectional odors, blisters, cracks and imperfections which detract from use or appearance. Comply with Fed Spec RR-T-650B Composition B, and complying with NFPA Class 1 and ADA material requirements.
- C. Treads: Provide Johnsonite "Service Weight" in manufacturer's standard profile 5/32 to 5/64 inch or thicker treads with square or tapered nose with a leading edge of 1/16 inch.
- D. Risers: Not required. Provide painted risers under other sections.
- E. Landing tiles: Provide VCT or other standard products as scheduled. Special stair tiles are not required.
- F. Colors/Patterns: Provide colors equal to Johnsonite "Color Match" Series plus No. 76 Cinnamon.
- G. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill substrates that do not conform to tread contours.
- H. Stringers: Where shown and where treads butt into drywall, provide 12 inch high rubber stringer[s] to provide a finished base running along rubber treads and risers.
- I. Carpet Nosing for carpet treads & risers: Johnsonite 2x undercut Carpet vinyl stair nosing VCD-XX for ¼ and 5/16 carpet, with ribbed surface. Where thicker carpet is provide, use type recommended by manufacturer for application. Provide color and samples for approval and selection by Architect. Include colors equal to Johnsonite "Color Match" series.
- F. Colors/Patterns: Provide colors selected or indicated in Finish Procut List.

2.2 ACCESSORIES, UNDERLAYMENT & LEVELING COMPOUNDS

- A. Comply with Section 09 65 50.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Comply with Section 09 65 50.

3.2 CLEANING, POLISHING AND PROTECTION

- A. Comply with Section 09 65 50.

END OF SECTION

SECTION 09 65 26 - RESILIENT TACTILE & PHOTO-LUMINESCENT WARNING ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: All the Contract Documents, including the Drawings, General and Supplementary Conditions and Division 1 General Requirements apply to the work of this Section.
- B. Section includes, without limitation, providing:
 - 1. Stair tread nosing resilient tactile and luminescent warning accessories.
 - 2. Other luminescent strips indicated.
- C. Extent: For egress paths or service stairs scheduled or shown to receive warning or luminescent nosings or strips.
- D. Related work:
 - 1. Division 03 – Concrete & Cementitious assemblies.
 - 2. Division 09 – Resilient flooring installation.

1.2 QUALITY ASSURANCE

- A. Comply with provisions of Section 09 65 70.

1.3 SUBMITTALS

- A. Comply with Division 01 and the following:
 - 1. Manufacturer's Data: Submit manufacturer's descriptive brochures and installation instructions for each type of resilient flooring and accessory.
 - 2. Samples: Submit 2 chains or boxes of small color samples illustrating entire line of material proposed for flooring and base.
 - 3. After initial color choice has been made by Architect, submit 2 sets of full size samples at least 12 inches long of each type to be used.
 - 4. Mark samples with name of contractor, project identification and area where materials are to be used. Also include the manufacturer's complete identification of his product.

1.4 PRODUCT DELIVERY AND STORAGE

- A. Deliver materials to project site in manufacturer's original, unopened containers with labels indicating brand names, colors and patterns and quality designations legible and intact.
- B. Do not open containers or remove markings until materials are inspected and accepted.
- C. Store and protect accepted materials in accordance with manufacturer's directions and recommendations.
- D. Unless otherwise directed, store materials in original containers at not less than 70` F for not less than 24 hours immediately before installation.

1.5 QUALITY ASSURANCE

- A. Comply with applicable provisions of ANSI A117.1-1986 detectable tactile warning surface design requirements.

1.6 ADDITIONAL MATERIALS

- A. Tile: Provide one full box or 5% of the total area of resilient materials installed, whichever is greater, of each pattern and color installed. Furnish extra stock in manufacturer's original unopened boxes plainly marked with product number, shade, pattern and location within Project where installed.

1.7 WARRANTY

- A. Warrant products as given below. Provide manufacturer's standard warranty equal to or better than times given below and/or warrant materials as follows:
Rubber & vinyl materials: 5 year limited warranty.

PART 2 - PRODUCTS

2.1 RESILIENT WARNING & LUMINESCENT ACCESSORIES

- A. Acceptable manufacturer: As scheduled, if not, Johnsonite of Chagrin Falls Ohio or approved equal.
- B. Material: First quality, homogeneous resilient rubber compound with color extending throughout thickness of product. Units shall be free of objectional odors, blisters, cracks and imperfections which detract from use or appearance. Comply with the following:
1. Floor tile Standard: ASTM F1344, Class 1A.
 2. Relief pattern: As shown or scheduled. .
 3. Thickness: As scheduled.
 4. Slip resistance: >0.85 per ASTM D2047.
 5. Abrasion resistance: > 0.5 grams, ASTM C501.
 6. Hardness: Shore A, 85 minimum; ASTM D2240.
 7. Size: As shown, if not, 18.125 inch.
 8. Color: Selected from full range, by Architect.

2.2 STAIR WARNING STRIPS

- A. Provide the type of stair warning strip listed below for stairs not scheduled to receive resilient treads or risers.
- B. Stair warning strip types: As scheduled, if not, as follows:
1. Nosing suitable to application to concrete filled metal pan stair tread without resilient stair tread or riser.
 2. Subject to approval select from one of the following:
 3. Johnsonite VITSN-XX, 3 x 2 inch, top set with 2" co-extruded visually impaired strip.
 4. Johnsonite DTN-XX, 1.75 x 1.75 inch, top set stair nosing for residential use.
 5. Johnsonite VIRCEN-XX-B2, 3 x 2.180 inch, top set with 2 inch co-extruded strip for visually impaired. Fill top of tread flush with fully bonded cement based underlayment to make top edge of nosing completely flush.
- C. Colors/Patterns: As scheduled, if not, provide colors equal to Johnsonite "Visually Impaired Color Solutions" Series plus, where noted, include:
1. Co-extruded photo-luminescent insert.
- D. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill substrates that do not conform to tread nosing contours.
- E. Underlayment and leveling compounds: Comply with Section 09 65 50.

2.3 PHOTO-LUMINESCENT EGRESS WARNING STRIPS

- A. Egress warning strip types: As scheduled, if not, as follows:
1. Available manufacturer: Everglow; <http://www.everglow.us/>.
 2. Product: As shown, if not equal to:
 3. "Everglow Photo-luminescent Exit Path Marking System" with the following characteristics:
 - a. Reliable and Effective
 - b. Requires no electricity, batteries, lamps or wiring.
 - c. Contains no radioactive or toxic components.
 - d. Tamper Resistant Acrylic Tape- free of vinyl and other toxic components

- B. Colors/Patterns: As scheduled, if not, provide colors from full manufactured range comply with NFPA requirements.
- C. Where paint coatings are shown in lieu of tapes, provide Everglow Epoxy Coating kits installed by trained mechanics with previous similar installation experience.

PART 3 - EXECUTION

3.1 INSTALLATION, CLEANING, POLISHING AND PROTECTION

- A. Comply with Section 09 65 50.
- B. Install work as shown and in compliance with applicable NFPA 101 requirements. Comply with manufacturer installation restrictions, requirements, and limitations.

END OF SECTION

SECTION 09 65 27.1 - MODULAR SPORTS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general Contract provisions, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitations, providing:
 - 1. Resilient modular tile sports flooring.
 - 2. Substrate preparation.
- C. Extent: Where shown, interlocking type.
- D. Related sections, without limitation, include:
 - 1. Division 3 – Concrete & Cementitious assemblies.
 - 2. Section 09 65 10 – Resilient base.
 - 3. Section 09 65 50 – Resilient flooring installation.

1.2 QUALITY ASSURANCE

- A. Comply with Section 09 65 50.

1.3 SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's descriptive brochures and installation instructions for each type of resilient flooring and accessory.
- B. Samples: Submit 2 chains or boxes of small color samples illustrating entire line of material proposed for flooring.
- C. After initial color choice has been made by Architect, submit 2 sets of full size samples at least 12 inches long of each type to be used.
- D. Mark samples with name of contractor, project identification and area where materials are to be used. Also include the manufacturer's complete identification of his product.

1.4 PRODUCT DELIVERY AND STORAGE

- A. Comply with provisions of Product Requirements, Division 1 and the following:
 - 1. Unless otherwise directed, store materials in original containers at not less than 70` F for not less than 24 hours immediately before installation.

1.5 JOB CONDITIONS

- A. Comply with Section 09 65 50.

1.6 ADDITIONAL MATERIALS

- A. Provide 2% of the total area of resilient tile installed, whichever is greater, of each pattern and color installed, for future maintenance requirements. Furnish extra stock in manufacturer's original unopened boxes plainly marked with product number, shade, pattern and location within Project where installed.

1.7 WARRANTY

- A. Warrant products as given below. Provide manufacturer's standard warranty equal to or better than times given below and/or warrant materials as follows:
Rubber & VT: 10 year limited warranty

PART 2 - PRODUCTS

2.1 SCHEDULED FINISHES

- A. Provide products shown in Finish Legend, if not, indicated provide materials below as given in finish schedule or shown on drawings.

2.2 INTERLOCKING, RUBBER FLOOR TILE [Roppe Tufflex]

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Roppe.
 2. Conner Sports Surface Solutions.
 3. Flexco.
 4. Horner Flooring Company, Inc.
 5. Johnsonite; a Tarkett company.
- B. Basis of design: Roppe Tufflex Spartus Multipurpose Sports Floor, interlocking type.
- B. Description: Athletic flooring consisting of modular rubber tiles with precision cut, interlocking edges, for free-lay installation.
1. Material: Rubber, Recycled-rubber compound.
 2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25% percent.
- C. Product characteristics:
1. Basis of design: Roppe Tufflex Spartus Multipurpose Sports Floor, interlocking type.
 2. Thickness over all: 0.3750 inch.
 3. Size/dimension: Interlocking: 25.75 x 25.75 inch.
 4. Usage: Interior and exterior.
 5. Fire rating:
 - a. Radiant Panel Critical Radiant Flux – 0.45 watts/cm² or more, Class I.
 - b. Smoke: ASTM E 662 Smoke Chamber Optical Density – 450 or less.
 - c. Flame spread: , < 75 per ASTM E84.
 6. Static Coefficient: Meet or exceed ADA required slip resistance.
 7. Border: Interlocking, beveled-edge tiles, of same material as floor tile; with bevels that transition from thickness of floor tile to surface below it; with straight outside edges; for use where flooring corners and edges do not abut vertical surfaces.
 8. Colors: As selected by architect from manufacturer's full range.
 9. Border Color and Pattern: As selected if not, matching floor tile
 10. Tile Interlock: Visible
 11. Installation: Loose laid.
- D. Performance:
1. ASTM D2047, Static Coefficient of Friction; > 0.8
 2. ASTM E648/NFPA 253, Critical Radiant Flux; Class 1, > 0.45 W/cm²
 3. ASTM E662/NFPA 258, Smoke Density; Passes, < 450
 4. ASTM F970, Static Load Limit; Passes 250 PSI
 5. ASTM F970, Modified Static Load Limit; Passes 1,000 PSI
 6. ASTM F1515, Light Stability: Passes $\Delta E < 8$
 7. ASTM F2772, Athletic Performance Properties of Indoor Sports Floor Systems: Passes
 8. ASTM F2569, Shock Absorption: Passes Class 1
 9. ASTM F2117 – Vertical Ball Rebound: Passes
 10. ASTM F2157 – Vertical Deformation: Passes
 11. ASTM E303 – Surface Friction, Dry: Passes
 12. ASTM E492, Acoustical (Impact Insulation Class) Impact; IIC 52 (6" concrete, no drop ceiling), 67 IIC (6" concrete, with drop ceiling).
 13. ASTM E90, Acoustical (Sound Transmission Class) STC 52 (6" concrete, no drop ceiling), STC 63 (6" concrete, with drop ceiling)

2.3 ADHESIVES

- A. Use only types recommended by manufacturer in writing for application, and meeting applicable VOC limits.

2.4 RESILIENT BASE

- A. When indicated on drawings, refer to section 09 65 10

2.5 ACCESSORIES

- A. Refer to Section 09 65 50.

2.6 FEATURE STRIPS & BORDERS

- A. As shown or scheduled, if not, carry contrasting border in each space with resilient flooring.

2.7 UNDERLAYMENT & LEVELING COMPOUNDS

- A. Refer to Section 09 65 50.

2.8 MOISTURE MITIGATION & MANUFACTURER RECOMMENDED APPLICATION PRODUCTS

- A. Comply with Section 09 65 50 and manufacturers recommendations and the following:
- B. Moisture Mitigation: Moisture testing is required for all Tuflex Rubber Tile installations. Mitigation should be performed if results indicate high levels of moisture. Recommended Moisture Mitigation Product:
 1. Excelsior MM-100, Moisture Mitigation provided by Roppe, subject to manufacturer limitations and restrictions.
 2. Use manufacturer recommended products including for maintenance and final clean up.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Refer to Section 09 65 50.

3.2 INSTALLATION

- A. Refer to Section 09 65 50, but install tiles loose laid per manufacturer direction.

3.3 CLEAN UP

- A. Remove from the job site and legally dispose of all cartons, cans, and rubbish resulting from the work of this Section.
- B. Restore or replace any finished exposed surface soiled by the work of this Section.

END OF SECTION

SECTION 09 65 50 - RESILIENT FLOORING INSTALLATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: All the Contract Documents, including the Drawings, General and Supplementary Conditions and Division 1 General Requirements apply to the work of this Section.
- B. Section includes, without limitation, providing:
 - 1. Leveling & flash patching.
 - 2. Calcium chloride or moisture meter testing.
 - 3. Installation of resilient flooring.
- C. Related work:
 - 1. Division 3 – Concrete & Cementitious assemblies.
 - 2. Division 6 - Carpentry
 - 3. Division 9 – Resilient flooring
- D. Owner requirements: Refer to Division 1, specific Owner requirements affecting use of adhesives.

1.2 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum 5 years experience installing resilient flooring.
- B. Verify substrate conditions and suitability by carrying out adhesion tests of resilient flooring bond to substrate as recommended by Armstrong in their installation system manual F-5061 and Moisture meter testing per ASTM F2170-02 Follow tile and adhesive manufacturer recommendations for performing test patches. Comply with testing requirements specified here.
- C. Prior to start of construction, coordinate with concrete work to ensure no concrete curing agents, sealers, hardeners, or parting agents will be used in areas to receive resilient flooring.
- D. VOC Washington State IAQ Test per ASTM D5116.
- E. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.3 SUBMITTALS

- A. Comply with provisions of Division 1 and submit:
 - 1. Manufacturer's Data: Submit manufacturer's descriptive brochures and installation instructions for each type of resilient flooring installation materials and accessories.
 - 2. Test results: Provide moisture content readings and test results in writing.

1.4 PRODUCT DELIVERY AND STORAGE

- A. Comply with provisions of Division 1.

1.5 JOB CONDITIONS

- A. Areas to receive flooring shall be heated to between 65 degrees F. and 90 degrees F. for at least 48 hours prior to installation. Maintain 65 degree F. temperature continuously during and after installation as recommended by flooring manufacturer, but for not less than 48 hours. Thereafter do not allow ambient temperature to fall below 55 degrees F.
- B. Verify age and extent of cure of concrete slabs.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Manufacturer requirements: Use products acceptable to and meeting manufacturer recommendations, limitations and requirements for each application as appropriate. Where manufacturer considers application unique or restricted to specific installatio product, use only product indicated in manufacturer literature
- B. Sustainagble & "Green" products: Use products complying with Sustainable design requirements and meeting manufacturer conditions.
- C. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer. Asphalt emulsions and other non-waterproof types not acceptable. Where manufacturer insists on use of their adhesives for warranties to be effective, use only their products.
- D. Concrete Slab Primer and Crack Filler: Non-staining type as recommended by flooring manufacturer.
- E. Floor cleaner: Commercial floor cleaner as recommended by flooring manufacturer such as "C-410" by Armstrong, Flintkote "Floor Cleaner" or Hillyard "Super Shine-All".
- F. Floor sealer: Commercial floor cleaner as recommended by flooring manufacturer such as "C-410" by Armstrong, Flintkote "Floor Cleaner" or Hillyard "Super Shine-All".
- G. Rubber/Cork Tile Sealer/Finish: *Johnson's Carefree Matte* or *Taski Vision Matte* mopped on after installation.
- H. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill substrates that do not conform to tread contours.

2.2 UNDERLAYMENT & LEVELING COMPOUNDS

- A. Latex Underlayment: As recommended for use on concrete floors by resilient flooring manufacturers and equal to Armstrong "S-105", Silpro "Pro-Finish" or "Lev-L-Astic" by Allied.
- B. Cementitious leveling materials: Provide materials suitable for application depending upon conditions such as existing unacceptable slabs, or wood flooring or cut-back mastics. Appropriate products include: "Masco Latex Cement" latex admix", "Mascrete Latex Flooring Cement", "Silflo 200 Self-Leveler" mixed with C-21 Acrylic, all by Silpro Masonry Systems of Ayer MA or comparable products by Ardex Inc. or approved equals. Provide products which can be feathered to zero and either trowel applied or self-leveling.

2.3 RESILIENT ACCESSORIES

- A. Edge strips, guards, reducers: Provide products shown, if not, as follows:
 - 1. Finishing components: Molded or extruded hard rubber to match conditions.
 - 2. Manufacturers: Roppe Corp, Johnsonite Inc., Mercer Plastic or approved equal.
 - 3. Material: 1st quality rubber free of imperfections.
 - 4. Shape: 1/8 inch or thicker, tapered or bullnose edge.
 - 5. Color: As selected by Architect.
 - 6. Size: Not less than 1" wide.
 - 7. Locations: At perimeter of resilient flooring abutting different floor material.
 - 8. Sizes and shapes: As required to meet other adjacent floor materials such as carpet.
 - 9. Provide 1st quality rubber free of imperfections.

PART 3 - EXECUTION

3.1 INSPECTION & TESTING

- A. Examine the areas and conditions where work to be installed. Ensure slabs are sufficiently cured. Notify construction manager in writing of any unsatisfactory conditions with are not covered as part of the work of this section.

- B. Use manufacture recommended moisture meters or carry out specified bond tests. Tests to include:
 1. ASTM F2170-02 Probe Test for determining relative humidity, probe or radio or both.
 2. Alkalinity: Test pH and comply with manufacturer recommendations.
 3. For long span planks: Measure floor and slab flatness and levelness according to ASTM E 1155.
 4. Submit test results in writing.

3.2 PREPARATION

- A. Prepare concrete substrates according to ASTM F 710 and as follows:
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. New construction: Verify floors have no variation greater than 1/8 inch in 10 feet; ensure concrete slabs are 21 days old or older and up to required strengths.
 3. Correct imperfections, dips and rises with suitable underlayment of approved type.
 4. Floors to receive resilient flooring shall be finished even and level, free of perceptible changes of level or line.
 5. Fill all cracks in subsurfaces with specified crack filler.
 6. Apply latex underlayment at intersections of resilient flooring with carpet and where required. Taper for a minimum length of 3 feet from the intersection joint. Finished application shall permit a smooth, level intersection of carpet and resilient surfaces.
- B. Prior to laying flooring, broom clean and vacuum surfaces to be covered. Remove dirt, oil, grease, sand, particles, bumps, ridges and surface imperfections or other foreign matter from surfaces to be covered.

3.3 RESILIENT FLOORING INSTALLATION PROCEDURES - GENERAL

- A. Install materials in accordance with Armstrong's "Guaranteed Installation Systems Guide Product F-5061" current edition, and these specifications and applicable manufacturers' instructions.

3.4 LAYING TILE

- A. Comply with manufacturer recommendations and the following:
 1. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 3" at room perimeters. Lay tile square to room axis, unless otherwise shown.
 2. Match tiles for color and pattern by using tiles from cartons in same sequence as manufactured and packaged. Cut tile neatly to and around all fixtures. Broken, cracked, chipped or deformed tile are not acceptable.
 3. Lay tile with grain in tile running in the same direction, unless otherwise directed by Architect.
 4. Feature strips and borders: Where required, shown, scheduled, specified or indicated, install contrasting colored strips or borders. Make borders true in line and consistent in layout.

3.5 LAYING SHEET GOODS

- A. Comply with manufacturer recommendations, standards and the following:
 1. Check squareness of space. Do not layout more adhesive than necessary for the time available to lay work. Verify seaming method appropriate to material being used; check edge thicknesses to ensure good match. Ensure full adhesion across entire face. Conduct work to prevent unnecessary traffic over floor during and after installation.
 2. Provide feature strips and borders where required.
 3. Unroll sheet floor coverings and allow them to stabilize before cutting and fitting.
 4. Maintain uniformity of resilient sheet flooring direction, and match edges for color shading at seams.
 5. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in substrates.
 6. Integral Flash Cove Base: Provide where and as shown, and as follows:
 - a. Cove floor coverings height shown, if not, 6 inches up vertical surfaces.
 - b. Support on cove strip and butt against cap strip.
 - c. Install metal corners and end stops.

3.6 INSTALLATION OF RESILIENT BASE AND ACCESSORIES

- A. Adhesively install resilient wall base and accessories, fully coat substrate with adhesive and roll in place; do not use tape. Unless otherwise indicated, field form corners. Install wall base in maximum lengths possible. Apply to walls, columns, pilasters, casework, and other permanent fixtures in rooms or areas where base is required. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.7 INSTALLATION OF FLOATING LUXURY VINYL TILE FLOORS

- A. Comply with the following:
1. Acclimatize materials before installation, as required by manufacturer.
 2. Provide adequate expansion space, not less than 0.25 inch.
 3. Do not install new flooring directly over existing wood board flooring unless wood flooring is tight, solid, true, plumb and plane to tolerances.
 4. Start installation from the left side of the room and work to the right.
 5. Install first plank in second row by inserting long side tongue into groove of plank in first row. Shift product down towards end seam and lightly lift previous plank in order to engage end joints together.
 6. Work across length of room installing planks along wall in first row and then aligning planks in second row. Keep these two rows straight and square. Check squareness and straightness often.
 7. Check groove on each plank is clean and free of debris. At first row, angle tongue of long side plank into groove of previous existing row.
 8. Glue floor perimeter when recommended by manufacturer using recommended adhesives.
 9. Trim around shapes and profiles using manufacturer recommended methods.
 10. Trim units as required for installation.
 11. Restore damaged finishes.
 12. Do not performance any maintenance until floor has been in place for 5 or more days.

3.8 CLEANING, POLISHING AND PROTECTION

- A. Comply with Division 01 and manufacturer recommendations. Do not clean, polish or wax tiles where manufacturer does not recommend same. In general, comply with the following:
1. Allow resilient flooring to set for at least five days without traffic before cleaning.
 2. Cleaning: Wash resilient floors with diluted commercial floor cleaner and rinse.
 3. Initial Waxing: Apply two coats of buffable commercial floor wax, and buff.
- B. Maintenance: Instruct Owner personnel of proper maintenance procedures for all installed products.

END OF SECTION

SECTION 09 67 23 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Substrate preparation
 - 2. Waterproofing.
 - 3. Resinous flooring.
 - 4. Integral base.
 - 5. Aggregate matrix system.
 - 6. Non-slip surface and topping.
- C. Extent, without limitation, includes: Storage flooring where indicated.
- D. Related requirements includes, without limitation:
 - 1. Section 03 30 00 - Cast in place concrete.

1.2 SYSTEM DESCRIPTION

- A. System generally consists of:
 - 1. Preparing substrate.
 - 2. Applying a cementitious urethane based self-leveling seamless flooring.
 - 3. Quartz aggregate broadcast and urethane/epoxy topcoat.
 - 4. Architect selected color and texture.
 - 5. Nominal thickness of 1/4 inch.
 - 6. Integral cove base.
 - 7. Non-slip finish.

1.3 SUBMITTALS

- A. Comply with Division 01 General Requirements and submit for approval:
 - 1. Product Data: Manufacturer's literature including installation instructions, use restrictions and limitations.
 - 2. Shop drawings: Layout of area to be finished showing any required expansion joints, construction joints and cove base assembly. Show all termination details and any floor drain connections.
 - 3. Initial Selection samples: Provide samples of color and material ranges, not less than 6 inches square and showing system thickness and all system components.
 - 4. Verification: Submit final samples of selected products. Include samples showing full variation of color and finish expected.
 - 5. Maintenance Data: Provide recommended maintenance procedures.
 - 6. Certification: Certify submitted materials comply with requirements.
 - 7. Certification: Certify substrate moisture content, condition and capacity is acceptable.
- B. Field Moisture Test Reports: Submit moisture test results; comply with requirements of Section 07 26 16 – Fluid Applied Slab Moisture Mitigation.
- C. Mock-Up/Field Samples: Prior to installation, provide mock up of each type of system proposed for use for approval. Accepted mock-ups may be incorporated into the work unless otherwise noted.
- D. Product Test Reports: Submit manufacturer's certified independent lab test reports not more than 2 years old documenting product performance.

1.4 QUALITY ASSURANCE

- A. Manufacturer experience: Not less than 5 years experience in manufacture and support of resinous industrial flooring.

- B. Applicator: Approved in writing by manufacturer for surface preparation and application of specified product.
- C. Regulatory approvals and compliance required: United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.
- D. Pre-installation conference: Held at site to review specifications, application procedure, quality control, inspection and acceptance criteria.
- E. Source limitations: Obtain primary products from a single source and manufacturer. Provide secondary products from source recommended by manufacturer.

1.5 PRODUCT REQUIREMENTS

- A. Comply with product requirements, delivery storage and handling provisions of Division 01 and the following:
 - 1. Do not deliver panels until job is ready for installation.
 - 2. Store products in ventilated dry area; protect from dampness, freezing, and direct sun light.
 - 3. Maintain temperatures below 85 °F and above 60 °F.
 - 4. Prevent breakage of containers.
 - 5. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.6 PROJECT CONDITIONS

- A. Site Requirements
 - 1. Provide air, material and substrate temperatures between 60 F and 85 F providing substrate temperature is above its dew point. Outside of this range, consult Manufacturer in writing.
 - 2. Relative humidity: Maintain 24 hours before and after installation less than 85% and surface temperature shall be at least 5 degrees F above dew point.
 - 3. Provide lighting equal to final lighting level during the preparation and installation of system.
- B. Conditions of new concrete to be coated with cementitious urethane material.
 - 1. New concrete: Moisture cured for 7 days minimum and have fully cured for 28 days in accordance with ACI-308 prior to the application.
 - 2. Conduct moisture tests of surfaces no sooner than 28 days after concrete installation and within 3 days of coating application.
 - 3. Outside of these parameters consult manufacturer in writing.
 - 4. Concrete finish: Flat rubbed finish, float or light steel trowel finish.
 - 5. Concrete with hard steel trowel finish: Not permitted for application.
 - 6. Sealers and curing agents should not to be used.
 - 7. Concrete slabs on grade without vapor barriers below: Consult manufacturer in the acceptability of using moisture suppressant coatings.

1.7 SEQUENCING & SCHEDULING

- A. Ensure new and existing concrete surfaces are clean and properly prepared in time for surfaces to be sufficiently dry and cured for proper application for flooring.

1.8 WARRANTY

- A. Provide manufacture's standard warranties.

PART 2 - PRODUCTS

2.1 RESINOUS EPOXY FLOORING SYSTEMS

- A. Manufacturers:
 - 1. Stonehard.
 - 2. General Polymers
 - 3. National Polymers Inc. Epoxy mortars, towel applied systems.
- B. Basis of design: Subject to compliance with requirements:

1. Stonhard, Inc.; Stonclad GS®. With top coat Stonkote GS4.
- C. System Characteristics:
1. Color and Pattern: Selected by Architect from manufacturer full range.
 2. Wearing Surface: As shown, if not, standard smooth.
 3. Integral Cove Base: 4 inch high.
 4. Overall System Thickness: nominal 1/4"
- D. System Components: Manufacturer's standard components that are compatible with each other and as follows:
1. Waterproofing: Stonproof ME7 membrane
 2. Primer:
 - a. Material Basis: Stonhard Standard Primer
 - b. Resin: Epoxy
 - c. Formulation Description: (2) two component, 100 percent solids.
 - d. Application Method: Squeegee and roller.
 - e. Number of Coats: (1) one.
 3. Mortar Base:
 - a. Material design basis: Stonclad GS
 - b. Resin: Epoxy.
 - c. Formulation Description: (3) three component, 100 percent solids.
 - d. Application Method: Metal Trowel.
 - 1) Thickness of Coats: nominal 1/4 inch (6.4 mm).
 - 2) Number of Coats: One.
 - e. Aggregates: Pigmented Blended aggregate.
 4. Top Coat:
 - a. Material design basis: Stonkote GS4
 - b. Resin: Epoxy.
 - c. Formulation Description: (2) two component 100 percent solids.
 - d. Type: pigmented.
 - e. Finish: standard.
 - f. Number of Coats: one.
- E. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Compressive Strength: 10,000 psi after 7 days per ASTM C 579.
 2. Tensile Strength: 1,750 psi per ASTM C 307.
 3. Flexural Strength: 4,000 psi per ASTM C 580.
 4. Water Absorption: < 1% per ASTM C 413.
 5. Impact Resistance: > 160 in. lbs. per ASTM D 2794.
 6. Flammability: Class 1 per ASTM E-648.
 7. Hardness: 85 to 90, Shore D per ASTM D 2240.
- F. Provide waterproofing component:
1. Waterproofing: Stonproof ME7 membrane.
- G. Non-slip performance: When wet system shall meet or exceed: A tested coefficient of friction when wet of 0.60 or higher. When dry, system shall meet European coefficient of friction of R12 or better.

CRITERIA	TEST	RESULT / NOTES
Primer		<i>Dur-A-Glaze #4 WB</i>
<i>Percent Solids</i>		56%
<i>VOC</i>		2 g/L
<i>Bond Strength to Concrete</i>	ASTM D 4541	550 psi, substrates fails
<i>Hardness</i>	ASTM D 3363	3H
<i>Elongation,</i>	ASTM D 2370	9%
<i>Flexibility</i>	ASTM D 1737	Pass / 1/4 Cyld. Mandrel
<i>Impact Resistance</i>	MIL D-2794	>160
<i>Abrasion Resistance</i>	ASTM D 4060	30 mg loss / CS 17 wheel, 1,000 g Load

Broadcast, & Grout Coat		<i>Dur-A-Glaze #4</i>
<i>Percent Solids</i>		100%
<i>VOC</i>		3.8 g/L
<i>Compressive Strength</i>	ASTM D 695	17,500 psi
<i>Tensile Strength</i>	ASTM D 638	2,100 psi
<i>Flexural Strength</i>	ASTM D 790	5,100 psi
<i>Abrasion Resistance</i>	ASTM D 4060	29 mg loss / C-10 Wheel, 1,000 gm load, 1,000 cycle:
<i>Flame Spread/NFPA-101,</i>	ASTM E 84	Class A
<i>Impact Resistance</i>	MIL D-24613	0.0007 inches, no cracking or delamination
<i>Water Absorption.</i>	MIL D-24613	Nil
<i>Potlife @ 70 F</i>		20 minutes
Topcoat		<i>Armor Top</i>
<i>Percent Solids</i>		95%
<i>VOC</i>		0 g/L
<i>Tensile Strength</i>	ASTM D 2370	7,000 psi
<i>Adhesion</i>	ASTM 4541	Substrate Failure
<i>Hardness</i>	ASTM D 3363	4H
<i>60° Gloss</i>	ASTM D 523	70
<i>Pot Lif</i>	70degrees F, 50% RH	2 Hours
<i>Full Chemical Resistance</i>		7 days
<i>Abrasion Resistance</i>	ASTM D4060	CS 17 wheel (1,000 g load) 1,000 cycles Gloss:4; Satin: 8 mg loss with grit Gloss:10; Satin: 12 mg loss without grit

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the provisions of Section 01 70 00 - including requirements related to:
 1. Inspection.
 2. Tolerances and measurement.
 3. Approvals, inspections and filed quality control.
 4. Layout.

3.2 EXAMINATION

- A. Examine and verify conditions per Section 01 70 00 and as follows:
 1. Verify substrates and underlying work is within tolerances specified.
 2. Verify structural components are properly placed.
 3. Before installation, examine rough-in and built-in construction for mechanical/electrical and other systems to verify actual locations of connections.
 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
- B. Moisture Testing: Perform tests recommended by manufacturer and as follows.
 1. Perform relative humidity test using is situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.

2. If the relative humidity exceeds 75% then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation system that has been approved by the manufacturer or other means to lower the value to the acceptable limit.
 3. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
 4. If the relative humidity exceeds 75% install Dur-A-Flex, Inc Dur-A-Glaze MVP Primer moisture mitigation system prior to resinous flooring installation. Slab-on grade substrates without a vapor barrier may also require the moisture mitigation system.
- C. Mask and protect areas, surfaces and openings not part of this work from adverse affections of preparation and installation
- D. Mechanical surface preparation Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.
1. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
 2. Wherever a free edge will occur, including doorways, wall perimeters, expansion joints, columns, doorways, drains and equipment pads, a ¼ inch deep by 3/16 inch wide keyways shall be cut in.
 3. Cracks and joints (non-moving) greater than 1/4 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
 4. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufacturer's recommendations.
- 3.4 WATERPROOFING
- A. Apply per manufacturer, after substrate preparation and moisture test approvals.
- 3.5 APPLICATION
- A. General: Apply system in 3 distinct steps as follows:
1. Substrate preparation
 2. Topping/overlay application with quartz aggregate broadcast.
 3. Topcoat application, with a anti-slip aggregate broadcast.
 4. Integration of anti-microbials as recommended by manufacturer. Note that Dur-A-Flex systems are integrated and not topically applied.
- B. Application start-up:
1. Immediately prior to application of system components, dry surfaces and remove dust and loose particles with vacuum or clean, dry, oil-free compressed air.
 2. Handle, mix and add components to achieve desired results and per manufacturer's recommendations.
 3. Follow substrate contour pitching or leveling surface.
- C. Topping:
1. Apply topping as a self-leveling system.. The topping shall be applied in one lift with a
 2. Nominal thickness of one lift: 3/16 inch.
 3. Topping components: Resin, hardener and filler all supplied by single manufacturer.
 4. Hardener: Add to resin and thoroughly disperse by manufacturer recommended mechanical means. Add aggregate catalyzed mixture and mix to achieve a homogenous blend.
 5. Apply topping over horizontal surfaces using pin rakes, trowels or other approved systems.
 6. Immediately after placing, degass topping with 15/16 inch spiked roller.
 7. Broadcast quartz aggregate into wet material at rate of 1 lbs/sf or more to flood and overtop surface.
 8. Allow material to fully cure. Vacuum, sweep and/or blow to remove loose aggregate.
- D. Topcoat:
1. Mix and apply per manufacturer recommended procedure.

2. Topcoat components: Resin, hardener and filler as supplied by single manufacturer.
3. Apply topcoat at rate of 70 sf per kit (0.85 gal).
4. Non-Skid coating: Broadcast at rate of 1 lb per 100 sf and back roll into coating.

E. Nominal finish floor thickness: 1/4 inch.

3.6 BASE

- A. Provide integral cove base in height shown, if not 4 inches.

3.7 FIELD QUALITY CONTROL

- A. Field Technical Services Representatives: Employed by system manufacture to verify quality of installation.
- B. Applicator Testing and Inspecting: Provide the following: Temperature: Air, substrate temperatures, relative humidity, and, dew point.
2. Coverage rates: Monitor quantity of material used on area covered.
- C. Tolerances: Comply with dimensional and location tolerances specified in applicable sections, and as follows:
1. Horizontal Lines and Levels: level by more than 1/8 inch in 10 feet (6 mm in 3 m), or 1/4 inch (12 mm) maximum.

3.8 ADJUSTING / CLEANING / PROTECTION

- A. Comply with Section 01 70 00 and the following:
1. Adjusting; Cleaning; Protection:
- B. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- C. Remove masking. Perform detail cleaning at installation completion leaving clean, smooth, unblemished surface

END OF SECTION

SECTION 09 68 10 - TILE CARPETING

PART 1 GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation providing: carpet tile.
- C. Extent:
 - 1. Where shown.
- A. Sustainable Design: CRI Green Label [Plus].

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
- C. Extra Stock: Submit extra stock equal to 2 percent of total used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Performance: Fire performance meeting requirements of building code and local authorities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Carpet Tile:
 - 1. Manufacturers: As per finish legend.
 - 2. Sustainable Design: CRI Green Label [Plus]; or approved equal.
 - 3. Material: High-performance nylon bonded to resilient backing.
 - 4. Material: As shown on Finish Legend, if not, as selected by allowance.
 - 5. Installation Method: Glue-down.
 - 6. Installation Method: Partial glue-down.
 - 7. Auxiliary Materials:
 - a. Edge guards.
 - b. Low VOC adhesives (less than 50 g/L), low VOC cements and fasteners.
 - c. Leveling compound.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with recommendations of Carpet and Rug Institute (Section 13, "Carpet Modules (Tiles).") Standard for Installation Specification of Carpet Tiles.
- B. Prepare surfaces and install materials in accordance with manufacturer's instructions and approved submittals. Clean,

patch, and level substrate. Install materials in proper relation with adjacent construction and with uniform appearance and parallel to walls unless otherwise shown. Coordinate with work of other sections.

- C. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- D. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- F. Install edge guards and reducer strips as required.
- G. Clean and then protect installed carpet tile to comply with CRI 104, Section 15, "Protection of Indoor Installations."

END OF SECTION

SECTION 09 76 50 - FIBER GLASS REINFORCED PLASTIC PANELS (FRP)

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: All of the Contract Documents, including the Drawings, the General and Supplementary Conditions and Division 1 General Requirements apply to the work of this Section.
- B. Section includes, without limitation, providing:
 - 1. Fiberglass reinforced plastic sanitary wall panels.
- C. Extent includes, without limitation:
 - 1. As shown, if not, janitor closet panels.

1.2 REFERENCED CODES AND STANDARDS

- A. All references to codes, specifications and standards referred to herein shall become a part of this section as though written out, and shall mean, and is intended to be the latest edition, amendment, and/or revision of such reference unless otherwise specified.
 - ASTM - American Society for Testing and Materials.
 - USDA - United States Department of Agriculture.

1.3 SUBMITTALS

- A. Samples: Provide two 12" x 12" samples each board and component specified.
- B. Manufacturer's Literature: Submit manufacturer's literature for all products furnished to include product characteristics, limitations.

1.4 QUALITY ASSURANCE

- A. Use only products having USDA approval of the appropriate resistive characteristics.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Comply with Division 1.

PART 2 - PRODUCTS

2.1 FRP SANITARY WALL PANELS

- A. Acceptable manufacturers and products: Provide one of the following, subject to compliance with specifications:
 - 1. "Pyro-Panel" Sequentia Series"; Crane Composites; www.cranecomposites.com/.
 - 2. "Custom FRP, Fire Rated"; Kal-Lite Co.; www.kal-lite.com/.
 - 3. "Standard FRP" ; Marlite; www.marlite.com/.
 - 4. Approved equal.
- B. Panels: Fiberglass reinforced plastic sanitary wall panels shall be non-combustible, UL listed Class A/1 fire rated, flame spread 25, smoke developed 200 and USDA approved and have the following characteristics:
 - 1. Panel thickness: 0.09 inch thick or more.
 - 2. Labels: As required to clearly identify proper fire rating.
 - 3. Texture: Smooth.
 - 4. Color: White unless otherwise indicated.
- C. Adhesives: Multi-purpose construction adhesive of type recommended by manufacturer for the application.
 - 1. VOC requirements: Comply with Division 01 and as follows:
 - a. Contact adhesives: 80 g/L.
 - b. Special purpose contact adhesives: 250 g/L.

2.2 ACCESSORY MATERIALS

- A. Provide accessories required to complete installation including moldings, trim, and clips. Use fasteners, rivets and the like of type recommended or when available, provided by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION OF SURFACES

- A. Examine surfaces and do not commence work until substrate is proper condition to receive work of this section.

3.2 WORKMANSHIP

- A. Install panels, trim, moldings and accessories plumb, plane and true. Follow manufacturer's installation recommendations and guidelines. Comply with USDA installation requirements. Layout work so as to minimize joints, irregular panels and excessive use of trim pieces. Remove defective, stained, damaged or unsightly work and reinstall new products.

3.3 CLEAN-UP, CLEANING AND PROTECTION

- A. During the process of the work, premises shall be kept reasonably free of all debris, cuttings and waste materials resulting from the work under this section. Upon completion and before final acceptance of the work, all debris, rubbish, excess materials, tools and equipment shall be removed from the site.
- B. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.
- C. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION

SECTION 09 81 10 - ACOUSTICAL INSULATION, SEALANTS & ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Noise separation and sound isolation assemblies using acoustical insulation.
 - 2. Neoprene sound isolators.
 - 3. Sound-rated-wall gap and penetration sealing.
 - 4. Conventional sound isolation components.
- C. Related sections include, without limitation:
 - 1. Division 09 - Framing and gypsum panel board assemblies.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- D. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical products that effectively reduce airborne sound transmission through perimeter joints and assemblies in building construction, as demonstrated by testing representative assemblies according to ASTM E 90. Acoustical components shall maintain required or indicated STC ratings at sound rated partitions.
 - 1. Field testing: When and if performed, testing shall be based upon field test FSTC values, not laboratory STC test values. Where an 55 STC rating is indicated, an FSTC rating of 55 is acceptable.

2.2 MANUFACTURERS

- A. Acoustic Insulation: Subject to compliance with specifications, provide products from the following:
 - 1. Rockwool International, "Roxul" ; www.rockwool.com/.
 - 2. Owens Corning "Thermafiber"; www.thermafiber.com/.
 - 3. Knauf Insulation; <http://www.knaufinsulation.com/>.
 - 4. Approved equal.
- B. Acoustic sealants: Subject to compliance with specifications, provide products from indicated manufacturers.
- C. Accessory and related components: As specified below.

2.3 MATERIALS & COMPONENTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard non-sag, non-hardening, paintable, non-staining latex acoustical sealant complying with ASTM C834 and C919.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.
 - b. Hilti, Inc.
 - c. Pecora Corporation.
 - d. Tremco Incorporated.
 - e. United States Gypsum Company.

2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.
 3. Acoustical sealants in fire rated or smoke rated assemblies: Refer to Division 07, do not use conventional acoustic sealants in fire rated assemblies.
- B. Sound isolation and vibration control and gypsum board assemblies:
1. Sound attenuation blankets and batts [SAFB]: 2.5 to 2.4 lbs per cubic foot Thermafiber, Roxul Safe-N-Sound, or approved equal.
 2. Stud wall isolation at walls run to underside of structure above: Kinetics Noise Control Wallmat with KAI-S neoprene anchors.
 3. Resilient channels: Use types shown, if any, as follows:
 - a. Walls: Clark-Dietrich RC Deluxe Resilient Channel [RCSD], ½ inch, single leg, 0.022 inch thick minimum; for walls using furring channels and having sound rated assemblies, open leg installed facing up at walls.
 - b. Ceilings: Clark-Dietrich RC-2 Pro Resilient Channel, ½ inch, double leg, 0.0179 inch [25 gage] thick minimum; for ceilings using furring channels and having sound rated assemblies.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Take field measurements prior to fabrication, where possible. Form to required shapes and sizes with true, straight edges, lines and angles.
- B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.
- C. Extend insulation on either side of acoustical rated partitions which do not go to underside of structural deck or surfaces above. Extend as follows:
 1. As shown, but at least 24 inches on either side, if not shown or if less shown.
- D. Provide acoustical sealant at both faces at top and bottom runner tracks, wall perimeters, openings, expansion and control joints.
- E. Ceilings with sound attenuation above ceilings: Extend over entire area of ceiling.
- F. Restore damaged finishes and protect work.

END OF SECTION

SECTION 09 91 12 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing for exterior substrates:
 - 1. Surface preparation.
 - 2. Application of prime and finish paint systems.
- C. Extent: Priming and finishing, without limitation include:
 - 1. Touch up of shop coats provided under other Sections unless specifically included in that Section.
 - 2. Finish painting of exposed piping, conduit, exposed raceways, metal hardware, exposed equipment including rooftop equipment supplied under mechanical and electrical trades, when such items have not been factory pre-painted.
 - 3. Touch up of factory finished items where permitted.
- D. Painting not included:
 - 1. Pre-finished items, only when such items are chrome plated, stainless steel, or a finish which has been specifically called for herein.
 - 2. Finish metal surfaces such as chrome, bronze, and stainless steel.

1.2 SUBMITTALS

- A. Product Data: Literature for each type of product, including:
 - 1. Preparation requirements.
 - 2. Application instructions.
 - 3. Manufacturer's specifications, with paint label analysis.
- B. Color charts/packs: 2 copies of full range of colors with each type of coating submitted. Use compact pack of color chips when available
- C. Samples for Initial Selection: For each type of topcoat product.
- D. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Benjamin Moore [MOR]
 - 2. Sherwin Williams Co. [S-W] [includes Pratt & Lambert]
 - 3. Duron, Inc. [DUR]
 - 4. Pittsburgh Paints PPG] (includes Porter.)
 - 5. Tnemec Company, Inc. [TNE]
 - 6. DuPont Nemours Co. [DuP]
 - 8. Approved equal.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: Provide colors indicated or scheduled, if not, as follows:
 - 1. As selected by Architect from manufacturer's full range
 - 2. Match Architect's samples.
 - 3. Percent of surface area may be painted with deep tones: **20%**
 - a. 10%
 - b. 20%
 - c. 30%

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Portland Cement Plaster: 12 percent.
 - 5. Gypsum Board: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
- D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

- E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

3.4 BACK PRIMING

- A. Unless specifically required to be provided by another section, prime all 6 of exterior wood before erection. Seal the backs of panels that might cup due to being finished only on one face.
- B. At the contractor's option, but strongly recommended by the Architect, perform as much backpriming as possible in the shop or manufacturing facility.

3.5 EXTERIOR PAINTING SCHEDULE – NEW CONSTRUCTION / METAL

- A. All Ferrous Metal Surfaces; Galvanized and Non-Galvanized (Unprimed):
 - Coat 1: Tnemec "Hydro-Zinc" Series 94H20 (min. 2.5 mils DFT).
 - Coat 2: Tnemec "Typoxy" Series 27WB (min. 3.0 mils DFT).
 - Coat 3: Tnemec "UVX" Series 740/750 (min. 3.0 mils DFT).
- B. All Ferrous Metal Surfaces (Shop Primed):
 - Coat 1: Tnemec "Typoxy" Series 27WB (min. 3.0 mils DFT).
 - Coat 2: Tnemec "UVX" Series 740 /750 (min. 3.0 mils DFT).
- C. All Galvanized Metals Surfaces: Unprimed.
 - Zinc Touch-Up: Tnemec "Hydro-Zinc" Series 94H20 (min. 2.5 mils DFT) after SSPC-SP11 Field Prep
 - Coat 2: Tnemec "Typoxy" Series 27WB (min. 3.0 mils DFT).
 - Coat 3: Tnemec "UVX" Series 740/750 (min. 3.0 mils DFT).

END OF SECTION

SECTION 09 91 22 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing for interior substrates:
 - 1. Surface preparation.
 - 2. Application of prime and finish paint systems.
- C. Extent: Priming and finishing, without limitation include:
 - 1. Touch up of shop coats provided under other Sections unless specifically included in that Section.
 - 2. Finish painting of exposed piping, conduit, electrical panels, exposed raceways, metal hardware, radiator covers, hangers, exposed ductwork and equipment supplied under mechanical and electrical trades, when such items have not been factory pre-painted.
 - 3. Touch up of factory finished items where permitted.
 - 4. Painting plywood backboards for electrical and telephone equipment.
 - 5. Re-painting indicated existing surfaces.
 - 6. Paint removal and re-painting indicated existing painted metal surfaces.
- D. Painting not included:
 - 1. Pre-finished items, only when such items are chrome plated, stainless steel, acoustical tile, or a finish which has been specifically called for herein.
 - 2. Concealed surfaces. "Concealed" here means the insides of shafts, crawl spaces, furred areas, utility tunnels, above hung ceilings and the utilities running in them unless specifically required to be painted.
 - 3. Finish metal surfaces such as chrome, bronze, and stainless steel.
 - 4. Utility piping in Mechanical Rooms.

1.2 DEFINITIONS

- A. Gloss Level: According to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: Literature for each type of product, including:
 - 1. Preparation requirements.
 - 2. Application instructions.
 - 3. Manufacturer's specifications, with paint label analysis.
- B. Color charts/packs: 2 copies of full range of colors with each type of coating submitted. Use compact pack of color chips when available.
 - 1. Not required where paint colors are schedule by architect on drawings.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 3. VOC content.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Benjamin Moore [MOR]
 2. Sherwin Williams Co. [S-W] [includes Pratt & Lambert]
 3. Duron, Inc. [DUR]
 4. Pittsburgh Paints PPG] (includes Porter.)
 5. Tnemec Company, Inc. [TNE]
 6. DuPont Nemours Co. [DuP]
 7. Approved equal.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: Provide colors indicated or scheduled, if not, as follows:
1. As selected by Architect from manufacturer's full range
 2. Match Architect's samples.
 3. Percent of surface area may be painted with deep tones: **20%**
- E. VOC Content: Products shall comply with VOC limits of Division 01, of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Dry-Fog Coatings: 400 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

- F. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
 2. Masonry (Clay and CMU): 12 percent.
 3. Wood: 15 percent.
 4. Portland Cement Plaster: 12 percent.
 5. Gypsum Board: 12 percent.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete and masonry surfaces preparation scheduled for painting: Provide work under Section 03 01 06.2
- E. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- F. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- G. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
1. SSPC-SP 2, "Hand Tool Cleaning."
 2. SSPC-SP 3, "Power Tool Cleaning."
 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- H. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- I. Existing Steel Field Finishes Substrates with topcoats: For existing painted steel surfaces to be repainted, remove paint to bare metal using mechanical and chemical means to achieve results equal to:

1. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
 2. Prime bare metal immediately.
- J. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- K. Aluminum Substrates: Remove loose surface oxidation.
- L. Wood Substrates:
1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 2. Sand surfaces that will be exposed to view, and dust off.
 3. Prime edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 5. To prevent rust showing from nail heads, nails shall be counter-sunk, except at siding. Nail holes and other openings should then be spot-primed with primer before puttying or caulking is done. After putty is set, prime complete surface.
- M. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.
- N. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.
- O. Existing Concrete & Masonry: Prepare and correct minor defects, cracks, ridges, holes, and the like under the work of this section. Make minor repairs where required to produce a smooth, flat even surface.
- P. Existing Paint: Prepare and correct minor defects, cracks, ridges, holes, and the like under the work of this section. Make minor repairs where required to produce a smooth, flat even surface. Before paint application, wash surfaces with TSP [tri-sodium phosphate] and allow to dry. Remove dust or other defects prior to paint application. Feather edges and prime areas as required, including multiple times, to ensure no defects, edges, ridges or removed paint areas are evident in the final application.
- 3.3 APPLICATION
- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- 3.4 BACK PRIMING
- A. Unless specifically required to by provided by another section, prime all 6 of exterior wood before erection. Seal the backs of panels that might cup due to being finished only on one face.
- B. At the contractor's option, but strongly recommended by the Architect, perform as much backpriming as possible in the shop or manufacturing facility.
- 3.5 CLEANING AND PROTECTION
- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.
- 3.6 SHEENS
- A. Paint sheens given below are provisional. Obtain written approval from Architect for each surface sheen required.

3.7 PAINTS SCHEDULED ON DRAWINGS

- A. Where drawings list or schedule particular products, use those products or approved equals with exact color matches. Intent of paint schedule below is to establish qualities levels, not to identify particular paint manufactures.

3.8 INTERIOR PAINTING SCHEDULE – NEW CONSTRUCTION / METAL

- A. All Ferrous Metal Surfaces, Galvanized and Non-Galvanized (Unprimed):
Coat 1: Tnemec "Tneme-Zinc" Series 90-97 (min. 3.0 mils DFT).
Coat 2: Tnemec "Enduratone" Series 23 (min. 2.0 mils DFT).
Coat 3: Tnemec "Enduratone" Series 23 (min. 2.0 mils DFT).
- B. Hollow Metal Doors [if not factory finished], Latex waterbased system x semi-gloss:
Coat 1: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
Coat 2: S-W ProMar® 200 Latex Semi-Gloss, B31W12200 Series
Coat 3: S-W ProMar® 200 Latex Semi-Gloss, B31W12200 Series

3.9 INTERIOR PAINTING SCHEDULE – NEW CONSTRUCTION / DRYWALL

- A. Gypsum board ceilings - Latex / flat sheen
Coat 1: S-W ProMar 200 Zero VOC Latex Primer, B28W2600 L.
Coat 2: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series, 1.6 mils dry
- B. Gypsum board walls - Latex / Egg-shell sheen:
Coat 1: SW " ProMar 200" Zero VOC Vinyl Acrylic Primer Sealer, 1.5 DFT, B28W2600.
Coat 2: SW " ProMar 200 HP" Zero VOC Interior Latex Eggshell, 1.6 DFT, B20-1900 Series.
Coat 3: SW " ProMar 200 HP" Zero VOC Interior Latex Eggshell, 1.6 DFT, B20-1900 Series.
- C. Gypsum board walls - Latex / Egg-shell sheen / Dark accent colors:
Coat 1: SW "Premium Wall & Wood Interior Latex Primer", B28W08111 1.8 DFT. Tint primer to shade gray.
Coat 2: SW "Emerald Interior Latex Satin", 1.7 DFT, K37 Series
Coat 3: SW "Emerald Interior Latex Satin", 1.7 DFT, K37 Series
- D. Gypsum board walls - Latex / Semi-gloss sheen:
Coat 1: SW " ProMar 200" Zero VOC Vinyl Acrylic Primer Sealer, 1.5 DFT, B28W2600.
Coat 2: S-W "ProMar 200" Zero VOC Latex Semi-Gloss, 1.6 mils DFT., B31-2600 Series.
Coat 3: S-W "ProMar 200" Zero VOC Latex Semi-Gloss, 1.6 mils DFT., B31-2600 Series.

3.10 PAINTING SCHEDULE: EXISTING SURFACES

- A. In addition to the new surfaces specified to be painted, paint all existing surfaces to remain or which are affected by alteration work. In general, such surfaces are indicated on the finish schedule. Such surfaces shall be given at least one finish coat; where one coat will not cover, provide 2 finish coats. Match quality of materials specified for new work. Touch-up work shall match the existing colors (except as otherwise directed) and shall be applied so that proper blending is assured as approved by the Architect.
- B. Refer to paragraph "PREPARATION " for preparing and spot priming existing surfaces. Such priming is not considered a coat of paint.
- C. In general, where surfaces are exposed to base material, use systems specified for new work.

END OF SECTION

SECTION 09 97 10 - CONCRETE FLOOR SEALERS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Concrete floor sealer/hardener on interior slabs.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers, acceptable to manufacturer. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONCRETE FLOOR CURING & HARDENING SEALERS

- A. Manufacturer: Curecrete Distribution, Inc.; www.ashfordformula.com/.
- B. Cure-Seal-Hardener: Ashford Formula, a water-based, chemically reactive penetrating sealer and hardener that densifies concrete to seal against water molecules, but allows air and water vapor to pass, so that concrete can achieve full compressive strength for minimized surface crazing and elimination of dusting.
 - 1. Abrasion Resistance to Revolving Disks: At least a 32.5% improvement over untreated samples when tested in accordance with ASTM C779.
 - 2. Surface Adhesion: At least a 22% increase in adhesion for epoxy when tested in accordance with ASTM D3359.
 - 3. Hardening: As follows when tested in accordance with ASTM C39:
 - a. After 7 Days: An increase of at least 40% over untreated samples.
 - b. After 28 Days: An increase of at least 38% over untreated samples.
 - 4. Coefficient of Friction: 0.86 dry, 0.69 wet when tested in accordance with ASTM C1028.
 - 5. Rebound Number: An increase of at least 13.3% over untreated samples when tested in accordance with ASTM C805.
 - 6. Light Exposure Degradation: No evidence of adverse effects on treated samples when tested in accordance with ASTM G23.
- C. Finish Coat: Tnemec Series 633 Prime-A-Pell H2O.
 - 1. Description: Prime-A-Pell H2O is a clear, filmless, low solids, penetrating water-based water repellent for above-grade, concrete, stucco, precast, brick, sandstone and block masonry.
 - 2. Active ingredient: Oligomeric Alkylalkoxy Siloxane/Alkylalkoxy Silane x 7%.
 - 3. VOC: EPA Method 24 0.16 lbs/gallon (19 grams/litre)
 - 4. Application rate: Per manufacturer published recommendations of substrate.
 - 5. Limitations: Do not use below grade nor to cover visible cracks.
- D.

PART 3 EXECUTION

3.1 INSTALLATION – ASHFORD FORMULA

- A. New Concrete: Apply cure-seal hardener to new concrete as soon as the concrete is firm enough to work on after troweling; with colored concrete, wait a minimum of 30 days before application.
 - 1. Spray on at rate of 200 ft²/gal (5 m²/L).

2. Keep surface wet with cure-seal-hardener for a minimum soak-in period of 30 minutes without allowing it to dry or become slippery. If slipperiness occurs before the 30 minute time period has elapsed, apply additional cure-seal-hardener, as needed, to keep the entire surface in a non-slippery state for the first 15 minutes; for the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state. In hot weather conditions, follow manufacturer's special application procedures.
 3. When the treated surface becomes slippery after this period, lightly mist with water until slipperiness disappears.
 4. Wait for surface to become slippery again, and then flush entire surface with water to remove all cure-seal-hardener residue.
 5. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
 6. Wet vacuum or scrubbing machines can be used in accordance with manufacturer's instructions to remove residue.
- B. Existing Concrete: Apply cure-seal-hardener only to clean, bare concrete.
1. Thoroughly remove previous treatments, laitance, oil and other contaminants.
 2. Saturate surface with cure-seal-hardener; respray or broom excess onto dry spots.
 3. Keep surface wet with cure-seal-hardener for a minimum soak-in period of 30–40 minutes.
 4. If most of the material has been absorbed after the 30 minute soak-in period, remove all excess material, especially from low spots, using broom or squeegee.
 5. If most of the material remains on the surface after the 30 minute soak-in period, wait until the surface becomes slippery and then flush with water, removing all cure-seal-hardener residue. Squeegee completely dry, flushing any remaining slippery areas until no residue remains.
 6. If water is not available, remove residue using squeegee.

3.2 APPLICATION OF TNEMEC SERIES 633

- A. Acceptable substrate surface temperature: Minimum 45°F (7°C) Maximum 90°F (32°C)
- B. Mix well prior to application. Do not dilute or thin. Prime-A-Pell H₂O must be used as supplied by the manufacturer.
- C. Apply using a low-pressure rotary or gear pump sprayer with a fan tip (0.03-0.06 orifice) that allows for application of the product at 20-30 psi. A commercial grade pump-up spray tank equipped with a fan tip is also acceptable. Airless paint sprayers are not acceptable for the application of water repellents. Do not atomize the product.
- D. On vertical installations, apply with a wet-on-wet technique. Apply a saturating application of the product working from the bottom up. On porous substrates such as concrete masonry units, allow a slight rundown (less than three inches). On high density materials such as precast concrete panels or GFRC, do not allow any rundown. On all substrates allow the product to penetrate the substrate for approximately 5 to 7 minutes, then apply again in the same manner. This second pass will require less material. Follow coverage rate guidelines, however, a test application should always be performed.
- E. On horizontal installations, apply in a single, saturation application. Apply enough material for the surface to remain wet for 2 to 3 minutes before absorbing into the substrate. Do not allow puddles to remain on surface; any areas of ponding should be dispersed with a broom.

3.3 PROTECTION

- A. Protect installed floors for at least 3 months until chemical reaction process is complete.
 1. Do not allow traffic on floors for 3 hours after application.
 2. Do not allow parking of vehicles on concrete slab.
 3. If vehicles must be temporarily parked on slab, place drop cloths under vehicles during entire time parked.
 4. Do not allow pipe cutting using pipe cutting machinery on concrete slab.
 5. Do not allow temporary placement and storage of steel members on concrete slabs.
 6. Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.
 7. Clean floor regularly in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 10 14 44 – INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Interior signage.
 - 2. Design/build fabrication.
 - 3. Signage accessories.
- C. Intent:
 - 1. Intent of this section is for the Contractor to provide all required space signage, room capacity signage, and accessibility signage per Owner's standard layout and designs and as required by Building and Accessibility codes.
 - 2. The Owners design standards and required layouts are attached to this section.
 - 3. Unless part of the FF&E budget, and where requested or otherwise indicated and if not, signage is shown on drawings, carry an allowance with separate line items to provide design/build:
 - a. Code mandated signage.
 - b. Occupied and/or office space name identification signage.
 - c. Service space signage.
 - d. Elevator stair access signage.
- D. Extent, without limitation, includes: As shown, if not per intent and as follows:
 - 1. Fire evacuation signs, including at elevator lobbies.
 - 2. Stair and stair door signs.
 - 3. Service & Utility rooms required to be signed by code.
 - 4. Fire extinguisher signs.
 - 5. International handicap access logo and signage
 - 6. Other signage mandated by code
 - 7. Other signage shown on the drawings
 - 8. Toilet room panels signs.
- E. Signage not mandated by code [and/or provided under FF&E Contract].
 - 1. Confer with Architect and Owner about extent of work under this contract, and where requested, provide work and pricing for:
 - 2. Office and administrative area signs.
 - 3. Site signage, not building-mounted.
- F. Related Sections, without limitation, include:
 - 1. Division 26 – Electrical: Power for signs.
 - 2. Section 10 44 30 - Field Applied Glass Films.

1.2 SUBMITTALS

- A. Comply with Division 01 General Requirements and submit for approval:
 - 1. Product Data: Manufacturer's literature including installation instructions, use restrictions and limitations
 - 2. Shop Drawings – Provide drawings showing all sign characteristics, locations and conditions.

1.3 QUALITY ASSURANCE

- A. Required ADA-compliant signs shall comply with ADA and have Grade 2 Braille duplicating signage text. Text shall be in raised tactile lettering. Height of characters shall comply with applicable requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with specifications and where no other manufacturers are listed below provide products from one of the following:
1. ACE Sign Systems, Inc.
 2. Advance Corporation; Braille-Tac Division.
 3. ASI Sign Systems, Inc.
 4. Best Sign Systems Inc
 5. Approved design/builder fabricator.

2.2 SIGN TYPES

- A. Prove interior panel signs with the following features: As shown on drawings, if not, as follows:
1. Type: As shown. Unframed type.
 2. Size: As shown. Unless otherwise shown, 6 inches square.
 3. Typeface: As selected by Architect and Owner.
 4. Braille: in compliance with ADA.
 5. Fastening: Concealed foam tape and silicone adhesive, designed for signage, with consistent thickness.
 6. Up date panels: Removable name plate units. Provide system to permit Owner to create new name plates of consistent visual character and to match type, background color, lettering color and the like of original installation.
- B. Signage criteria for stairs
1. Sign at every floor level landing to identify the stair, floor level, exit level of discharge, and terminus level, and if roof access is available.
 2. Approximately 5' above finish floor
 3. Visible with door open and door closed.
 4. Direction arrows at every landing where exit level is above landing; visible whether door is open or closed.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the provisions of Division 01 and in particular, Section 01 70 00, and as follows:
1. Install materials and systems in accordance with manufacturer's instructions, limitations and restrictions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated, according to manufacturer's written instructions, and with the code provisions as adopted by authorities having jurisdiction.
- B. Install sign units level, plumb and at the height indicated, with sign surfaces free from distortion or other defects in appearance. Repair or replace damaged units as directed by the Architect. Cooperate with other trade contractors for installation of sign units to finish surfaces.
- C. Adjust, clean and protect signage until acceptance.

END OF SECTION

SECTION 10 21 16 – HDPE TOILET PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. This Section includes, without limitation, providing:
 - 1. Toilet compartments and screens.
 - 2. Type: Solid-plastic, high density polyethylene, HDPE.
 - 3. Compartment Style: Overhead braced and floor mounted.
- C. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for supports that attach units to overhead structural system.
 - 2. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.2 SUBMITTALS

- A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.
- B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

1.3 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Basis of design: "Eclipse 2" Scranton Products.
 - 2. Bradley Corporation.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Metpar.
- B. Basis of design: Metpar Polly SPR [HDPE] "The Corinthian Type FP5500"

2.2 MATERIALS

- A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.
- B. Solid-Plastic, Polymer Resin:
 - 1. High-density polyethylene (HDPE) with homogenous color throughout fabricated from polymer resins compounded under high pressure, forming single thickness panel.
 - 2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.

3. Fire hazard classification: Class A flame spread/smoke developed rating per ASTM E84.
4. Provide material not less than 1 inch (25 mm) thick with seamless construction and eased edges in color and pattern as follows:
 - a. Color and Pattern: At least one color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns.
- C. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch (0.8 mm) thick and 3 inches (75 mm) high, finished to match hardware, with stainless steel tamper resistant Torx head sex bolt.
- D. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:
 1. Material: Clear-anodized aluminum.
- E. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
 1. Material: Stainless steel.
 2. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac)
- F. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish.
- G. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.
- H. Privacy: Provide rabbeted edge or other systems for enhanced privacy.

2.3 FABRICATION

- A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.
 1. Provide internal reinforcement in metal units for compartment-mounted hardware, accessories, and grab bars, as indicated.
 2. Solid-Plastic, Polymer-Resin Compartments and Screens: Provide aluminum heat-sink strips at exposed bottom edges of HDPE units to prevent burning.
- B. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Wall-Hung Screens: Provide units in sizes indicated of same construction and finish as compartment panels, unless otherwise indicated.
- D. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be handicapped accessible.
 1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degrees.
 2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
 3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
 5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

2.4 STAINLESS-STEEL SHEET FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
1. Remove or blend tool and die marks and stretch lines into finish.
 2. Grind and polish surfaces to produce uniform, directional textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
 3. Finish: Manufacturer's standard No. 3 or No. 4 directional polish.
 4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 5. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions and requirements of Division 01. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
- B. Evidence of cutting, drilling or patching: Not acceptable. Remove such work and replace.
- C. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- D. Screens: Attach with anchoring devices according to instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING AND CLEANING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.
- B. Provide protection and maintain conditions to ensure compartments and screens are without damage or deterioration until Substantial Completion.

END OF SECTION

SECTION 10 26 05 - WALL & CORNER GUARDS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Wall corner protection systems.
 - 2. Manufactured wall protection bumper rails.

1.1 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

1.2 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Performance: Fire performance meeting code requirements.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Corner Guards:
 - 1. Manufacturers: Arden Architectural Specialties; Balco/Metalines; Construction Specialties; InPro Corporation; IPC Door and Wall Protection Systems; Pawling Corp., Architectural Products Div.; Spectrim Building Products, LLC; Tepromark International; or approved equal.
 - 2. Locations: As shown or scheduled.
 - 3. Type 3: Stainless steel corner guards, surface mounted, full height, service areas and where shown and as follows:
 - a. Flush-mount stainless steel Type 430 or 304 16 gauge, w/ 3.5" wings.
 - b. Equal to InPro SS Flush Mount.
- B. Manufactured wall protection rails
 - 1. Basis of design: As shown, if not:
 - a. Manufacturer: Life Science Products; www.ispinc.com/.
 - b. Series: Sani-Rail Wall Protection.
 - 2. Components:
 - a. Stainless Steel Components: Where shown, Type 304 stainless steel, #4 satin finish.
 - b. Fasteners: Supplied by the manufacturer.
 - c. End caps: As shown, if not, integral radius return in stainless steel.
 - d. Plate thickness: As shown, if not, 0.25 inch.
 - e. Rail height: As shown, if not, architect selected from 3, 4 or 6 inch.
 - f. Bracket: As shown, if not, Z bracket with 3 inch offset.
 - 3. Assembly: Surface mounted.
 - 4. Attachment hardware: Appropriate for wall construction.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions and approved submittals. Install materials in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Restore damaged finishes. Clean and protect work from damage.

END OF SECTION

SECTION 10 28 00 - TOILET & BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Toilet and bath accessories as scheduled on drawings.
- C. Related Sections:
 - 1. Section 08 80 30 "Mirrors" for frameless mirrors.
 - 2. Section 09 30 00 "Tiling" for ceramic toilet and bath accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
 - 6. Approved full-size Samples will be returned and may be used in the Work.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.3 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.5 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch (0.8-mm) minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch (0.9-mm) minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick, use tempered or safety glass unless otherwise noted.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 MANUFACTURERS

- A. Subject to compliance with requirements, provide comparable products from one of the following:
 - 1. As scheduled on the drawings.

2.3 ACCESSORIES

- A. Provide products scheduled or indicated.

2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Fire extinguishers.
 - 2. Cabinets.
 - 3. Accessories.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Standards: UL and FM listed products, NFPA 10.
- C. Regulations: ADAAG.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Fire Extinguishers:
 - 1. Manufacturers: J. L. Industries; Larsen's Manufacturing; Potter-Roemer; or approved equal.
 - 2. Extinguishers: Filled, charged, pressurized, tagged, dated, and rechargeable. Underwriters Laboratories and FM approved.
 - 3. Type: Multipurpose dry chemical type, UL 4A-80BC.
 - 4. Rating: Verify sizing for project requirements.
 - 5. Public Area Mounting: Cabinet mounted.
 - 6. Service Area Mounting: Metal brackets.
- B. Cabinets:
 - 1. Manufacturers: J. L. Industries; Larsen's Manufacturing; Potter-Roemer; or approved equal.
 - 2. Mounting: Recessed.
 - 3. Trim: Trimless with hidden flange.
 - 4. Doors: Enameled steel, baked enamel finish.
 - 5. Doors: Steel, factory primed.
 - 6. Door Lettering: Black, vinyl die cut, vertical, all capitals.
 - 7. Fire Rated Walls: Provide UL listed, fire rated cabinets which maintain wall rating.
 - 8. Door Style: Duo-panel.
 - 9. Accessories:
 - a. Glass breaker or fire handle.
 - b. Signage.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Install fire extinguishers in mechanical and service areas with wall-hung brackets at locations and heights indicated and acceptable to authorities having jurisdiction.
- C. Install fire extinguishers in cabinets in public areas plumb and level at heights acceptable to authorities having jurisdiction.
- D. Restore damaged finishes. Clean and protect work from damage.

END OF SECTION

SECTION 11 31 10 – RESIDENTIAL GRADE KITCHEN APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section Includes, without limitation, providing:
 - 1. Residential grade or type kitchen appliances.

1.2 PERFORMANCE REQUIREMENTS

- A. Energy Star: All other indications to the contrary, provided only Energy Star rated and compliant units.
- B. Accessibility: For appliances in public use or in accessible dwellings: Comply with applicable provisions of ADA and state barrier free accessibility requirements.
- C. CFC: Provide refrigerants CFC free and compliant with applicable regulations.

1.3 SUBMITTALS

- A. Comply with Division 01 General Requirements and submit for approval:
 - 1. Product Data: For each product, Manufacturer's literature including installation instructions, use restrictions and limitations.
 - 2. Shop drawings:
 - a. For all units: Provide unit dimensions and installation clearances required.
 - b. For built-in units, provide shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction and templates for work installed by others.
 - c. Field Measurements: Take accurate field measurements before installation and indicate same on shop drawings for built in units.
 - 3. Samples: Color and material ranges showing variation of color and finish, if any.
 - 4. Operation and maintenance Data: Provide recommended maintenance procedures, including operating instructions, list of spare parts and maintenance schedule.
 - 5. Warranty: Manufacturer's standard warranty. Include labor and materials to repair or replace defective materials.

1.4 QUALITY ASSURANCE

- A. Comply with Division 01 requirements and governing codes and regulations.
- B. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for 5 years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers and fabricators, subject to compliance with requirements, include:
 - 1. GE.
 - 2. Approved equal.
- B. Basis of design: As scheduled or approved equals..

2.2 APPLIANCES – GENERAL

- A. Appliance: Provide scheduled units or approved equals including:
 - 1. Ranges, electric, or induction type.
 - 2. Range hoods, recirculating type.
 - 3. Refrigerator/freezers.
 - 4. Microwave/convection ovens.
 - 5. Microwave ovens.

2.3 ACCESSORIES / COLOR

- A. Whether customarily supplied with the units or not, provide all pigtails, plugs and associated wiring, as well as all lamps, bulbs, and the like.
- B. Color: Unless otherwise indicated or selected, units shall be color indicated, if none, stainless steel.

2.4 KITCHEN APPLIANCE SCHEDULE

- A. Provide products from a single manufacturer and equal or superior to basis of design and specified performance and as scheduled on drawings, in appliance schedule provided elsewhere.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with the provisions of Division 01 and in particular, Section 01 70 00.

3.2 INSTALLATION

- A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Comply with the following:
 - 1. Built-In Equipment: Securely anchor units to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed. Install appliances level and plumb.
 - 2. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate for proper operation of equipment.
 - 3. Utilities: Refer to Drawings for plumbing, venting and electrical requirements. Connect units to service utility terminations provided by the trades.
 - 4. Start up and fully test all appliances. Replace or repair any units not found to operate properly.
 - 5. Level refrigerator so that doors are self-closing when open 45° or less.
 - 6. Leave Owner's Manual for all appliances in cabinet drawer in kitchen.
 - 7. Furnish and install lamps in all appliances which require them.
- C. Remove interior packing material from appliances, debris resulting from appliance installation and properly dispose of it. Repair or replace work of other trades soiled or damaged by work of this Section. Clean and protect work from damage.

END OF SECTION

SECTION 12 24 05 – RESIDENTIAL CORDLESS ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
 - 1.
- B. Section includes, without limitation, providing:
 - 1. Residential cordless roller window shades.
- C. Related Work:
 - 1. Division 06 – Carpentry: Blocking.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Shade mounting assembly and attachment.
 - 2. Size and location of access to shade operator and adjustable components.
 - 3. Minimum Drawing Scale: 1/4 inch = 1 foot.
- D. Samples for Initial Selection: For each colored component of each type of shade indicated.
 - 1. Include similar Samples of accessories involving color selection.
- E. Samples for Verification:
 - 1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
 - 2. For the following products:
 - a. Shade Material: Not less than 12-inch- square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
 - b. Valance: Full-size unit, not less than 12 inches long.
- F. Window Treatment Schedule: For roller shades. Use same designations indicated on Drawings.
- G. Product Certificates: For each type of roller shade, signed by product manufacturer.
- H. Qualification Data: For Installer.
- I. Product Test Reports: For each type of roller shade.
- J. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- C. Safety standards: Child and pet safe per WCMA/ANSI standards.

- D. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Rollers Shades: Before installation begins, for each size, color, texture, and pattern indicated, full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. RollEase; www.rollease.com/.
 - 2. Draper Inc.
 - 3. Hunter Douglas Contract; Nysan Shading Systems.
 - 4. MechoShade Systems, Inc.

2.2 MANUAL CORDLESS RESIDENTIAL WINDOW SHADES

- A. Manufacturer: Subject to compliance with schedules and specifications, provide:
 - 1. Rollease Easy Spring Series.
 - 2. Approved equal.
- B. Product: RollEase Easy Spring Plus FR Fabric
 - 1. Application: Single shade unless otherwise shown.
 - 2. Key components:
 - a. Headrail.
 - b. Mounting brackets.
 - c. Spring side brackets.
 - d. Aluminum tube
 - e. Spring.
 - f. Spring stop.
 - g. Bottom rod.

- h. Shade fabric.
3. System size: 1.25 or 1.50 inch or as required.
4. Roller tube shall be extruded aluminum engineered with a channel to accept fabric spline. The tube size will be determined by the manufacturer based on window size and fabric selection.
5. Cordless mechanism is enclosed inside the tube raising and lowering the shade smoothly due to a unique dual speed braking system. Tension can be manually adjusted so shade always raises at the desired speed.
6. Cassette valance shall be an aluminum extrusion with a curved front profile and covered with fabric to match the shade. Manufacturer will determine the cassette size based on the window size and fabric selection.
7. Fabric Wrapped Hem bar shall be an elliptical or round shaped aluminum extrusion painted to color coordinate with the fabric and finished with color coordinated plastic end caps. The fabric wraps around the front side of the extrusion and is visible on the room side. The color coordinated aluminum hem bar is visible on the window side. Hem bar shall include a clear plastic hem grip to protect the fabric and facilitate raising and lowering the shade.
8. Installation brackets shall be steel and can accommodate top or back mounting. Provide optional projection brackets to match details; available in 3.25 and 4 inch.

C. Fabric:

1. Type: Light filtering, woven fabric, stain and fade resistant
2. Fabric series or line: As shown.
3. Source: As scheduled.
4. Fiber: PVC-coated polyester, polyester.
5. Weave: As scheduled.
6. Roll Width: Standard for selected product.
7. Openness Factor: As indicated, if not, 1 percent.
8. Color: As scheduled, if not, as selected by Architect from manufacturer's full range.

2.3 ROLLER SHADE FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.
- B. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.
 1. Lifting Mechanism: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
 1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
 2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
- F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, other conditions affecting performance.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 1.5 inches to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 12 36 25 - PLASTIC LAMINATE COUNTERTOPS

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section includes, without limitation, providing:
 - 1. Plastic laminate countertops.
 - 2. PVC nosing.
 - 3. Plastic laminate bullnose edge.

1.1 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.
- B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
- C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish.

1.2 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Standards: Architectural Woodwork Institute (AWI) "Architectural Woodwork Quality Standards."
- C. Standards: Woodwork Institute (WI) "Manual of Millwork."
- D. Preservative Treatment: Nonpressure method, exterior type, AWPA N1.
- D. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD-Exterior Glue.
 - 3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
 - 4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 - 5. Hardwood Plywood and Face Veneers: HPVA HP-1.
- E. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship of each type of finish carpentry.

PART 2 PRODUCTS

2.1 LAMINATE MANUFACTURERS

- A. Subject to compliance with specifications:
 - 1. Wilsonart International Div. of Premark International, Inc.
 - 2. Nevamar Company, LLC, Decorative Products Div.; F
 - 3. Formica Corporation, or approved equal.

2.2 PLASTIC LAMINATE COUNTERTOPS

- A. Plastic Laminate Materials:
 - 1. Laminates:
 - a. Type: High pressure plastic laminates meeting NEMA LD-3, as
 - b. Manufacturers: Formica Corporation, Wilsonart, Nevamar or equal.

- c. Colors: Solid color selected by Architect from standard range of color.
 2. Grades:
 - a. General Purpose H-5 [.050"] for horizontal surfaces;
 - b. VF-3 [.030"] for vertical surfaces;
 - c. HF-4 [.042"] for post-forming surfaces; and
 - d. 0.020" for backing surfaces.
 3. Adhesives: As recommended by laminate manufacturer. Use waterproof type at utility, food preparation, sink area, vanity and where ever laminate may come in contact with water vapor or liquid.
- B. Construction
 1. Grade: Premium.
 2. Core: As allowed by grade.
 3. Edge: As shown, if not, as follows:
 - a. Type: Prefabricated edge banding, or where approved, post-formed edge.
 - b. Material: PVC or ABS plastic. Note that ABS is more durable environmentally friendly.
 - c. Thickness: 3 mm or 5 mm.
 - d. Height: As shown, if not, 1-5/16 inch.
 - e. Available supplier: Edge Co.; <http://edgecoinc.com/got-a-match-lookup/>.
 4. Post-formed counters: Where approved by Architect, ensure edge is double radius with laminate returning to bottom and not substrate is exposed, provide integral rear and loose sides, not less than 3 inches.
 5. Backsplashes: Unless otherwise shown, integral, 3 sides, full height to underside of cabinets or trim if so shown.
 6. Adhesives: Low VOC contact adhesive (less than 80 g/L).
- C. Fabrication:
 1. Plastic laminate type: GP H-5 horizontal grade laminate adhered with waterproof adhesive.
 2. Substrate: 45-pound density or heavier phenolic resin particle board equal to Grade 1-M-3, ANSI 208.1 in thickness shown; where not shown provide 3/4 inch thick stock. Do not use hardboard.
 3. Certain countertop designs may integrate solid surfacing and metal faced high pressure laminates. Review details for these applications.
 4. Edge band: As above.
 5. Adhesives: Low VOC contact adhesive (less than 80 g/L).
 6. Seams: Only at "L" shaped countertops or if longer than 12 feet; use urea resin adhesives at seams.
 - a. Seams in peninsula or bartops: Not permitted.
- D. Interior Auxiliary Materials:
 1. Screws: FS FF-S-111.
 2. Nails: FS FF-N-105.
 3. Anchors: Type required for secure anchorage.
 4. Adhesives: Low VOC types.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Provide work to sizes, shapes, and profiles indicated. Install work to comply with quality standards referenced. Back prime work and install plumb, level and straight with tight joints; scribe work to fit.
- B. Quality Standard: Install woodwork to comply with [AWI Section 1700] [WI Manual of Millwork] for the same grade specified for type of woodwork involved.
- C. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Use non-corrosive fasteners for exterior work. Coordinate with work of other sections.
- D. Comply with manufacturer's requirements for cutting, handling, fastening and working treated materials.
- E. Repair minor damage, clean and protect.

EW COMMUNITY CENTER ALTERATIONS & ADDITIONS | East Windsor, CT
Stephen Jager Associates IIc | Project No. 2021.33
20 September 2022

END OF SECTION

TOWN OF EAST WINDSOR

NOTICE OF BID

**Sidewalk Replacement
Main Street
Warehouse Point**

Sealed bids are invited and will be received by the Town of East Windsor, until 11 a.m., Monday, May 23, 2022 at the Department of Public Works, 6 Woolam Road East Windsor, Connecticut, at which time and place they will be publicly opened and read aloud.

Proposals must be submitted on the forms provided and in a sealed envelope plainly marked with the appropriate title.

A pre-bid conference to review the project will be held at the Public Works Facility, East Windsor, CT, Monday, May 9, 2022, at 10:00 a.m. All prospective bidders are urged to attend.

A satisfactory Bid Bond or Certified Check, in an amount equal to five percent (5%) of the base bid, shall be submitted with each bid. The Bid Bond shall be made payable to the Town of East Windsor and shall be properly executed by the Bidder. A 100% Performance, Labor and Material Bond is also required. All sureties must be listed on the most recent IRS circular 570.

The Connecticut DOT permit is required for the work within the state ROW for Route 510.

The Information for Bidders, Form of Bid, Specifications, and other contract documents may be obtained or examined at the Department of Public Works 6 Woolam Road East Windsor, CT Monday – Friday 7:30am – 3:00pm (860) 292-7073.

Bids, to receive consideration, must be in the hands of the authorized representative, no later than the day and hour mentioned above.

The Town of East Windsor reserves the right to accept or reject any or all bids; to waive any informalities, or; to accept any bid deemed in the best interests of the Town of East Windsor.

All bids will be considered valid for a period of sixty (60) days.

**AN AFFIRMATIVE ACTION/EQUAL OPPORTUNITY EMPLOYER
MBE's, WBE's, SBE's and SECTION 3 DESIGNATED ENTERPRISES
ARE ENCOURAGED TO APPLY**

**East Windsor Department of Public Works
Sidewalk Replacement
Main Street
Warehouse point**

Instructions to Bidders

1. RECEIPT OF OPENING BIDS

Sealed bids of proposals for performing the work described herein will be received at the Department of Public Works, 6 Woolam Road East Windsor, 06088, until the time and date as shown on the Invitation to Bid.

Copies of contract documents may be obtained from the Department of Public Works, during the hours specified on the Invitation to Bid.

Proposals must be made on the forms furnished herein. Prior to the time and date designated for receipt of bids, a bid submitted may be modified or withdrawn by notice to the party receiving bids at the place designated for receipt of bids. A change shall be so worded as not to reveal the amount of the original bid.

Withdrawn bids may be resubmitted up to the date and time designated for the receipt of bids provided that they are then fully in conformance with these instructions to bidders.

Unless stated otherwise in the Advertisement or Invitation to Bid, the properly identified bids received on time will be opened publically and will be read aloud. The owner shall have right to reject any or all bids, reject a bid not accompanied by a required bid security or by any data required by these Contract Documents, or reject a bid, which is in any way incomplete or irregular.

2. ADDENDA & INTERPRETATIONS

Any request from prospective bidders for interpretation of meaning of Contract Drawings, specifications or other Contract Documents shall be made in writing to Leonard Norton, Director of Public Works/Town Engineer, 11 Rye Street, Broad Brook, Connecticut 06016, or email to lnorton@eastwindsorct.com and to be given consideration must be received at least seven (7) days prior to date fixed for opening of proposals.

Interpretations will be made in the form of written addenda to the Contract Documents, which addenda shall become a part of Contract. Not later than three (3) days prior to date fixed for opening of proposal, addenda will be mailed to all persons who obtained Contract Documents and provided information to be included on the list of Bidders. Failure of any bidder to receive any such addenda shall not relieve bidder from any obligation under his proposal as submitted.

**East Windsor Department of Public Works
Sidewalk Replacement
Main Street
Warehouse Point**

Instructions to Bidders
(continued)

3. METHOD OF AWARD

The contract will be awarded to the responsible bidder submitting the lowest bid complying with conditions of these Contract Documents. The bidder to whom the award is made will be notified at the Owner's convenience. The successful bidder shall execute and deliver to the Owner, within ten (10) days after receiving the Notice of Award, and Agreement in the form provided by the Owner, in such number as the Owner shall require.

The Owner also reserves the right to reject any or all bids, for any reason the Owner deems advisable, and to award the contract or contracts to any Contractors bidding on the work regardless of the amount of bid. It is intended that the contract or contracts will be awarded to the lowest responsible and eligible bidder possessing skill, ability and integrity necessary to provide faithful performance of the work.

4. BID SECURITY

The bid must be accompanied by a Bid Bond, in an amount equal to five (5) percent of the amount of the bid. The Bid Bond shall be duly executed by the Bidder as principal and having a surety thereon, which shall be acceptable to the Owner.

No bidder may withdraw his bid within thirty (30) calendar days after the actual date of bid opening.

5. SUBCONTRACTORS

The bidder is advised that any person, firm or other party to whom it is proposed to award a subcontract under this contract must be acceptable to and approved by the Owner. A list of intended subcontractors must be included on the submitted Bid Form.

6. QUALIFICATIONS OF BIDDER

The Town of East Windsor may make such investigation as deemed necessary to determine the ability of the bidders to discharge his contract. The bidder shall furnish the Owner with all such information and data as may be required for that purpose. The Owner reserves the right to reject any bid if the bidder fails to satisfactorily convince the Owner that he is properly qualified by experience and facilities to carry out the obligation of the Contract and to satisfactorily complete the work called for herein. Conditional bids will not be accepted.

**East Windsor Department of Public Works
Sidewalk Replacement
Main Street
Warehouse Point**

Instructions to Bidders
(continued)

7. EXECUTION OF CONTRACT & NOTICE TO PROCEED

Upon receipt of acceptable signed Agreement, the Owner will, within ten (10) days, enter into and sign the Agreement unless it deems it not in the best interest of the Town.

The notice to proceed shall be issued within ten (10) days of the execution of the Agreement by the Owner. Should there be reasons why the notice to proceed cannot be issued within such period, the time may be extended by mutual agreement.

8. PAYMENT

The Owner shall pay the Contractor 100% of the Contract value upon completion of the work, minus any penalties for delay of completion of work

9. DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The bidder to whom the contract is awarded will be required to execute the Agreement within ten (10) calendar days from the date when the Notice of Award is delivered to the Bidder. In case of failure of the Bidder to execute the Agreement, the Owner may, at its option, consider the Bidder in default, in which case the bid security accompanying the proposal shall be called.

10. TIME OF COMPLETION

The Bidder must agree to commence work on or before the date specified in the Notice to Proceed and to faithfully complete the project within sixty (60) calendar days. The Owner may deduct \$100 per day from payment due to the contractor for everyday beyond this time limit.

11. CONDITIONS OF WORK

At the date fixed for opening of bids, it will be presumed that each Bidder has made an examination of location and site work to be done under contract; has satisfied himself as to actual condition, requirements and quantities of work; and has read and become thoroughly familiar with Contract Documents, including Contract Drawings and addenda.

East Windsor Department of Public Works
Sidewalk Replacement
Main Street
Warehouse Point
Instructions to Bidders
(continued)

12. INTERPRETATION OF ACCEPTABLE WORK

The specifications, bidding and contract documents are to be interpreted as meaning those acceptable to the Town of East Windsor. Any substantive changes or interpretations will be issued by the town in writing as an addendum.

13. TAX EXEMPTIONS

The Town of East Windsor is exempt from federal excise taxes and Connecticut's sales-tax and use taxes. Bidders shall avail themselves of these exceptions.

14. INSURANCE

The bidder awarded this bid must provide a current certificate of insurance to the Office of the Chief of Police prior to the commencement of work with the following requirements:

- A. liability limits for bodily injury and personal injury \$1,000,000 per occurrence
- B. liability limits for property damage including that caused by motor vehicle \$1,000,000 per occurrence
- C. contractual liability \$1,000,000 per occurrence
- D. owner's protective liability and property damage
- E. Workers compensation as required by Connecticut state statute
- F. The Town of East Windsor is to appear as an additional insured on all certificate of insurance
- G. All insurance is to be provided by a company authorized to issue such insurance in the State of Connecticut
- H. Insurance may not be canceled or modified without sixty (60) days written notice by registered US mail to Office of the First Selectman, Town of East Windsor, 11 Rye Street Broad Brook, CT 06016.
- I. The insurance company rating should be no less than A-VII by A.M. Best.

15. LAWS AND REGULATIONS

SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART I - GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 INTENT

- A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.
- B. Any apparatus, appliance, material or work not shown on Drawings but mentioned in the Specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation as determined by good trade practice even if not particularly specified, shall be furnished, delivered and installed under their respective Divisions without any additional expense to the Owner.
- C. Minor details not usually shown or specified but necessary for proper installation and operation shall be included in the work as though they were hereinafter shown or specified.
- D. Work under each Section shall include giving written notice to the UCHC Agent of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

1.3 DEFINITIONS

- A. "Architect" means Stephen Jager Associates, 4 Grand View Drive, Enfield, CT 06082.
- B. "Engineer" means Acorn Consulting Engineers, Inc., West Simsbury, CT 06092.
- C. "regulating authorities" or "authorities", means all Governmental, Utility, and Insuring Authorities having jurisdiction.
- D. "Subcontractor" word means specifically the subcontractor working under this Division. Other Contractors are specifically designated "Plumbing Subcontractor", "General Contractor" and so on.
- E. Note: Take care to ascertain limits of responsibility for connecting equipment which requires connections by two or more trades.
- F. Word "install" shall mean set in place complete with all mounting facilities and connections as necessary ready for normal use or service.
- G. Words "furnish" or "supply" shall mean purchase, deliver to, and off-load at the job site, all ready to be installed including where appropriate all necessary interim storage and protection.
- H. Word "provide" shall mean furnish (or supply) and install as necessary.
- I. Word "finished" refers to all rooms and areas scheduled to be painted in Room Finish Schedule on the drawings. All rooms and areas not covered in Schedule, including underground tunnels and areas above ceilings shall be considered not finished, unless otherwise noted.
- J. Words "approved equal" mean any product which in the opinion of the UCHC Agent is equal in quality,

arrangement, appearance, and performance to the product specified.

- K. Word "wiring" shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.
- L. Word "product" shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.

1.4 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect. (Do not scale the drawings)
- B. Work under each Section shall closely follow Drawings in layout of work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom; where space conditions appear inadequate, UCHC Agent shall be notified before proceeding with installations.
- C. The UCHC Agent may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.
- D. Where variances occur between the Drawings and Specifications or within either of the Documents, the item or arrangement of better quality, shall be included in the Contract price. The UCHC Agent shall decide on the item and the manner in which the work shall be installed.

1.5 SURVEYS AND MEASUREMENTS

- A. Before submitting a Bid, the Contractor shall visit the site and shall become-thoroughly familiar with all conditions under which the work will be installed. The Contractor will be held responsible for any assumptions, omissions or errors made as a result of failure to become familiar with the site and the Contract Documents.
- B. The Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or which interfere with the intent of the Drawings and Specifications, the UCHC Agent will be notified and work will not proceed until instructions from the UCHC Agent are received.

1.6 CODES AND STANDARDS

- A. The Following Codes and Standards listed below apply to all sprinkler work. Wherever Codes and/or Standards are mentioned in these Specifications, the latest applicable edition or revision shall be followed:

NFPA-13 (2013) - Connecticut Supplement
Connecticut State Building Code - Connecticut Supplement
The BOCA National Building Code
The BOCA National Fire Code
The BOCA National Code Supplement
The National Electrical Code

- B. The following Standards shall be used where referenced by the following abbreviations:

AABC	Associated Air Balance Council
ACGIH	American Conference of Governmental Industrial Hygienists

ADC	Air Diffusion Council
AGA	American Gas Association
AIA	American Institute of Architects
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ARI	Air Conditioning and Refrigeration Institute
ASE	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASTM	American Society of Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CGA	Compressed Gas Association
CSA	Canadian Standards Association
CISPI	Cast Iron Soil Pipe Institute
EJMA	Expansion Joint Manufacturing Association
EPA	Environmental Protection Agency
FM	Environmental Protection Agency
FSSC	Federal Specification
HIS	Hydraulic Institute Standards
IBR	Hydraulic Institute Standards
IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
ISO	Insurance Services Office
MCAA	Mechanical Contractors Association of America
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NOFI	National Oil Fuel Institute
NSC	National Safety Council
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PDI	Plumbing and Drainage Institute
SBI	Steel Boiler Industry (Division of Hydronics Institute)
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
STI	Steel Tank Institute
UL	Underwriters' Laboratories

C. All materials furnished, and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction and the requirements of all Governmental departments having jurisdiction.

D. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, and Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether shown on Drawings and/or specified or not.

1.7 PERMITS AND FEES

A. The Contractor shall give all necessary notices, obtain all permits; and pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the work, file all necessary Drawings, prepare all documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspection for his work, and deliver a

copy to the UCHC Agent before request for acceptance and final payment for the work.

1.8 COORDINATION WITH OTHER DIVISIONS

- A. All work shall be carried out in conjunction with other trades and full cooperation shall be given in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, etc., required by other trades.
- B. The Contractors are required to examine all of the Project Drawings and mutually arrange work so as to avoid interference with the work of other trades. In general, ductwork-, heating, condenser, chilled water piping, sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The UCHC Agent shall make final decisions regarding the arrangement of work which cannot be agreed upon by the Contractors.
- C. Where the work of the Contractor will be installed in close proximity to or will interfere with work of other trades, the Contractors will cooperate in working out space conditions to make a satisfactory adjustment.
- D. If the work under a Section is installed before coordinating with other Divisions or Sections or so as to cause interference with work of other Sections, the necessary changes to correct the condition shall be made by the Contractor causing the interference without extra charge to the Owner.
- E. If so, directed in other Sections, the Contractor indicated shall prepare composite working drawings and sections clearly showing how the work is to be installed in relation to the work of other trades, at no extra charge to the Owner.

1.9 ACCEPTANCES

- A. The equipment, materials, workmanship, design and arrangement of all work installed under the Mechanical Sections shall be subject to the review of the UCHC Agent.
- B. Within 30 days after the awarding of a Contract, the Mechanical Contractor shall submit to the UCHC Agent, for review, a list of manufacturers of equipment proposed for the work under the Mechanical Sections. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.

If extensive or unacceptable delivery time is expected on a particular item of equipment specified, the Contractor shall notify the UCHC Agent, in writing, within 30 days of the awarding of the Contract. In such instances, deviations may be made pending acceptance by the UCHC Agent or the Owner's representative.
- C. Where any specific material, process or method of construction or manufactured article is specified by reference to the catalog number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, the Contractor shall verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.
- D. If material or equipment is installed before it is reviewed, the Contractor shall be liable for its removal and replacement at no extra charge to the Owner if, in the opinion of the UCHC Agent, the material or equipment does not meet the intent of, or standard of quality implied by, the Drawings and Specifications.
- E. Failure on the part of the UCHC Agent to reject shop drawings or to reject work in progress shall not be interpreted as acceptance of work not in conformance with the Drawings and/or Specifications. Work not in conformance with the Drawings and/or Specifications shall be corrected whenever it is discovered.

1.10 EQUIPMENT DEVIATIONS/SUBMITTALS

- A. Where the Contractor proposes to deviate (substitute or provide an equivalent) from the equipment or materials as hereinafter specified, he shall do so by making a request in writing. The Contractor shall state in his request whether it is a substitution or an equivalent to that specified and the amount of credit or extra cost involved. A copy of said request shall be included in the Base Bid with manufacturer's equipment cuts. The Base Bid shall be based on using the materials and equipment as specified with no exceptions.
- B. In these Specifications and on the accompanying Drawings, one or more makes of materials, apparatus or appliances may have been specified for use in this installation. This has been done for convenience in fixing the standard of workmanship, finish and design required for installation. The details of workmanship finish and design, and the guaranteed performance of any material, apparatus or appliance which the Contractor desires to deviate for those mentioned herein shall also conform to these standards.
- C. Where no specific make of material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for the Engineers review.
- D. Where two or more names are given as equivalents, the Contractor must use the specified item or one of the named equivalents. Where one name only is used and is followed by the words "or acceptable equivalent", the Contractor must use the item named or he may apply for an equipment deviation through the prescribed manner in accordance with Item 1.09, Paragraph B.
- E. Equipment, material, or devices submitted for review as an "equivalent" shall meet the following requirements:
- The equivalent shall have the same construction features such as, but not limited to:
Material thickness, gauge, weight, density, etc.
- The equivalent shall perform with the same or better operating efficiency.
- The equivalent shall be locally represented by the manufacturer for service, parts and technical information.
- The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as AMCA or ARI labels.
- F. Where the Contractor proposes to use an item of equipment other than specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Designers of Record at the expense of the Contractor and at no additional cost to the Owner.
- G. Where such accepted deviation or substitution requires a different quantity and arrangement of piping, valves, pumps, wiring, conduit and equipment from that specified or indicated on the Drawings, the Contractor shall, with the acceptance by the UCHC Agent, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the substitution.
- H. The UCHC Agent shall determine if an "acceptable equivalent" to a manufacturer listed in the Specifications is considered acceptable.
- I. All sprinkler submittals shall be submitted using the following format. If equipment to be used on project is as specified (manufacturer, model #, etc. the same) then no cut sheets are required. If equipment to be used on project is different than specified, then a cut sheet of equipment to be used shall be submitted along with an explanation of the difference between specified equipment and equipment requested to be used and the reason why the deviation. Submittals will only be accepted on a 8.5 X 11 sheet of paper with three (3) columns with the following headings: "SPECIFIED EQUIPMENT DISCRPTION", "EQUIPMENT REQUESTED DISCRPTION", AND "REASON FOR DIFFERENCE". If contractor is using equipment as specified, he would list equipment

under "Specified Equipment Description" and under "Equipment Requested Description" he would put "Same as Specified" and continue with next piece of equipment.

1.11 CHANGES IN WORK

- A. A Change Order is a written order to the Contractor signed by the Owner and the Architect, issued after Contracts have been awarded, authorizing a change in the work or an adjustment in the Contract sum or the Contract time. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract sum or the Contract time.
- B. All changes in the work shall follow the recommendations of the AIA "General Conditions of the Contract for Construction", Article 12.

1.12 MANUFACTURER'S IDENTIFICATION

- A. All component parts of each item of equipment or device shall bear the manufacturer's nameplate giving name of manufacturer, description, size, type, serial and model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a Subcontractor or distributor will not be acceptable.
- B. All material and equipment for the electrical portion of the mechanical systems shall bear the label of or be listed by UL, or other accredited authoritative agencies or testing organizations approved by the authority having jurisdiction.

1.13 SHOP DRAWINGS

- A. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed.
- B. Shop drawings shall be submitted within 60 days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review copies of all shop drawings to be incorporated in the Sprinkler Contract. Refer to the General Conditions and Supplementary General Conditions for the quantity of copies required for submission. Where quantities are not specified, provide seven (6) copies for review.
- C. Provide shop drawings for all devices specified under equipment specifications for all systems including fire alarm, sprinkler, clock, controls, etc., or where called for elsewhere in the Specifications. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures) of all shop drawings, catalog cuts, material lists, etc., shall be submitted to the UCHC Agent at one time. No consideration will be given to a partial shop drawing submittal.
- D. Submittals shall be marked with the trade involved, i.e., HVAC, plumbing, fire protection, etc. when the submittal could involve more than one trade, e.g., valves, piping, etc.

Where multiple quantities or types of equipment are being submitted, provide a cover sheet (With a list of contents) on the submittal identifying the equipment or material being submitted.

- E. Failure to submit shop drawings in ample time for review shall not entitle the Contractor to an extension of Contract time. No claim for extension by reason of such default will be allowed, nor shall the Contractor be entitled to purchase, furnish and/or install equipment which has not been reviewed by the UCHC Agent.
- F. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.
- G. Acceptance rendered on shop drawings shall not be considered as a guarantee of measurements or building

conditions. Where drawings are reviewed, review does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings.

- H. Acceptance of shop drawings shall not apply to quantity nor relieve Contractor of his responsibility to comply with intent of Drawings and Specifications.

Acceptance of shop drawings is final and no further changes will be allowed without the written consent of the UCHC Agent.

- J. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.
- K. Bidders shall not rely on any verbal clarification of the Drawings and/or Specifications. Any questions shall be referred to the UCHC Agent at least five (5) working days prior to Bidding to allow for issuance of an Addendum.

1.14 RECORD DRAWINGS

- A. Maintain at the job site a record set of Sprinkler Drawings on which any changes in location of equipment, piping, valves and access panels shall be recorded. These shall be clearly marked for Record Drawings- on a clean set of reproducible mylar sepias at the completion of the work and turned over to the UCHC Agent.

1.15 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the work, except as otherwise specifically indicated, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail and be so selected and arranged as to fit properly into the building spaces. Where no specific type or quality of material is given, a first-class standard article as accepted by industry standards shall be furnished.
- B. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, fitters, metal workers, welders, helpers and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.
- C. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the UCHC Agent and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- D. All labor for installation of mechanical systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The UCHC Agent reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.16 PROTECTION OF MATERIALS AND EQUIPMENT

- A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include making good all damage thus caused.
- B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.
- C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place and

completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures, and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.

- D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Insure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.17 SUPPORTS

- A. Unless otherwise specifically noted, the Contractor shall furnish all necessary supports for all equipment furnished under this Division.
- B. Unless otherwise shown, all equipment shall be securely attached to the building structure in an acceptable manner. Attachments shall be of a strong and durable nature; any attachments that are insufficient in the opinion of the UCHC Agent shall be replaced as directed without extra cost to the Owner.
- C. All pipping supports shall be designed and constructed such that the equipment will be capable of resisting both vertical and horizontal movement as dictated by applicable seismic Codes.

1.18 SLEEVES, INSERTS AND ANCHOR BOLTS

- A. The Contractor shall provide, set in place and be held responsible for the location of all sleeves, inserts and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the Contractors expense.

It is the responsibility of the Contractor to furnish cast-in-place sleeves, inserts and anchors in sufficient time to be installed during initial concrete pours. Where job schedules make this impossible, coordinate and obtain acceptance from the Structural UCHC Agent for alternate installation methods.

- B. All pipes and conduits passing through floors, walls or partitions shall be provided with sleeves having an inside diameter one (1") inch larger than the outside diameter of the pipe, conduit or insulation enclosing the pipe.
- C. Penetrations through fire-rated walls, ceilings and floors (except slab on grade) in which piping passes shall be filled solidly with acceptable fire-stopping material.
- D. When piping or conduit penetrate the floor of a mechanical room located above an occupied space, such penetrations shall be made completely watertight, such that a liquid leak shall not pass through the penetration.

1.19 CUTTING AND PATCHING

- A. All cutting and patching shall be done by the Contractor. The Contractor shall furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of work.
- B. Work under this Division shall include furnishing, locating and setting inserts and/or sleeves required before the floors and walls are built or be responsible for cutting, drilling or chopping where sleeves and inserts were not installed or correctly located. The Contractor shall do all drilling required for the installation of hangers.
- C. Exercise extreme caution when core drilling or punching openings in concrete floor slabs in order to avoid cutting or damaging structural members. No structural members shall be cut without the written acceptance of the Structural UCHC Agent and all such cutting shall be done in a manner directed by him.

1.20 SCAFFOLDING, RIGGING, HOISTING

- A. The Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises any equipment and apparatus furnished under this Division. Remove same from premises when no longer required.

1.21 EXCAVATION AND BACKFILLING

- A. Excavation and backfilling shall be carried out under Division 2 of the Specifications, unless otherwise indicated in individual trade Sections.
- B. It is the responsibility of the Mechanical Contractor to coordinate sizes, depths, fill and bedding requirements with the Division 2 Contractor and any other excavation work required under this Division.

1.22 WATERPROOFING

- A. Where any work pierces waterproofing, including waterproof concrete and floors in wet areas, the method of installation shall be reviewed by the UCHC Agent before work is done. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

1.23 ACCESSIBILITY AND ACCESS PANELS

- A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation-of the work.
- B. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include, but not be limited to: valves, drain points, etc. Access doors shall be furnished if required for better accessibility. Minor deviations from the Drawings may be made to allow better accessibility, but changes of magnitude or which involve extra cost shall not be made without the acceptance of the UCHC Agent.
- C. Access doors in walls, ceilings, floors, etc., shall be furnished by the appropriate Subcontractor and installed by the Contractor. It is the responsibility of the Contractor to coordinate and provide information regarding the sizes and quantities of access doors required for his work. The Contractor shall arrange his work in such a manner as to minimize the quantity of access doors required, such as grouping shutoff valves in the same area. Where possible, locate valves in already accessible areas, such as lay-in ceilings, etc. Minimum access door size is 18" X 18".
- D. On a clean set of prints, the fire protection Contractors shall mark in red pencil the location of each required access door, including its size and fire rating (if any), and shall submit the print to the Architect for review before access doors are purchased or installed.
- E. Upon completion of the Project, the Contractor shall physically demonstrate that all equipment and devices installed have been located and/or provided with adequate access panels for repair, maintenance and/or operation. Any equipment not so furnished shall be relocated or provided with additional access panels by the installing Contractor at no additional cost to the Owner.
- F. Permanent ladders for access to equipment when shown on Plans shall be furnished and installed by the Contractor.

1.24 TEMPORARY OPENINGS

- A. The Contractor shall ascertain from an examination of the Drawings whether any special temporary openings in the building will be required for the admission of apparatus provided under this Division and shall notify the Contractor or the Construction Manager accordingly. In the event of failure of the Contractor to give sufficient

notice in time to arrange for these openings during construction, the Contractor shall assume all costs of providing such openings thereafter.

1.25 SHUTDOWNS

- A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the UCHC Agent.
- B. The UCHC Agent and the Owner shall be notified of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.
- C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.26 TAGS AND CHARTS

- A. Each valve and piece of apparatus under this Division shall be provided with suitable brass or laminated plastic tags securely fastened with brass chains, screws or rivets. Equipment shall be numbered with laminated plastic tags or neatly stenciled letters two (2") inches high using designations in equipment schedules and/or shall conform to a directory indicating number, location and use of each item. Directories shall be prepared under each Section and provided to the UCHC Agent for approval.

1.27 ESCUTCHEONS

- A. The Contractor shall provide escutcheons on pipes wherever they pass through floors, ceilings, walls or partitions in visible locations.

1.28 COLOR-CODING AND PIPING IDENTIFICATION

- A. All piping shall be color-coded with semi-rigid plastic identification markers, Seton Setmark Type "SNA", Type "STR" or equivalent. Direction of flow arrows shall be included on each marker. On all horizontal pipe runs, the markers shall be installed 25 feet apart or less. Also, locate markers at wall penetrations, valves, changes in direction and at branch main take-offs.
- B. The background color of each identification marker shall also be color coded in conformance with ANSI A13.1.
- C. All identification markers are subject to UCHC Agents review prior to installation. See individual trade Sections for further requirements.

1.29 PAINTING

- A. All finish painting in completed areas shall be performed under Division 9 of the Specifications.
- B. All materials shipped to the job site under this Division, shall have standard manufacturer's finish, unless otherwise specified.
- C. All exterior piping, fittings and hangers shall be properly primed and finished with a minimum of two (2) coats of high grade exterior enamel.

1.30 PIPE EXPANSION

- A. All pipe connections shall be installed to allow for freedom of movement of the piping during expansion and contraction without springing. Swing joints, expansion loops and expansion joints with proper anchors and guides shall be provided by the Contractor where necessary and/or where shown on the Drawings. Anchors and guides shall be subject to the review of the UCHC Agent. Pay particular attention to plastic piping with high coefficients of expansion.

Consideration of required seismic lateral restraints shall be given when anchoring piping and making provision for expansion.

1.31 ELECTRICAL CONNECTIONS

- A. Unless otherwise specified, all wiring shall be furnished and installed under Division 16.
- B. All power wiring shall be furnished and installed complete from power source to equipment junction box..

1.32 MAINTENANCE

- A. The Contractor shall provide the necessary skilled labor to assure the proper operation and to provide all required current and preventative maintenance for all equipment and controls provided under this Division until final acceptance of the building by the Owner. The Contractor shall not assume acceptance of the building by the Owner until he receives written notification.
- B. The Contractor shall receive calls for any and all problems experienced in the operation of the equipment provided under this Division and he shall take steps to immediately correct any deficiencies that may exist.
- C. The Contractor shall check all controls in the building to ascertain that they are functioning as designed. This portion of the work shall be performed by the Contractor who installed the controls and be verified with the AHJ.
- D. Where normal preventative maintenance for any piece of equipment requires special tools, the Contractor shall furnish the appropriate tools for that piece of equipment (i.e., valve wrenches, etc.).

1.34 DEMOLITION

- A. All required demolition work shall be performed by the respective trades. All demolition work shall be performed in a neat and orderly fashion.
- B. After piping, equipment, etc., has been removed, neatly cap remaining piping. In finished areas, all piping shall be cut back to a concealed location, i.e., within walls, above ceilings, etc., before capping.
- C. Before submitting his Bid, the Contractor shall visit the site with Architectural and Sprinkler Plans in hand, and shall inspect all existing systems to determine the extent of demolition work involved. Particular attention is drawn to the removal of existing walls or portions of existing walls. In those areas, all exposed and concealed piping, equipment, etc., running across or through affected areas shall be removed as required. Piping shall then be either capped, or, if required for the proper continuing operation of an existing system to remain, piping shall be rerouted around the affected areas and reconnected as required.
- D. In general, it shall be the responsibility of the Contractor to remove demolished equipment, piping, etc., from the site and properly dispose of it. If the Owner shall so request, however, the Contractor shall turn over demolished equipment, etc., to the Owner for the Owner's use.

1.35 LUBRICATION

- A. All equipment installed under this Contract having moving parts and requiring lubrication shall be properly

lubricated according to manufacturer's recommendations prior to testing and operation. Any such equipment discovered to have been operated before lubrication by the Contractor is subject to rejection and replacement at no additional cost to the Owner. Units furnished with sealed bearings are exempted.

1.37 CLEANING

- A. The Contractor shall thoroughly clean and flush all piping, ducts and equipment of all foreign substances, oils, burrs, solder, flux, etc., inside and out before being placed in operation.
- B. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.
- C. During the course of construction, all ducts and pipes shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.
- D. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.

1.38 OPERATING INSTRUCTIONS

- A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, the contractor shall have a factory authorized representative, for each piece of equipment, fully instruct the Owner or the Owner's representative in the operation, adjustment and maintenance of all equipment furnished. The Contractor shall give at least seven (7) days notice to the Owner and the UCHC Agent in advance of this period.
- B. The Contractor shall furnish to the Contractor for delivery to the UCHC Agent four (4) complete bound sets of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Division. All instructions shall be submitted in draft for review prior to final issue. Manufacturers advertising literature or catalogs will not be acceptable for operating and maintenance instruction.
- C. The Contractor, in the above-mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this Division.
- D. The appropriate Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.
- E. Refer to individual trade Sections for any other particular requirements related to operating instructions.

1.39 ADJUSTING AND TESTING

- A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the UCHC Agent that they are in proper adjustment and in satisfactory, permanent operating condition.

1.40 GUARANTEES/WARRENTICES

- A. The Contractor shall guarantee all material and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner.
- B. During this guarantee period, all defects developing through faulty equipment, materials or workmanship shall be

corrected or replaced immediately by this Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineers satisfaction.

- C. Contractor shall provide name, address, and phone number of all contractors and subcontractors and associated equipment they provided
- D. A 15 minute telephone response time and a 2 hour on site response time is required for all equipment service. All equipment service shall be performed by factory trained technicians.

END OF SECTION 210500

SECTION 21 13 00 - WET SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Complete wet-pipe sprinkler system, including all required accessories.
- B. Alarm check & valves.
- C. Fire department connection.
- D. Sprinklers.
- E. Fire protection specialties.
- F. System design, installation, and certification.
- G. Sprinkler system and devices signage.
- H. Hangers and supports for sprinkler installation.
- I. Reduced Pressure Detector Assembly.
- I. Double Check Valve Assembly..
- J. Sprinkler drain line splash block.

1.3 RELATED WORK

- A. Section - Trench Excavation.
- B. Section 210000 - Common Work Results for Fire Suppression.
- C. Section 230550 - Common Work Results for HVAC
- d. Section 233000 - Basic Materials and Methods.
- D. Section 283102 - Fire Alarm System.
- E. All Other Sections of Division 23 and 28.

1.4 REFERENCES

- A. Connecticut Building Codes, 2018, with current amendments.
 - 1. 2015 International Building Code.
 - 2. 2015 International Residential Code.
 - 3. 2015 International Existing Building Code.
 - 4. 2015 International Mechanical Code.
 - 5. 2015 International Plumbing code.
 - 6. 2015 International Conservation Code.
 - 7. 2017 National Electric Code NFPA-70-2014
 - 8. ICC/ANSI A117-1-2009.
 - 9. 2015 International Fire Code.
 - 10. 2013 NFPA-13

1.5 SYSTEM DESCRIPTION

- A. Sprinkler system to provide complete coverage for the Entire Building.
- B. 6 inch fire service from water main in street to new fire service equipment room at the ground floor.
- C. The piping layout and head locations indicated on the Contract Drawings are diagrammatic. The Contractor is responsible for a complete, fully coordinated installation.
- D. Coordinate existing structural elements and building construction for adequate coverage.
- E. Provide fire department connections and all valves, switches and accessories.
- F. Interface system components with new fire alarm system.
- G. System shall be designed to meet NFPA 13 and NFPA 24 Standards, Engineer's requirements, Fire Marshall's requirements, and Owner's insurance underwriter.

1.6 QUALITY ASSURANCE

- A. Workmanship and Qualifications: All materials and equipment shall be installed in accordance with NFPA Standard 13 and all applicable local codes and ordinances. The sprinkler subcontractor shall be state licensed to install sprinkler system. All work and materials must conform to the requirements set forth by this Specification. Fire protection equipment shall be installed to conform to NFPA Standard 13 as applicable, and devices used shall be listed and approved by Underwriters Laboratories (UL) and/or Factory Mutual (FM). Welding shall be in accordance with NFPA Standard 13 by certified welders.
- B. Codes and Standards: All work shall be equal or superior to that required by codes, regulations, ordinances, and laws imposed by the jurisdictional authorities. Nothing in the Specifications permit violation of such directives, and where conflict occurs, the directive shall govern, except where superior work is specified or indicated.
- C. In addition to complying with the above codes and regulations, comply with the requirements of the following:
 - 1. NFPA Standard 13.
 - 2. NFPA Standard 24.
 - 3. State Building and Fire Codes.
 - 4. Local Jurisdictional Authorities.
- D. Maintain one copy of document on site and record all changes "as-built".

1.7 HYDRAULICALLY DESIGNED SYSTEM

- A. The pipe sizing and arrangement shown on the Contract Drawings are generally diagrammatic. The Contractor shall submit for approval a hydraulically designed system in according to the applicable requirements of NFPA-13 and the Project Specifications.
- B. Hydraulically designed system shall include calculations and detailed layout showing all hydraulic reference nodes. The requirements established under section 14.1 "Working Plans" and 14-3 "Hydraulic Calculation Forms" of NFPA-13 shall be followed.
- C. Calculations shall include a summary sheet, detailed work sheets, and water supply graph sheets for each set of calculations.
- D. The design area(s) shall be the most hydraulically demanding based on the criteria of NFPA-13.
- E. Include loss through the reduced pressure detector assembly based on manufacturer's publicized data.
- F. The design velocities shall be kept to a minimum. The design maximum shall be 20 fps. Contractor shall also verify any local design requirements or restrictions.
- G. Hydraulically designed system must meet the approval of the Fire Marshal and the Owner's insurance

underwriter.

H. All drawings and calculations must bear the seal of a professional engineer, licensed in the State of Connecticut.

1.8 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 210500.
- B. Submit manufacturer's data, drawings, and installation instructions for all equipment and specialties.
- C. Submit hydraulic calculations with all information required under NFPA 13.
- D. Submit installation shop drawings, including major building structural components, detailed pipe layout, elevations, hydraulic reference points, hanger and support locations, seismic brace locations, and components and accessories. Show all changes in ceiling elevation, obstructions, and hydraulically most remote area, with summary of calculation. Coordinate these shop drawings with all building elements, including, but not limited to, mechanical system, electrical systems, structural systems, architectural components, reflected ceilings, etc. Provide dimensioning of critical areas.
- E. Provide layout of sprinklers for the Building to have full sprinkler coverage.
- F. Plans shall be 1/4" equals 1'-0" scale minimum.
- G. After successful review by Architect and Engineer, submit shop drawings to Owner's insurance underwriter and local Fire Marshal for approval. Submit proof of approval to Architect/Engineer. Any deviation from approved plans must have approval from the Fire Marshal and Architect/Engineer.

1.9 OPERATION AND MAINTENANCE DATA

- A. Submit manufacturer's operation and maintenance data under provisions of Section 210500.
- B. Include written maintenance data on components of system, servicing requirements, and Record Drawings.

1.10 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 210500.
- B. Record actual locations of sprinklers and deviations of piping from Drawings. Indicate drain and test locations.

1.11 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this Section with minimum five years experience.
- B. Design sprinkler system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State where the project is located.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.
- B. All equipment, valves, alarms, gages, etc., shall be covered and protected during the execution of the work. All equipment and piping shall be protected from freezing. Labeling to remain in place.
- C. All unloading, hauling, and handling of materials shall be the responsibility of the sprinkler subcontractor.
- D. The sprinkler subcontractor can obtain information on available storage space on site from the Owner when making examination of the site.

1.13 EXTRA MATERIALS

- A. Provide extra sprinkler heads under provisions of NFPA 13.
- B. Provide suitable wrenches for each head type.
- C. Provide metal sprinkler storage cabinet with sprinklers in fire service room.

PART 2 PRODUCTS

2.1 ALARM VALVES

A. Acceptable Manufacturers:

- 1. Tyco.
- 2. Viking Corporation.
- 3. Victaulic.
- 4. Reliable.
- 5. Substitutions are Permitted.

B. WET PIPE SPRINKLER ALARM VALVE

- 1. Where Alarm Check Valves are specified for use in wet-pipe sprinkler systems they shall be specifically listed for such use. Alarm Check Valves, 2-1/2, through 8 Inch: Shall be equal to Tyco Model AV-1. Alarm Check Valves shall be of ductile iron construction intended for use in either the vertical or horizontal position. Valves shall be rated for use at a maximum service pressure of 300 psi. When variable water supply pressures exist, Alarm Check Valves shall be installed with a retard chamber. Alarm Check Valves shall be connected to a water motor-operated mechanical alarm or a pressure switch equal to the Potter PS10A, for initiating electrical alarms, or both. Alarm Check Valves shall be UL listed and FM approved. Alarm Valve trim shall be listed/approved with the Alarm Valve to which it is attached.
- 2. When variable water supply pressures exist, a Retard Chamber shall be installed on the alarm line of an alarm check valve help prevent false alarms. Retard Chambers shall be equal to Tyco Model RC-1. Retard Chambers shall be of a one-piece design constructed out of cast iron. A restriction assembly connected to the Retard Chamber having a 1/8" orifice shall allow water in the alarm line of the alarm check valve to automatically drain. Retard Chamber shall be UL listed and FM approved with the alarm check valve to which they are attached.
- 3. When a hydraulically operated outdoor alarm is required as an audible notification of water flow through a system valve that alarm shall be specifically listed for such use. Water Motor Alarms shall be equal to Tyco Model WMA-1. The Water Motor Alarm shall be rated for use at a maximum service pressure of 300 psi. The Water Motor Alarm shall be of a red or aluminum finish. Water Motor Alarms shall be UL listed and FM approved with the alarm check valve to which they are attached.
- 4. Where check valves are specified in lieu of Alarm Valves for use in the riser of a wet-pipe sprinkler system they shall be specifically listed for such use. Riser Check Valves 2-1/2" through 8" shall be equal to Tyco Model CV-1FR. Riser Check valves shall be of ductile iron construction intended for use in either the vertical or horizontal position. Riser Check valves shall be rated for use at a maximum service pressure of 300 psi. Riser Check Valves shall be equipped with a removable cover for ease of field maintenance. Riser Check valves shall be equipped with listed pressure gauges on both the system and supply sides of the valve clapper and a main drain connect above the clapper. A vane type water flow switch, equal to the Potter VSR-F, shall be mounted on the system side of the check valve to serve as the initiating device for electrical alarms. Riser check valves shall be UL listed and FM approved.
- 5. Riser manifold assemblies shall be equal to Tyco Model RM-1. Where an integrated manifold consisting of a water flow detector, main drain, system pressure gauge, and test connection is specified for use in wet-pipe sprinkler system riser it shall be specifically listed for such use. These assemblies shall be of ductile iron construction intended for use in either the vertical or horizontal position. These assemblies shall be rated for use at a maximum service pressure of 300 psi. Riser manifold assemblies shall be UL (or ULC) listed and FM approved.

2.2 SPRINKLERS

- A. Acceptable manufacturers:
 - 1. Tyco.
 - 2. Viking Corporation.
 - 3. Victaulic.
 - 4. Reliable.
 - 4. Substitutions are Permitted.
- B. Semi-Recessed Ceiling Type: Glass bulb automatic sprinkler, adjustable, recessed pendent type with chrome or white plated sprinkler and escutcheon, 1/2" orifice size, 5.6K factor, 3/4" to 1-3/8" adjustable range below ceiling.
- C. Concealed Ceiling Type: Adjustable concealed automatic sprinkler with ceiling cover plate, 1/2" orifice size, 5.6 K factor, brass finish sprinkler, white factory painted cover plate.
- D. Upright Type: Glass bulb automatic upright sprinkler with all brass frame & finish, 1/2" orifice size, 5.6 K factor.
- E. Sidewall Type: Sidewall glass bulb automatic sprinkler, chrome or white plated sprinkler and escutcheon, 1/2" orifice size, 5.3 K factor. Provide adjustable escutcheon where obstructions prevent the sprinkler from being directly mounted on wall.
- F. Pendant Type: Glass bulb automatic pendant sprinkler with chrome or white plate finish, 1/2" orifice size, 5.6 K factor. Provide adjustable escutcheon and chrome plated sprinkler guard.
- G. Quick Response, Pendent and Upright Type: Quick response sprinkler, 1/2" orifice, 5.6 k factor; sprinkler and escutcheon shall be chrome or white plated.
- H. Extended Coverage Fast Response Sidewall Type: Extended coverage horizontal sidewall automatic sprinkler, 1/2" orifice, 5.6 K, 8.0K factors. Sprinkler and escutcheon shall be chrome or white plated.
- I. Dry Sidewall or Pendant Sprinkler: Glass bulb automatic sprinkler, chrome plated, 1/2" orifice size, 5.6 K factor, adjustable standard. Coordinate lengths with installation.
- J. Spare Sprinklers: Furnish spare automatic sprinklers in accordance with the requirements of NFPA Standard 13 for stock of extra sprinklers. The sprinklers shall be packed in a suitable container and shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. Furnish no less than two special sprinkler head wrenches, or at least one head wrench for each container or sprinkler box, whichever is greater.
- K. Guards: Finish to match sprinkler head.

2.3 FIRE DEPARTMENT CONNECTION

- A. Acceptable Manufacturers:
 - 1. Potter-Roemer, Inc.
 - 2. Viking Corporation.
 - 3. Fire Protection Products, Inc.
 - 4. Substitutions are Permitted.
- B. Two-Way Fire Department connection is based on Potter-Roemer, Inc. Model 5710-B.
- C. Single Fire Department connections is based on a 5" Storz, with 30 degree angle fitting turned down. Verify requirements with Local Fire Department.
- D. Fire Department connections shall be constructed of cast brass with brass clapper, brass swivel couplings and a brass hinge pin. The words "AUTO SPKR" and "F.D. Conn." are cast in raised letters on the body.
- E. Threads shall match local fire department's standard.

2.4 SPECIALTIES

- A. Acceptable Manufacturers:

1. Potter-Roemer, Inc
2. Viking Corporation.
3. Substitutions are not Permitted.

- B. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy red enameled gong and motor housing, nylon bearings and inlet strainer.
- C. Electric Bell Alarm: Electric operated motor type alarm with round red enamel steel bell with 120 Volt A.C. connection.
- D. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two sets (Form C) contacts rated 10 amp at 125/250 volt AC.
- E. Pressure Switch: 1/2 inch male pressure connection to alarm check valve wet system and actuated by any flow of water in excess of one sprinkler. Maximum pressure rating, 175 psi, weatherproof, with tamper resistant screws, rated 10 amp at 125/250 volt AC.
- F. Valve Supervisory Switch: Shall be installed on all control valves, 120 volt AC output. Switch based on Potter-Roemer, Fig. #6220 through 6223.
- G. Retard Chamber: Shall be of the same manufacturer as alarm valve.
- H. Pressure Gauge: Stainless steel 3-1/2 inch case with 1/4 inch male N.P.T. connection, glass enclosed dial with range of 0-300 psi.

2.5 REDUCED PRESSURE DETECTOR ASSEMBLY

- A. Reduced Pressure Detector Assembly: ANSI/ASSE 1013 (AWWA C506); bronze body, two independently operating, spring loaded check valves. Diaphragm type differential pressure relief valve located between check valves; assembled with two gate valves, strainer, test cocks and metered bypass. Detector assembly shall be Model #909RPDA as manufactured by Watts.
- B. Detector assembly shall be the line size as the pipe it is connected to. Each assembly shall conform to the characteristics required by the utility providing fire water service. Verify fire service utility requirements.
- C. Detector assembly shall prevent the reverse flow of fire protection system substances from being pumped or syphoned into safe drinking water system. Assemblies shall be able to detect leaks. Provide relief vent to atmosphere.
- D. Detector assembly shall feature resilient wedge shut-offs, epoxy coated cast iron body construction, removable bronze seats, stainless steel internal parts, and shall be tested and certified under FCCCHR of USC Manual Section 10.

2.5a DOUBLE CHECK VALVE ASSEMBLY

- A. Double Check Valve Assembly shall consist of two independent tri-link check modules with a single housing, sleeve access port, four test cocks and two drip tight shut-off valves. Tri-link checks shall be removable and serviceable, without the use of special tools.
- B. The housing shall be constructed of 304 Schedule 40 stainless steel pipe with groove end connections. Tri-link checks shall have reversible elastomer discs and in operation shall produce drip tight closure against reverse flow caused by back pressure or siphonage.

Contractor to have all backflow assemblies approved by local water companies.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate work of this Section with other affected work.

- B. The flow test data obtained from the Local Water Company as follows: ## psi static; ## psi residual at #### GPM. Flow test was done on date on Hydrant #, Address.
- C. Subcontractor shall field verify prior to the installation of the sprinkler system the location of exposed structure and other building elements. Furnish and install the appropriate sprinkler head type and spacing per NFPA for this application.

3.2 INSTALLATION - FIRE SERVICE

- A. Installation of fire service shall be done in accordance with Water Utility and NFPA-24.
- B. Concrete thrust blocks are to be provided at each change in direction of the new fire service and at all tees and bends. The concrete shall be of a mix of one part cement, two and one-half parts sand, and five parts stone. Backing to be placed between undisturbed earth and fitting being restrained. Backing shall be of such bearing area as to assure adequate resistance and shall be placed so joints are accessible for inspection and repair.
- C. Tie-rods to be provided on new fire service at point where service enters building foundation. Minimum threaded rod size shall be 5/8 inch.
- D. Pipe shall have a minimum of 5'-0" of cover.
- E. Provide a flanged fitting within building at 6 inches above finished floor.
- F. Bolted joints shall be cleaned and coated with asphalt or other corrosion retarding material.
- G. Foundation penetration shall be sealed water tight.
- H. Upon completion of fire service installation, piping shall be flushed and tested before backfilling in accordance with NFPA-24.

Refer to Specification Section on trench Excavation for trenching and backfilling.

3.3 INSTALLATION - PIPING

- A. Install equipment in accordance with manufacturer's instructions.
- B. Products shall be installed in accordance with the requirements of this Specification and all applicable NFPA Standards.
- C. Impairments to the existing water supplies shall be minimized. All work shall be complete before making the final connections to the existing water supplies. Notify the Owner's representative before impairing any fire protection equipment.
- D. Maintain a clean and orderly site during the installation of the sprinkler system. Materials shall not be stored in the halls or other public areas.
- E. Cutting, welding and other hot work shall not be permitted without permission from the building owner.
- F. Provide reduced pressure detector assembly at sprinkler system water source connection.
- G. Locate Fire Department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- H. Locate outside alarm gong & bell on building wall as indicated.
- I. Place pipe runs to minimize obstruction to other work.
- J. Provide OS&Y gate valves directly in front of and immediately after detector assembly. There shall be no fittings or pipe between gate valves and detector assembly.
- K. Provide piping offsets as required to center heads in two directions in ceiling tile.

- L. Apply strippable tape or paper cover to ensure concealed sprinkler head cover plates do not receive field paint finish.
 - M. All sprinkler piping shall be installed concealed above ceilings and within walls unless noted otherwise on the drawings.
 - N. Hydrostatically test entire system.
 - O. Require test to be witnessed by the Fire Marshal.
 - P. Keep sprinkler system downtime to a minimum.
 - Q. Provide access panels for all valves and flow switches.
- 3.4 INSTALLATION - SPRINKLERS
- A. Provide sprinkler coverage throughout the entire Building.
 - B. Provide sprinkler layout of entire building for review by Architect/Engineer
- 3.5 EXTRA STOCK
- A. Provide extra sprinkler heads under provisions of NFPA 13. Provide extra sprinkler heads in proportion to the type of heads installed.
 - B. Provide suitable wrenches for each head type.
 - C. Provide sprinkler head cabinets to store the extra supply of heads and wrenches in locations designated.
- 3.6 CLEANING
- A. Flush entire piping system of foreign matter.
- 3.7 IDENTIFICATION
- A. Provide and apply signs to control, drain, test and alarm valves to identify their purpose and function. Provide and permanently attach hydraulic calculations data nameplate at the controlling valve for the sprinkler system. Provide lettering size and style from NFPA's suggested styles.
- 3.8 TESTING
- A. Piping; The completed system shall be subject to a pressure test, and to such other tests as the authorities having jurisdiction may require. The pressure test shall be a hydrostatic pressure of (200) pounds per square inch for a period of two hours. The above ground piping and attached appurtenances shall show no pressure loss or leaks, refer to NFPA Standard 13 Hydrostatic Tests. For buried piping, refer to NFPA Standard 24 Testing Underground Systems. Before applying specific test pressure, all air must be expelled from the system. All defects of whatever type shall be repaired or replaced to the satisfaction of the Owner and authorities having jurisdiction. Packing rings, special joint bolts, gaskets, and other material required for the proper installation of the pipe and fittings shall be provided. Testing shall be completed prior to permanent sealing of walls and partition.
 - B. Leaks in mechanical joints shall be repaired by dismantling the joint, reassembling it, and tightening the bolts in the correct order. Leaks in screw or grooved joint shall be repaired by dismantling the joint and reassembling it. Attempting to repair leaks in joints by over tightening the bolts or fittings shall not be permitted.
 - C. Upon satisfactory completion of all tests, submit three copies of the Standard Contractors Material and Test Certificate to the Owner.

END OF SECTION 211300

SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The following Drawings indicate the work required under this Division.
- All Drawings associated with this project.
- And all other Contract Drawings.
- B. Certain items of work pertaining to the work of this Division are provided under other Divisions of the Specification. These include, but are not limited to the following:
1. Excavating and backfilling for buried utilities, piping, etc.
 2. Concrete work for equipment bases, thrust blocks, meter pads, valve boxes, etc.
 3. Installation of access doors in finished construction.
 4. Installation of pipe sleeves in walls and floors.
 5. Wiring of mechanical equipment. (Motor starters furnished under this Section.)
 6. Framing of openings in walls, floors, roof for ductwork, piping, fans, etc.
 7. Chases, soffits, furred spaces required to conceal work of this Division.
 8. Flashings for plumbing vents, roof curbs, etc.
 9. Wiring of sprinkler system controls, accessory equipment.
- C. Materials furnished under other Divisions and installed by this Division include, but are not limited to:
1. Refer to Architectural Specifications and Drawings to determine items furnished under other Sections that will require work under this Division and include such work.
- D. Complete Utility connections as indicated or needed, extension to Project, metering as required, and connection to building systems, including:
1. Apply for all services and pay for all fees, assessments, and charges of the Utility for each connection, all in a timely manner and according to the Project Schedule.
 2. Provide and install all metering, valves, accessories as required by Utility. Install entire service in accordance with the Utility's requirements or other applicable regulation.
 3. All necessary coordination with Utility to determine scope of work provided by Utility and the part provided by Contractor so that a complete Utility connection is made.
- E. Provide coordination for Mechanical and Electrical installations. Provide additional coordination drawings, as directed by Architect, in areas of potential interferences.
- F. All work shall comply with applicable codes and regulations, including, but not limited to the following:
1. 2018 Connecticut Building, Fire Safety, and Health Codes, as amended, including all codes, standards and regulations referenced therein.
 2. Requirements of Local, State, and Federal authorities having jurisdiction over the Work.
 3. Current regulations of the Occupational Safety and Health Administration (OSHA).

4. Requirements of affected Public Utility Companies.
5. Special requirements set down by the Owner, the Owner's Insurance Carrier, or other concerned entities.
- G. Mechanical Contractors must be ACCA Quality Assured (QA). The ACCA QA program is a self-certification activity for professional HVAC contracting businesses. QA participants attest that they satisfy the requirements for the EPA ENERGY STAR Qualified New Homes Program (Version 3).

1.2 RELATED DOCUMENTS

- A. Instructions to Bidders, the General Conditions of The Contract, and General Requirements shall apply and be binding to the Contractor and their subcontractors, vendors or suppliers who performs work under this Division.
- B. Where items of the General or Special Conditions are repeated in this Section, it is intended to call particular attention to or qualify them. It is not intended that any parts of the General or Special Conditions be assumed to be omitted if not repeated in this Section.

1.3 INTENT

- A. Intent of the Specifications and Drawings is to call for finished work, tested and ready for operation.
- B. Material and equipment mentioned in Specifications or shown on the Drawings shall be furnished new, completely installed and adjusted, and left in a clean, safe, and satisfactory condition ready for operation. All supplied appliances and connections of every sort necessary shall be furnished and installed to the satisfaction of the Architect and Owner.
- C. Apparatus, appliances, material, or work not shown on the Drawings but mentioned in Specifications, or vice versa, or any incidental accessory items such as valves, unions, fittings, etc., necessary to make the work complete, serviceable, and perfect in all respects and ready for operation, even though not particularly specified or shown, shall be provided and installed without additional cost to the Owner.
- D. Minor details not usually shown or specified, but necessary for the proper installation and operation of the work shall be included as if specified herein.
- E. Prior to submission of bids, give written notice to Architect of any materials or apparatus believed to be inadequate, unsuitable, or in violation of laws, ordinances, rules, or regulations of the authorities having jurisdiction over the work; or any necessary items believed omitted. In absence of such notice, it is mutually agreed that the cost of all required and necessary items has been included in the bid and that all systems specified and shown will function satisfactorily without claim for additional cost to the Owner.

1.4 DEFINITIONS

- A. The following words or terms contractions used for convenience throughout this specification are, unless specifically noted to the contrary, defined as follows:
 1. "Architect" means Stephen Jager Associates, 4 Grand View Drive, Enfield, CT 06082
 2. "Engineer" means Acorn Consulting Engineers, Inc., West Simsbury, Connecticut 06092.
 3. "contractor" , as used herein, means the Prime Sub-contractor responsible for the work of that specific section of Division 15.
 4. "furnish" or "provide" or "supply" means to supply, erect, install, connect, test, and place into operation the particular item or work referred to unless otherwise specified.
 5. "work" means all of the labor, material, equipment, and supplies needed to fully execute the intent of this Specification.
 6. "Regulating authorities" or "authorities", means all governmental, utility and insuring authorities having jurisdiction.
 7. "piping" includes all pipe, fittings, valves, hangers, insulation, and other accessories relating to piping, and the labor to install same.

8. "concealed" means hidden from view in chases, furred spaces, hung ceilings, embedded in construction, or buried underground. It is intended that all piping, equipment, and accessory items be concealed unless specifically indicated otherwise on the Drawings.
9. "exposed" means "not concealed" as defined above. work in tunnels, crawl spaces, within cabinetry, or otherwise accessible to view shall be considered "exposed" unless specifically noted otherwise.
10. "ductwork" means, in addition to ducts, all fittings, dampers, air control devices, hangers, flexible connectors and other accessories related to such ductwork.

1.5 DRAWINGS

- A. Drawings are generally diagrammatic and are intended to convey the scope and general arrangement of the work. Deviations from the depicted arrangement shall be approved by the Architect.
- B. Location of items shown on the Drawings, or called for in the Specifications, not definitely fixed by dimension, are approximate only. Exact location necessary to secure the best conditions and serviceability shall be determined in the field and shall have the review of the Architect.
- C. Follow the Drawings in laying out the work. Check Architectural, Structural, and other trade Drawings to verify spaces available so that maximum head room and service access can be maintained. Where space conditions appear inadequate, notify Architect before proceeding with the work.
- D. Work on the Drawings is intended to be approximately correct to the scale of the Drawings. Figured dimensions and large scale details shall take precedence over layouts on smaller scale Drawings. Dimensional information shall be taken only from the Architectural or Structural Drawings and details.
- E. Typical details shall apply to each and every occurrence of the item. Drawings make use of symbols and schematic diagrams to indicate and define various items of work. These have no dimensional significance, nor do they necessarily delineate each and every item required to make the work complete. Work shall be installed according to the diagrammatic intent of the Drawings, in conformity with the applicable dimensions, and as required by the finally approved shop and fabrication drawings.
- F. No interpretation shall be made from the limitations of symbols and diagrams that any necessary element or work has been excluded.
- G. If directed by the Architect or Owner, make reasonable modifications in the layout of the work to avoid conflict with work of other trades or for better execution of the work.
- H. Refer to Drawings and Specifications of all other trades to ascertain if any items provided or installed therein require work under this Division so that the final installation will be a complete job, ready for operation, completely coordinated and interconnected. It is understood that indication of any item on the Drawings or in the Specifications carries with it the instruction to furnish and install completely, regardless of whether this instruction is explicitly stated.
- I. No statement in Drawings or Specifications, or any omission in either should be misunderstood as relieving the Contractor from providing a complete job. No inclusion, exclusion or limitation in the language of the Drawings or Specifications shall be interpreted as meaning that any required item or accessory necessary to complete any required system is omitted.
- J. The use of words in the singular shall not be considered as limiting where other indications allude to more than one item being needed.

1.6 VISITING THE SITE

- A. Prior to submitting a bid, visit the site of the work, inspect the Existing Building and conditions so as to determine if these conditions will affect the work. Bidders are cautioned that they will be held responsible for any assumptions made regarding existing conditions.

1.7 SUBSTITUTIONS

- A. Within thirty (30) days after Award of Contract, submit to the Architect for review a list of manufacturers of all materials and equipment proposed for use on the project. Indicate on submittal which items are substitutions.

- B. A review, without exception, of this list does not constitute approval, nor does it guarantee acceptance of the shop drawings when submitted.
- C. The Contractor's intent to purchase the exact make specified does not relieve him from the responsibility to submit this list. Failure to submit this list will require the Contractor to supply the exact item specified as the basis for design.
- D. Submittal of items which differ from those specified or indicated as the basis for design carries the implicit guarantee that the substituted item will provide the intended service and is compatible with other items or systems interfacing with it.
- E. When proposing a substitute item, the Contractor shall be responsible for all costs of accommodating the substitution, including, but not limited to, space and accessibility, modifications required to other systems, structural adequacy and the like.
- F. If substitutions require the Architect or Engineer to prepare sketches or revised drawings in order to become acceptable, the cost of such sketches, drawings, or engineering shall be borne by the Contractor.
- G. When substitutions require Engineer or Architect to spend an inordinate time for review of substitutions, the cost of review over four (4) hours will be charged to the Contractor who made the submittal.

1.8 SHOP DRAWINGS

- A. After acceptance of List of Manufacturers required under paragraph 1.07(A) of this Section, and prior to delivery of materials and equipment to the project site, submit nine (9) copies of shop drawings of each item for review by the Architect.
- B. Each submittal shall contain a complete list of all materials contained within. Include intended use for each item.
- C. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature and complete characteristics of equipment, including, but not limited to, dimensions, capacity, code compliance, motor and drive and testing, construction, electrical characteristics, support, all as required for this project.
- D. Architect may designate submittal of physical samples for review on items where actual color, texture or other characteristics might not be adequately described by a drawing or written material. Upon approval of a sample, each and every item of that sort must be identical to the approved sample.
- E. Certified performance curves shall be submitted for all fan and pumping equipment. Certified ratings shall be submitted for all operating equipment.
- F. Samples, drawings, specifications, catalogs, etc., submitted for review shall be labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specification governing, Contractor's name and name of project.
- G. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the Contractor from his responsibility of furnishing material or performing work according to Contract Documents.
- H. Failure to submit shop drawings in ample time for checking shall not be cause for an extension of Contract Time, and no claim by reason of such default will be allowed.
- I. Submittals for all systems which require the interconnection of three or more devices shall include a system block diagram. The diagram shall be of the one line type and with sufficient detail to show interfaces and method of operation.
- J. Material or equipment installed prior to review shall be liable for removal and replacement at no extra charge to the Owner if the material or equipment does not meet the intent of Drawings and Specifications.

1.9 EQUIPMENT AND MATERIALS

- A. Equipment and materials furnished or required shall be new, without blemish or fault. Equipment shall bear labels attesting to approval by Underwriters Laboratories, AGA, or other recognized testing laboratory where specified or required to have such approval.

- B. Where no specific indication as to type or quality is indicated, a first-class article shall be furnished.
- C. All equipment of a type shall be products of a single manufacturer.
- D. Each item shall bear the manufacturer's nameplate showing name, ratings, model numbers and serial numbers. Nameplates of suppliers or distributors will not be acceptable.
- E. Provide line sized valves and unions or flanges on each pipe connection to items of equipment requiring piped connections.

1.10 RECORD DRAWINGS

- A. Obtain from the Architect a clean set of blue-line prints of the work and during construction indicate any deviations in routing, arrangement, elevation or size thereon.
- B. "As-Built" drawings shall be kept up to date concurrently with the execution of the work and turned over to the Architect for review and approval at the conclusion of the project. Failure to keep up to date on these drawings will require the Contractor to reconstruct his installations, make whatever investigations to accurately locate the installed work are needed, even if he has to cut into finished construction. All costs for this work shall be borne by the Contractor who failed to keep "as-built" drawings up to date.
- C. These drawings shall indicate the exact location and elevation of all utilities, sewers under floor slabs or buried on the site. Dimensions shall refer to the finished walls of the building or to finished grade or floor level. Include, as well, the final location of ducts and pipes concealed in chases, walls or above permanent ceilings.
- D. The location of all valves and cleanouts shall be indicated by dimension.

1.11 LAWS, ORDINANCES, CODES, PERMITS, FEES AND REGULATIONS

- A. Give all necessary notices, obtain all permits, pay all taxes and fees in connection with the work. File all Contract Documents, prepare documents and obtain all approvals of governmental departments having jurisdiction over the work. Obtain Certificates of Inspection and deliver to Architect before Application for Final Payment.
- B. Materials and workmanship shall comply with the rules and regulations of the National Board of Fire Underwriters, applicable Building and Life Safety Codes, the requirements of Boards of Health, Fire Insurance Rating Organizations, Local and State Fire Marshal, and the requirements of all governmental departments having jurisdiction. If contract requirements are in excess of the minimum standards of Codes, the Contract Provisions shall apply.
- C. Provide complete, working utility connections as described in 1.01 (D) above.

1.12 ROYALTIES AND PATENTS

- A. Pay all royalties and defend all suits and claims for infringement of any patent rights and save the Owner harmless on account thereof.
- B. If it is observed that a process or article specified is an infringement of a valid patent, promptly notify the Architect in writing. If work is performed knowing it is an infringement of a patent, all costs arising therefrom shall be borne by the Contractor.

1.13 STANDARD REFERENCES

- A. Certain items may be specified or indicated by reference to recognized standards. These may include the following:

AGA	American Gas Association
API	American Petroleum Institute
ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association

AMCA	Air Moving and Conditioning Association
NBFU	National Board of Fire Underwriters
SBI	Steel Boiler Institute
IBR	Institute of Boiler and Radiator Manufacturers
STI	Steel Tank Institute
NACR	National Association of Corrosion Engineers
NEC	National Electrical Code
ETL	Electrical Testing Laboratories
NEMA	National Electrical Manufacturer's Association
PFMA	Power Fan Manufacturer's Association
UL	Underwriters Laboratories, Inc.
NFPA	National Fire Protection Association
FM	Factory Mutual Insurance Company
IRI	Industrial Risk Insurers
AABC	Associated Air Balance Council

- B. The particular standard referred to shall be the latest legally defined revision to that standard.

1.14 INTERPRETATION OF PLANS AND SPECIFICATIONS

- A. Questions or disagreements arising as to interpretation of the intent of the Contract Documents, or the kind and quality of work required, shall be decided by the Architect whose interpretation shall be final, conclusive, and binding.

1.15 PROCEDURE OF WORK

- A. Work shall proceed in a planned, orderly manner as approved by the Architect.
- B. Procedure and scheduling of the work shall be coordinated with other trades as approved by the Architect, and may be adjusted from time to time to meet job conditions.

1.16 CHANGES TO THE WORK

- A. During the progress of the work, the Architect may make changes, alterations, additions or deletions to the drawn or specified work after having agreed to an equitable allowance to be added or deducted from the contract price.
- B. Claims for extra cost to cover extra work will not be allowed unless specifically authorized in writing by the Architect prior to the execution of such additional work.

1.17 COORDINATION OF TRADES

- A. Cooperate with other trades in the interchange of information and requirements in a timely manner.
- B. Participate in preparation of Project Coordination Drawings as more fully described in 1.01 (E), above.

1.18 PROTECTION OF WORK AND PROPERTY

- A. Be responsible for maintaining and protecting equipment and materials stored or installed at the project site, from loss or damage of all causes, until final acceptance by Owner.
- B. Be responsible for protection of finished work of other trades from damage or defacement caused by operations. Remedy all such damages at no cost to Owner.
- C. New roof penetrations shall conform with the existing roof system manufacturer's requirements. Provide documentation from the existing roofing system manufacturer at the completion of the project to indicate the integrity of roofing system has been maintained, and that the roof warranty is in force for the remaining warranty period. Provide all material, labor, testing and expenses necessary to satisfy the roofing system manufacturer's requirements so to maintain the Owner's roof bond.

1.19 CUTTING, PATCHING, PAINTING, EXCAVATING AND BACKFILLING

- A. Cutting, patching, painting, excavating and backfilling shall be done under other Divisions unless specifically noted

otherwise.

- B. Make sure that sleeves are set, chases and openings provided for, and trenching requirements are established so not to delay progress of the project.
- C. Failure to provide information to other trades making it necessary to cut or patch finished work shall be cause for the cost of the cutting and patching to be borne by the Contractor failing to provide the information.

1.20 TEMPORARY OPENINGS

- A. Determine if any temporary openings will be required for admission of equipment or materials and notify the Architect of these requirements.
- B. Failure to give sufficient notice to arrange for these openings shall result in this Contractor's assumption of all costs associated with making and repairing such temporary openings.

1.21 PIPE EXPANSION

- A. Install piping systems to allow for freedom of movement during expansion and contraction without springing. Provide swing joints, expansion joints, loops, or compensators, complete with guides, where necessary to allow for expansion or contraction.

1.22 INSTRUCTION BOOKS AND OPERATING INSTRUCTIONS

- A. Furnish three (3) sets of Operating and Maintenance Manuals in hard cover covering all Mechanical Systems in the project. Include manufacturer's approved submittal of each item. Submit for review of Architect.
- B. Manuals shall contain, as a minimum, the following:
 - 1. Description of the project and major sub-systems.
 - 2. Descriptive text covering the filling, purging, starting, and adjusting of each system, and procedures for shutting down and making systems secure.
 - 3. Copies of all valve tag lists and equipment schedules.
 - 4. Copies of all control system diagrams and description of operation.
 - 5. A schedule of maintenance based on the manufacturer's recommendations, showing what work is to be performed and at what intervals.
 - 6. Copies of the finally approved submittal for each item, together with the manufacturer's installation, operation, and maintenance instructions and parts lists.
 - 7. List of Firm names, addresses, telephone numbers to be contacted for regular or emergency service, or purchase of parts.
- C. Manuals shall be arranged in one or more three-ring binders, completely indexed as follows:
 - 1. General information; Items 1, 2, 3, & 7 above.
 - 2. Control system information; Item 4.
 - 3. Approved submittal, maintenance, and parts information; Items 5 & 6.
 - 4. Each Section shall be identified by a permanent index tab.
 - 5. Each item within a major Section shall be separately indexed for quick reference.
- D. Provide adequate written and/or verbal instructions to the Owner's operating personnel and such others as the Owner may designate. As a minimum, provide for three (3), eight hour working days of instructions. Individual equipment or systems

may require additional or different periods of instruction.

1.23 ACCESSIBILITY

- A. Install work so that all parts are readily accessible for inspection, maintenance and service.
- B. Locate connections, valves, unions, strainers, etc. so as to be readily accessible.
- C. Where items are located in non-access spaces (ceilings, tunnels, chases), provide approved access doors or panels. Group items requiring access to limit the number of access points.
- D. Access doors shall have the same fire rating as the wall, floor, or ceiling involved. Doors shall be of size required, but no less than 12" X 12" minimum size. Access doors shall be delivered to the Contractor for installation.

1.24 ELECTRICAL WORK FOR MECHANICAL TRADES

- A. Each trade supplying electrically operated equipment for installation and wiring under Division 16 shall furnish sufficiently detailed information and wiring diagrams in a timely manner.
- B. Equipment including a number of electrical items in a single enclosure or a common base shall be supplied internally wired as a unit to numbered terminals.
- C. Electrical devices having a mechanical element such as a float valve, pressure switch, etc., shall be installed and mechanically connected under this Division and left ready for wiring under Division 16.

1.25 MOTORS AND MOTOR CONTROLS

- A. Motors shall conform to all applicable regulations and be suitable for the load, duty, voltage characteristics, service, and location intended.
- B. Unless otherwise specified, motors shall be rated for continuous duty at rated service factor with a temperature rise not exceeding NEMA standards. Motors shall be able to withstand momentary overloads of 125% of rating without damage or overheating.
- C. Motors 1/3 HP and smaller shall be capacitor start, capacitor run or permanent split capacitor type, designed to run at 120 volts, 1 phase, 60 hertz.
- D. Each trade furnishing motor driven equipment shall provide an approved starting device and deliver same to electrical Contractor for installation and wiring.
- E. Single phase motor starters shall be manual "TT" type toggle switch with melting alloy overload device, unless otherwise indicated.
- F. Polyphase motor starters shall be solid state type soft start equivalent to Allen-Bradley SMC-Flex. The starter shall include electronic overload, integral bypass, modular communication capabilities, motor starting capabilities for both star-delta and standard squirrel-cage induction motors, advanced protection and diagnostics in a compact, maintainable, modular package. The bypass minimizes heat generation during run time and automatically closes when the motor reaches its nominal speed. Features shall include built-in SCR bypass/run contactor, built-in electronic motor overload protection, CT on each phase, metering, LCD display, keypad programming and four programmable auxiliary contacts. Starters shall meet and have the approval of the following standards: UL 508, EN/IEC 60947-4-2, CE Marked (open type) per EMC Directive and Low Voltage Directive. The following are the modes of operation to be provided: Soft Start. Selectable kick-start, current limit start, dual ramp start, full voltage start, linear speed acceleration, preset slow speed, and pump control-start & stop. The starter shall provide the following motor control features: electronic motor overload protection, stall protection and jam detection, underload protection, undervoltage protection, overvoltage protection, voltage unbalance protection, excessive start protection. The starter shall meter current for each phase, power factor, voltage for each phase, motor thermal capacity usage, power in KW, elapse time and power usage in kWh. A serial interface port shall allow connection to a Bulletin 20 Human Interface Module.
- G. Single phase motors requiring automatic control interlocking shall be solid state type soft start having the same requirements as polyphase motor starters.
- H. Provide, for each starter requiring automatic control, one normally open and one normally closed auxiliary contact.

- I. All motor starters shall be furnished in NEMA 1 enclosure with reset button in cover unless otherwise indicated elsewhere.
- J. Certain large or special purpose motors may require reduced voltage starting. In this case, the appropriate section of the equipment specifications will give complete specifications on the type of motor controller required.
- K. All motor starters being automatically controlled shall be provided with a fused control circuit transformer, 120 or 24 volts as required by control system. Control circuit transformers shall also be provided in all starters operating at line voltages over 250 volts, whether or not automatically controlled.
- L. Provide premium energy efficient motors. Motor name plates shall indicate the nominal efficiency per NEMA Standard MG-12.54. Minimum efficiency shall be as follows:

Horsepower	Nominal Efficiency
1.0	85.5
1.5	86.5
2.0	86.5
3.0	89.5
5.0	89.5
7.5	91.0
10.0	91.7
15.0	93.0
20.0	93.0
25.0	93.6
30.0	94.1
40.0	94.1
50.0	94.5

1.26 TESTS

- A. Test all piping and equipment as required by the various Sections of the Specifications.
- B. Tests to be witnessed by and be to the satisfaction of the Architect or his designee, and others having legal jurisdiction.
- C. Pressure tests shall be applied to piping before insulating and before connecting to equipment having pressure ratings lower than the test pressure.
- D. Work shall be tested, repaired, and retested until an approved test is achieved.
- E. Damages caused by testing or failure of a test shall be repaired to the satisfaction of the Architect, at no cost to the Owner.
- F. In general, piping systems shall be tested to 150% of the maximum expected operating or surge pressure, or 125 psi, whichever is greater. Utility connections shall be tested in accordance with the Utility's requirements.
- G. Completed systems shall be tested to demonstrate proper operation, capacity, and acceptable noise and vibration levels. Insofar as possible, systems normally operated during certain seasons of the year shall be tested during that season.
- H. Costs for all testing shall be borne by the appropriate Contractor.

1.27 QUIET OPERATION

- A. Fans and motors shall be isolated from the building structure by approved means. Noise and hum of equipment shall be absorbed or attenuated so as not to be objectionable.
- B. Where noise or vibration levels are considered objectionable by the Architect, they shall be corrected at no additional cost to the Owner.

1.28 USE OF INSTALLATION BY OWNER

- A. Owner shall have the privilege of using any part of the work when sufficiently complete, but such use shall not be considered as an acceptance of the work in lieu of a written certificate from the Architect.

1.29 CLEANUP

- A. Piping, ducts and equipment shall be thoroughly cleaned, inside and out, before being placed into operation.
- B. Any stoppage in a system shall be removed and any work damaged in the course of such removal shall be restored to its original condition at no additional cost to the Owner.
- C. Keep site free from accumulation of waste materials or rubbish. Periodically clean work areas. At conclusion of work remove all tools, construction equipment, surplus materials from the site and leave in clean condition.

1.30 GUARANTEE AND SERVICE

- A. Guarantee all work to be free from defects in workmanship and/or materials and that all apparatus will achieve the capacity and characteristics specified. If during the period of One (1) Year (or other term specified elsewhere) from certificate of completion of the work, defects appear, remedy such defects without cost to the Owner. In default thereof, the Owner may have such corrective work done and charge the cost to the Contractor. Indemnify Owner for property damage which might result from such a defect which made repairs necessary.
- B. Certain equipment will require guarantee periods exceeding one year due to the need for seasonal operation. In such case, the guarantee period shall extend through one, complete, continuous operating season.
- C. Air conditioning compressors shall be furnished with the Manufacturer's Extended Warranty covering five (5) years from date of project acceptance. Deliver warranty certificate to Owner's authorized representative.

1.31 INSURANCE

- A. Fully insure all employees, material and finished work as required by the General Conditions of the Contract.

1.32 SCAFFOLDING, RIGGING, HOISTING

- A. Unless otherwise indicated, the work on each Section shall include all scaffolding, rigging, hoisting and services necessary to deliver, install, erect in place all items of equipment. Remove such handling materials when no longer needed.

END OF SECTION

SECTION 220503 - PEX-A PIPING SYSTEM

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. This Specification covers Branch & Main, Parallel Water Distribution Systems with Multi-Port Tees, cross-linked polyethylene (PEX-A) tubing and fittings using PEX cold expansion technology for domestic hot and cold water distribution systems. The system is assembled when the fitting barb is inserted fully into the tubing and fitting using the appropriate tool to create a permanent leak proof joint.
- B. Manifolds, tees, multi-port tees, valving, sleeves, seals, caps and fittings.
- C. Installation tools and accessories.
- D. Firestop devices specific for the installation.
- E. Field pressure testing of the installation.

1.3 RELATED WORK

- A. This Section is to be used in conjunction with the provisions of all other Sections of Division 22 and 23, especially Section 220500, Common Work Results for Plumbing.
- B. Section 233000 - Basic Materials & Methods.
- C. Section 230700 - Insulation Systems.

1.4 SUBMITTALS

- A. Provide submittals for review in accordance with the provisions of Section 220500.
- B. Submit manufacturers installation instructions under Section 220500.
- C. Schedule of pipe and fitting types proposed for each service scheduled.

1.5 REFERENCES

- A. ASTM International (ASTM):
 - 1. ASTM D 2765 - Test Methods for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics.
 - 2. ASTM D 6394 - Specification for Sulfone Plastics (SP).
 - 3. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 5. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops. 6. ASTM F 876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
 - 7. ASTM F 877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems.
 - 8. ASTM F 1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Crosslinked Polyethylene (PEX)
- B. AWWA:
 - 1. C904 Standard for Crosslinked Polyethylene (PEX) Pressure Pipe, 1/2 in. Through 3 in., for Water Service.

- C. ANSI/UL
 1. ANSI/NSF Standard 14 Plastics Piping System Components and Related Materials.
 2. ANSI/NSF Standard 61 Drinking Water System Components - Health Effects.
 3. ANSI/NSF Standard 359 Valves for Crosslinked Polyethylene (PEX) Water Distribution Tubing Systems.
- D. NSF 61 - Drinking Water System Components - Health Effects.
- E. ICC - International Plumbing Code.
- F. ICC - International Mechanical Code.

1.6 QUALITY ASSURANCE

- A. The installer shall be a qualified installer, licensed within the jurisdiction, and familiar with the installation of Cross-linked Polyethylene (PEX-A) tubing systems.
- B. The installation of Cross-linked Polyethylene (PEX-A) tubing for hot and cold water distribution systems shall conform to the requirements of Code.
- C. All items provided under the provisions of this Section shall be new and shall be a system provided by one manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. PEX tubing shall be shipped to the job site on truck or in such a manner to protect the tubing. PEX-A fittings and manifolds shall not be handled rough during shipment. The tubing and fittings shall be unloaded with reasonable care.
- B. PEX-A tubing and fittings shall be stored in a flat, dry, well ventilated location, not exposed to direct sunlight. Normal care in handling shall be exercised to avoid abuse of the tubing. The tubing and fittings shall not be thrown or dropped on the ground, walked on, or dragged.

1.8 PROJECT CONDITIONS

- A. The location of a manifold with valves shall be accessible and in an area not subject to freezing. Proper support of the manifold shall be provided.
- B. PEX-A tubing shall not be left exposed in direct sunlight for extended periods of time. Short periods not to exceed 60 days are permissible.

1.9 WARRANTY

- A. The tubing and fittings manufacturer shall warrant that the tubing and fittings are free from defects and conform to the designated standard. The warranty shall only be applicable to tubing and fittings installed in accordance with the manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Tubing: Uponor, Viega LLC, Nibco.
Fittings: Uponor, Viega, Nibco, Sioux Chief.
- B. Manufacturer named above is for standard of reference and does not necessarily limit equipment and materials to listed manufacturer. Items of same physical size, function, quality and performance will be considered if of a system provided by a single manufacturer.

2.2 MATERIALS

- A. Tubing Standard: PEX-A density cross-linked polyethylene tubing shall be manufactured to the requirements of ASTM F876 and meet the standard grade hydrostatic pressure ratings from Plastic Pipe Institute in accordance

with RT-4/03. The following standard grade ratings are required; 200 °F at 80 psig, 180 °F at 100 psig, and 73.4 °F at 160 psig.

1. Chlorine testing: performed in accordance with NSF Protocol P171 and ASTM F2023. Extrapolated test lifetimes shall meet or exceed the following end use condition 100% @ 140 °F 80 psig: 40 years after application of 0.5 design factor, or ASTM F2023 minimum extrapolated lifetime of 80 years.

B. Fitting Standard: PEX-A cold expansion fittings shall be tested as a system with PEX-A tubing.

1. UNS No. C69300 Lead-free (LF) Brass.
2. UNS No. C27453 Lead-free (LF) Brass.
3. 20% glass-filled polysulfone as specified in ASTM D 6394.
4. Unreinforced polysulfone (group 01, class 1, grade 2) as specified in ASTM D 6394.
5. Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D 6394.
6. Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D 6394.
7. Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked "F1960".

D. Multi-Port Tees:

1. Engineered polymer branch multi-port tee.
2. Engineered polymer flow-through multi-port tee.
3. Engineered polymer commercial branch multi-port tee.
4. Engineered polymer commercial branch multi-port elbow.
5. Engineered polymer commercial flow-through multi-port tee.

F. Polymer Manifolds shall be of plastic construction having a male NPSM thread or PEX inlets.

1. Engineered polymer valved manifold.
2. Engineered polymer valveless manifold.
3. Lead - free copper branch manifold.
4. Lead-free copper valved manifold.

G. PEX Adapter Fittings shall conform to one of the following ASTM standards; F877, F1807, F2159 or ASME B1.20.1. The adapter fittings shall mate to NPT threads, copper tubing, copper fittings or ProPress Fittings.

2.3 SOURCE QUALITY CONTROL

A. The PEX-A tubing and fitting manufacturer shall maintain a third party listing of the tubing and fittings. The tubing and fittings shall be certified in accordance with ANSI/NSF 14/61 to verify suitability to transport potable water. The tubing and fittings shall have the mark "NSF-pw", "cNSFus-pw", or "NSF 61" permanently marked on the product to verify the material listing.

B. The manufacturer of the PEX-A tubing and fittings shall maintain a quality control program in accordance with ISO 9001 or NSF International in the manufacturing plant to assure that the tubing and fittings are continually being produced to the required standard. The tubing and fittings shall be certified as complying with NSF14.

2.4 FIRE STOPPING DEVICES

A. Fire stopping of PEX-A tubing shall be done using the fire stopping devices that are listed by an accredited testing agency for use on copper tube size O.D. SDR99 PEX tubing, for the specific wall, floor or ceiling being penetrated.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install PEX-A piping system in accordance with the manufacturer's printed installation instructions.
- B. Utilized the manufacturer's recommend tool to install the PEX-A piping system.

3.2 EXAMINATION

- A. The installing contractor shall carefully examine the PEX tubing for defects, cuts, abrasions, cracks, fading color, or blemishes. There shall be no cracks or heavy deformations of the tubing. Fittings and manifolds shall be checked for any signs of abuse. Any damaged tubing or fittings shall be rejected.

3.3 INSTALLATION

- A. Test the PEX-A piping system for 100 psig for 30 minutes with less than 73°F water, to insure the piping system is leak free.
- B. PEX-A tubing shall not exceed an eight times the tubing outside diameter (OD) free bend radius or five times the tubing OD supported bend radius, with use of the PEX-A tubing manufacturers approved bend support. Install fitting for changes in direction where any minimum bend radius is exceeded.
- C. Protect PEX-A tubing from exposure to direct and indirect sunlight exposure.
- D. Provide allowance for thermal expansion and contraction of PEX-A tubing passing through a wall, floor, ceiling or partition by installing a sleeve for the piping to run through. Refer to Specification Section 233000 for sleeve requirements.
- E. All PEX-A piping system components shall be insulated per it's service requirements. Refer to Specification Section 230700 for the requirements.
- F. Where PEX-A tubing is installed under slab, tubing shall have no fittings. Back fill material must be free of large rocks, glass, or other sharp objects.
- G. PEX-A tubing installed horizontal must be supported a maximum of every 32", with the PEX-A tubing system manufacturer's approved suspension clips or plastic insulators.
- H. PEX-A tubing installed vertical must be supported at each floor or ceiling penetration and a maximum of every 48 inches in between.
- I. PEX-A tubing at all fixtures shall be terminated with a copper stub out terminations or tubing chrome trim terminations & stops.
- J. Provide unit shutoffs at all manifold locations.

END OF SECTION

SECTION 22 07 00 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

- A. Section Includes:
 - 1. Plumbing piping insulation, jackets and accessories.
 - 2. Plumbing equipment insulation, jackets and accessories.

1.3 SUBMITTALS

- A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- B. Samples: Submit one samples of representative size illustrating each insulation type.
- C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.
- D. Perform Work in accordance with State of Connecticut standards.
- E. Maintain one copy of document on site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.7 WARRANTY

- A. Furnish five year manufacturer warranty for man made fiber.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:
 - 1. CertainTeed.
 - 2. Knauf.
 - 3. Johns Manville.
 - 4. Owens-Corning.
 - 5. Substitutions: Permitted.
- B. Manufacturers for Closed Cell Elastomeric Insulation Products:
 - 1. Aeroflex. Aerocell.
 - 2. Armacell, LLC. Armaflex.
 - 3. Nomaco. K-flex.
 - 4. Substitutions: Permitted.
- C. Manufacturers for Polyisocyanurate Foam Insulation Products:
 - 1. Dow Chemical Company.
 - 2. Substitutions: Permitted.
- D. Manufacturers for Extruded Polystyrene Insulation Products:
 - 1. Dow Chemical Company.
 - 2. Substitutions: Permitted.
- E. Furnish materials in accordance with State of Connecticut standards.

2.2 PIPE INSULATION

- A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 850 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- B. TYPE P-2: ASTM C547, molded glass fiber pipe insulation. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 850 degrees F.
- C. TYPE P-3: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 650 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- D. TYPE P-4: ASTM C612; semi-rigid, fibrous glass board noncombustible. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 650 degrees F.
- E. TYPE P-5: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.

- F. TYPE P-6: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
 - 1. Thermal Conductivity: 0.30 at 75 degrees F.
 - 2. Maximum Service Temperature: 300 degrees F.
 - 3. Operating Temperature Range: Range: Minus 58 to 300 degrees F.
- G. TYPE P-7: ASTM C534, Type I, flexible, nonhalogen, closed cell elastomeric insulation, tubular.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Maximum Service Temperature: 250 degrees F.
 - 3. Operating Temperature Range: Range: Minus 58 to 250 degrees F.
- H. TYPE P-8: ASTM C547, Type I or II, mineral fiber preformed pipe insulation, noncombustible.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Maximum Service Temperature: 1200 degrees F.
 - 3. Canvas Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric treated with fire retardant lagging adhesive.
- I. TYPE P-9: ASTM C591, Type IV, polyisocyanurate foam insulation, formed into shapes for use as pipe insulation.
 - 1. Density: 2.0 pounds per cubic foot.
 - 2. Thermal Conductivity: 180 day aged value of 0.19 at 75 degrees F.
 - 3. Operating Temperature Range: Range: Minus 297 to 300 degrees F.
 - 4. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied film of 4 mils thickness and water vapor permeance of 0.02 perms.
- J. TYPE P-10: ASTM C578, Type XIII, extruded polystyrene insulation, formed into shapes for use as pipe insulation.
 - 1. Thermal Conductivity: 180 day aged value of 0.259 at 75 degrees F.
 - 2. Operating Temperature Range: Range: Minus 297 to 165 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied film of 4 mils thickness and water vapor permeance of 0.02 perms.
- K. TYPE P-11: ASTM C533; Type I, hydrous calcium silicate pipe insulation, rigid molded white; asbestos free.
 - 1. Thermal Conductivity: 0.45 at 200 degrees F.
 - 2. Operating Temperature Range: 140 to 1200 degrees F.

2.3 PIPE INSULATION JACKETS

- A. Vapor Retarder Jacket:
 - 1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
 - 2. Water vapor transmission: ASTM E96/E96M; 0.02 perm-inches.
- B. PVC Plastic Pipe Jacket:
 - 1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.
 - 2. Thickness: 10 mil.
 - 3. Connections: Brush on welding adhesive.

2.4 PIPE INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.
- D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.

- E. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum single piece construction with self adhesive closure. Thickness to match pipe insulation.
- F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- G. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.
- H. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.
- I. Adhesives: Compatible with insulation.

2.5 EQUIPMENT INSULATION

- A. TYPE E-1: ASTM C553; glass fiber, flexible or semi-rigid, noncombustible.
 - 1. Thermal Conductivity: 0.24 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 450 degrees F.
 - 3. Density: 1.5 pound per cubic foot.
- B. TYPE E-2: ASTM C612; glass fiber, rigid board, noncombustible with factory applied kraft aluminum foil jacket.
 - 1. Thermal Conductivity: 0.24 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 450 degrees F.
 - 3. Density: 3.0 pound per cubic foot.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- C. TYPE E-3: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 650 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- D. TYPE E-4: ASTM C612; semi-rigid, fibrous glass board noncombustible.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 650 degrees F.
- E. TYPE E-5: ASTM C612; glass fiber, semi-rigid board, noncombustible.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Maximum Operating Temperature: 850 degrees F.
 - 3. Density: 3.0 pound per cubic foot.
- F. TYPE E-6: ASTM C553; mineral fiber blanket, Type I.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Maximum Operating Temperature: 1000 degrees F.
 - 3. Density: 1.0 pound per cubic foot.
- G. TYPE E-7: ASTM C533; Type II, hydrous calcium silicate block insulation, asbestos free.
 - 1. Thermal Conductivity: 0.45 at 200 degrees F.
 - 2. Operating Temperature Range: 140 to 1200 degrees F.
- H. TYPE E-8: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: Range: Minus 70 to 220 degrees F.
- I. TYPE E-9: ASTM C612, man made mineral fiber, noncombustible, Classes 1-4.
 - 1. Thermal Conductivity: 0.25 at 100 degrees F.
 - 2. Maximum Service Temperature: 1200 degrees F.
 - 3. Density: 4 pound per cubic foot.

2.6 EQUIPMENT INSULATION JACKETS

- A. PVC Plastic Equipment Jacket:
 - 1. Product Description: ASTM D1785, sheet material, off-white color.
 - 2. Minimum Service Temperature: -40 degrees F.
 - 3. Maximum Service Temperature: 150 degrees F.
 - 4. Water Vapor Transmission: ASTM E96/E96M; 0.002 perm-inches.
 - 5. Thickness: 10 mil.
 - 6. Connections: Brush on welding adhesive.

- B. Aluminum Equipment Jacket:
 - 1. ASTM B209.
 - 2. Thickness: 0.016 inch thick sheet.
 - 3. Finish: Smooth.
 - 4. Joining: Longitudinal slip joints and 2 inch laps.
 - 5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

- C. Stainless Steel Equipment Jacket:
 - 1. ASTM ASTM A240/A240M OR ASTM 666 Type 302 stainless steel.
 - 2. Thickness: 0.010 inch thick.
 - 3. Finish: Smooth.
 - 4. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

- D. Canvas Equipment Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric with fire retardant lagging adhesive compatible with insulation.

- E. Vapor Retarder Jacket:
 - 1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
 - 2. Water vapor transmission: ASTM E96/E96M; 0.02 perm-inches.

- F. Field Applied Glass Fiber Fabric Jacket System:
 - 1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
 - 2. Glass Fiber Fabric:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Blanket: 1.0 lb/cu ft density.
 - c. Weave: 5 x 5.
 - 3. Indoor Vapor Retarder Finish:
 - a. Cloth: Untreated; 9 oz/sq yd weight.
 - b. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.7 EQUIPMENT INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.

- B. Covering Adhesive Mastic: Compatible with insulation.

- C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

- D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

- E. Adhesives: Compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify piping and equipment has been tested before applying insulation materials.
- B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

- A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.
- B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.
- C. Piping Systems Conveying Fluids Below Ambient Temperature:
 - 1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
 - 2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- D. Glass Fiber Board Insulation:
 - 1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
 - 2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
 - 3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.
- E. Polyisocyanurate Foam Insulation:
 - 1. Wrap elbows and fitting with vapor retarder tape.
 - 2. Seal butt joints with vapor retarder tape.
- F. Hot Piping Systems less than 140 degrees F:
 - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
 - 3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.
- G. Hot Piping Systems greater than 140 degrees F:
 - 1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
 - 3. Insulate flanges and unions at equipment.
- H. Inserts and Shields:
 - 1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
 - 2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
 - a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.

- b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
- 3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.
- I. Insulation Terminating Points:
 - 1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
 - 2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.
 - 3. Condensate Piping: Insulate entire piping system and components to prevent condensation.
- J. Closed Cell Elastomeric Insulation:
 - 1. Push insulation on to piping.
 - 2. Miter joints at elbows.
 - 3. Seal seams and butt joints with manufacturer's recommended adhesive.
 - 4. When application requires multiple layers, apply with joints staggered.
 - 5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.
- K. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.
- L. Heat Traced Piping Interior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer.
- M. Heat Traced Piping Exterior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size insulation large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water.
- N. Prepare pipe insulation for finish painting. Refer to Section 09 90 00.

3.3 INSTALLATION - EQUIPMENT

- A. Factory Insulated Equipment: Do not insulate.
- B. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- D. Equipment Containing Fluids Below Ambient Temperature:
 - 1. Insulate entire equipment surfaces.
 - 2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
 - 3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 4. Finish insulation at supports, protrusions, and interruptions.
- E. Equipment Containing Fluids 140 degrees F Or Less:
 - 1. Do not insulate flanges and unions, but bevel and seal ends of insulation.
 - 2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
 - 3. Finish insulation at supports, protrusions, and interruptions.
- F. Equipment Containing Fluids Over 140 degrees F:
 - 1. Insulate flanges and unions with removable sections and jackets.

2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
3. Finish insulation at supports, protrusions, and interruptions.

G. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.

H. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

I. Prepare equipment insulation for finish painting. Refer to Section 09 90 00.

3.4 SCHEDULES

A. Water Supply Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Domestic Hot Water Supply and Recirculation	2.2 - P-1	1-1/4 inches and smaller	1.0
		1-1/2 inches and larger	1.0
Domestic Cold Water	2.2 - P-2	1-1/4 inches and smaller	1.0
		1-1/2 inches and larger	1.0
Deionized Water			

B. Drainage Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Storm Piping (horizontal above ground within building)			
Storm Piping (horizontal and vertical above ground below building when PVC pipe is used)			
Sanitary Sewer Piping (horizontal and vertical above ground below building when PVC piping is used)			

C. Equipment Insulation Schedule:

EQUIPMENT	INSULATION TYPE	INSULATION THICKNESS inches

Roof Drain Bodies		
Domestic Hot Water Storage Tanks		

END OF SECTION 220700

SECTION 221000 - PLUMBING PIPING AND PUMPS

PART 1 - GENERAL

1.1 GENERAL

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

- A. Section Includes:
1. Pipe hangers and supports.
 2. Plumbing piping.
 3. Valves.
 4. Piping specialties.
 5. Plumbing drainage specialties.
 6. Plumbing supply specialties.
 7. In-line circulator pumps.
 8. Sump pumps.
 9. Sewage ejectors.

1.3 SUBMITTALS

- A. Product Data: Required.
- B. Manufacturer's Installation Instructions: Required.
- C. Manufacturer's Certificate: Required.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Required.

1.5 WARRANTY

- A. Furnish five year manufacturer warranty for pumps.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Conform to ASME B31.9.

2.2 PIPES AND TUBES

- A. Sanitary Sewer Piping, Buried Within 5 Feet of Building and Sanitary Sewer Piping, above Grade:
1. Cast Iron Pipe: ASTM A74, service weight, with neoprene gaskets or lead and oakum joints.
 2. Cast Iron Pipe: CISPI 301, hubless, service weight, with neoprene gaskets and stainless steel clamps.
 3. Copper Tube: ASTM B306, type DWV with cast bronze or wrought copper fittings and Grade 50B solder joints.
 4. ABS Pipe: ASTM D2661 or ASTM D2751 with ABS fittings and solvent weld joints.
 5. PVC Pipe: ASTM D2665 or ASTM D3034 SDR 26, polyvinyl chloride (PVC) material.
 - a. Fittings: PVC, ASTM D2665 or ASTM D3034.
 - b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
 6. PVC Pipe: ASTM D2665, ASTM D3034, or ASTM F679 with PVC fittings and elastomeric gasket joints.

- B. Water Piping, Buried Within 5 Feet of Building:
 - 1. Copper Tubing: ASTM B42, Tempered O61 annealed without fittings.
 - 2. Ductile Iron Pipe: AWWA C151 with ductile iron fittings rubber gasket joints and 3/4 inch diameter rods.
- C. Water Piping, above Grade:
 - 1. Copper Tubing: ASTM B88, Type L, drawn, with cast brass or wrought copper fittings and Grade 95TA solder joints.
 - 2. Galvanized Steel Pipe (Cold Water Only Sizes 4 inch and Larger): ASTM A53/A53M, Grade B, Schedule 40 with cast iron fittings and grooved mechanical couplings.
- D. Equipment Drains and Overflows:
 - 1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black steel, malleable iron or forged steel fittings, threaded or welded joints.
 - 2. Copper Tubing: ASTM B88, Type L, drawn, cast brass, wrought copper fittings, lead free solder joints.
 - 3. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26, PVC fittings, solvent weld joints. Plenum rated.

2.3 VALVES

- A. For drinking water service, provide valves complying with NSF 61.
- B. Gate Valves:
 - 1. Up to 2 inches: Bronze body, bronze trim, non-rising stem, soldered or threaded ends.
 - 2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, flanged or grooved ends.
- C. Ball Valves:
 - 1. Up to 2 inches: Bronze one piece body, lever handle, solder or threaded ends.
 - 2. Over 2 inches: Cast steel flanged body, lever handle.
- D. Plug Valves:
 - 1. Up to 2 inches: Bronze body, bronze tapered plug, non-lubricated, threaded ends.
 - 2. Over 2 inches: Cast iron body and plug, pressure lubricated, flanged ends.
- E. Butterfly Valves:
 - 1. Up To 2 inches: Bronze body, stainless steel disc, threaded ends, 10-position lever handle.
 - 2. Over 2 inches: Iron body, chrome plated iron disc, wafer or lug ends, 10 position lever handle.
- F. Swing Check Valves:
 - 1. Up to 2 inches: Bronze body and swing disc, solder or threaded ends.
 - 2. Over 2 inches: Iron body, bronze trim, flanged ends.
- G. Spring Loaded Check Valves:
 - 1. Iron body, bronze trim with threaded, wafer or flanged ends.
- H. Relief Valves:
 - 1. Bronze body, automatic, direct pressure actuated, ASME labeled.

2.4 PIPING SPECIALTIES

- A. Strainers:
 - 1. Size 2 inches and Under: Threaded ends, brass or iron body, Y pattern.
 - 2. Size 2-1/2 inch to 4 inch: Flanged iron body, Y pattern.
 - 3. Size 5 inch and Larger: Flanged iron body, basket pattern.
- B. Flexible Connectors:
 - 1. Corrugated stainless steel hose with stainless steel exterior braiding.
- C. Pressure Gages:

1. Gage: ASME B40.1.
 - a. Case: Cast aluminum.
 - b. Dial Size: 3-1/2 inch diameter.
 - c. Mid-Scale Accuracy: One percent.

- D. Thermometers:
 1. Stem Type Thermometer: ASTM E1.
 - a. Size: 9 inch scale.
 - b. Accuracy: ASTM E77 2 percent.

- E. Heat Trace:
 1. Self-Regulating Heating Cable.
 - a. Electric Based System.
 - b. Load: 8 Watts / foot.
 - c. Volts: 208V.
 - d. Jacket Type: Polyolefin.

2.5 PLUMBING DRAINAGE SPECIALTIES

- A. Floor Drains:
 1. Floor Drain (FD): Lacquered cast iron body with removable perforated sediment bucket and adjustable round strainer.
 2. All floor drains to be provided with Trap seal rubber plugs.

- B. Cleanouts:
 1. Finished Floor: Cast iron body with adjustable nickel-bronze round scored cover in service areas and round depressed cover to accept floor finish in finished floor areas.
 2. Line Type: Cast iron body, round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.6 PLUMBING SUPPLY SPECIALTIES

- A. Backflow Preventers:
 1. Reduced Pressure Backflow Preventers: ASSE 1013; assembled with two gate valves, strainer, and four test cocks.

- B. Water Hammer Arrestors:
 1. Copper construction, piston type constructed to PDI WH 201.

- C. Thermostatic Mixing Valves:
 1. Capacity 77 gpm at 45 psi differential, with check valve, volume control shut-off valve on outlet, stem type thermometer on outlet, strainer stop check on inlet.
 2. Conform to ASSE 1070 to temper water to maximum 110 degrees F.

- D. Hose Bibbs/Hydrants:
 1. Interior Hose Bibbs: Bronze or brass, replaceable hexagonal disc, hose thread spout, chrome plated with vacuum breaker.
 2. Wall Hydrant: Non-freeze, self-draining type with chrome plated, lockable recessed box hose thread spout, removable key, and vacuum breaker.

- E. Diaphragm-type Compression Tanks:
 1. Construction: Welded steel, ASME tested and stamped; with flexible diaphragm sealed into tank, and steel legs or saddles.

2.7 IN-LINE CIRCULATOR PUMPS

- A. Bronze casing, bronze impeller, alloy steel shaft with integral thrust collar and two oil-lubricated bronze-sleeve bearings and mechanical seal.

PART 3 - EXECUTION

3.1 INSTALLATION - VALVES

- A. Install gate, ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- B. Install ball valves for throttling, bypass, or manual flow control services.
- C. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.
- D. Install spring loaded check valves on discharge of pumps.
- E. Install valves for throttling service. Install non-lubricated plug valves only when shut-off or isolating valves are also installed.

3.2 INSTALLATION - PLUMBING SUPPLY PIPING

- A. Install water piping in accordance with ASME B31.9.
- B. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to washing machine outlets & flush valve toilets.
- C. Provide water service complete with approved back-flow preventer and water meter with by-pass valves and sand strainer as required.
- D. Test backflow preventers in accordance with ASSE.
- E. Disinfect domestic water system piping in accordance with local code requirements.
- F. Test domestic water system piping per 2003 IPC and in accordance with local code requirements.

3.3 INSTALLATION - PLUMBING DRAINAGE PIPING

- A. Excavate and backfill in accordance with Section 31 20 00.
- B. Establish elevations of buried piping outside building to provide not less than 1 ft of cover.
- C. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.
- D. Test drainage piping per 2003 IPC and in accordance with local code requirements.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.9.
- B. Support horizontal piping using spacing in accordance with local code requirements.

3.5 INSTALLATION - PUMPS

- A. Install line size shut-off valve and strainer on pump suction. Install line size check valve, and balancing valve on pump discharge.
- B. Install pumps in accordance with manufacturer's published instructions.

3.6 SERVICE CONNECTIONS

- A. Install sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and verify proper slope for drainage and proper cover to avoid freezing.

- B. Install new water service complete with water meter with by-pass valves. Install sleeve in wall for service main and supported at wall, calked and made watertight.

3.7 SCHEDULES

IN-LINE CIRCULATOR PUMPS			
Drawing Code	n/a		
Manufacturer & Model	n/a		
Service	n/a		
Capacity	n/a		
Head	--		
Minimum Efficiency	n/a		
Motor Size	n/a		
Motor volt/phase	n/a		

PIPES AND TUBES			
	Buried	Above Grade	
A. Sanitary Sewer	2.2 - A.5. PVC	2.2 - A.5. PVC	
B. Water	2.2 - B.1. Copper Tubing	2.2 - C.1. Copper	
C. Storm	---	---	
D. Equipment Drains & Overflows		2.2 - D.2. Copper	

END OF SECTION 221000

SECTION 22 11 00 - FACILITY FUEL PIPING

PART 1 - GENERAL

1.1 GENERAL

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe hangers and supports.
 - 2. Pipe and pipe fittings.
 - 3. Valves.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Pipe Hangers and Supports: Submit manufacturers catalog data including load carrying capacity.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
- B. Pipe Hangers and Supports: Design data, indicate pipe sizes, load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- C. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit spare parts lists and maintenance procedures.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 54.
- B. List and label flexible connectors and hoses in accordance with UL 536.
- C. Perform Work in accordance with State of Connecticut.

1.6 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. Carpenter & Paterson Inc.
 - 2. Creative Systems Inc.
 - 3. Flex-Weld, Inc.
 - 4. Glope Pipe Hanger Products Inc.
 - 5. Michigan Hanger Co.
 - 6. Superior Valve Co.
 - 7. Substitutions: Permitted.
- B. Conform to ASME B31.9 ASTM F708 MSS SP 58 MSS SP 69 MSS SP 89.

- C. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron Carbon steel, adjustable swivel, split ring.
- D. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
- E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- F. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
- G. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
- H. Vertical Support: Steel riser clamp.
- I. Floor Support for Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- J. Floor Support for Pipe Sizes 6 inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- K. Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

1.7 PIPES AND TUBES

- A. Natural Gas Piping, Buried:
 - 1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black with polyethylene jacket and welded joints.
 - 2. Polyethylene Pipe: ASTM D2513, SDR 11.5, with socket type fittings and fusion welded joints.
- B. Natural Gas Piping, above Grade:
 - 1. Steel Pipe: ASTM A53/A53M, Grade B, Schedule 40 black, with malleable iron or forged steel fittings, screwed or welded.
 - 2. Copper Tubing: ASTM B88, Type K L, annealed with wrought copper fittings and compression joints.
 - 3. Corrugated Stainless Steel Tubing: ANSI LC 1.
 - 4. Regulator Vent Piping, Above Grade:
 - a. Indoors: Same as natural gas piping, above grade.
 - b. Outdoors: PVC pipe, tubing, and fittings, UL 651.

1.8 VALVES

- A. Manufacturers:
 - 1. American Valve
 - 2. FMC Crosby Valve
 - 3. Red-White Valve Corp.
 - 4. Substitutions: Permitted
- B. Gate Valves:
 - 1. Up to 2 inches: Bronze body, bronze trim, non-rising stem, hand wheel, inside screw, double wedge disc, soldered or threaded.
 - 2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, solid wedge, flanged or grooved ends.
- C. Globe Valves:
 - 1. Up to 2 Inches: Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable composition disc, solder or threaded ends, with back seating capacity.
 - 2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, plug type disc, flanged ends, renewable seat and disc.
- D. Ball Valves:

1. Up to 2 inches: Bronze or stainless steel one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
2. Over 2 inches: Cast steel flanged body, chrome plated steel ball, Teflon seat and stuffing box seals and lever handle.

E. Plug Valves:

1. Up to 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.
2. Over 2 inches: Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends.

1.9 PIPING SPECIALTIES

A. Flanges, Unions, and Couplings:

1. Pipe Size 2 inches and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
2. Pipe Size Over 2 inches: Forged steel flanges for ferrous piping; bronze flanges for copper piping; preformed neoprene gaskets.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Strainers:

1. Size 2 inches and Under: Threaded brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
2. Size 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
3. Size 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

C. Flexible Connectors:

1. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 350 psig.

D. Pressure Gages:

1. Gage: ASME B40.1, UL 393 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
 - a. Case: Cast aluminum.
 - b. Bourdon Tube: Brass.
 - c. Dial Size: 4 inch diameter.
 - d. Mid-Scale Accuracy: two percent.
 - e. Scale: Psi.

E. Pressure Regulator: Comply with ANSI Z21.80.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Verify excavations are to required grade, dry, and not over-excavate.

2.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside piping before assembly.

- C. Prepare piping connections to equipment with flanges or unions.

2.3 INSTALLATION - INSERTS

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

2.4 INSTALLATION - PIPING SYSTEMS

- A. Install dielectric connections wherever jointing dissimilar metals.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Route piping parallel to building structure and maintain gradient.
- D. Install piping to maintain headroom. Group piping to conserve space. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- G. Sleeve pipe passing through partitions, walls and floors.
- H. Install piping system allowing clearance for installation of insulation and access to valves and fittings.
- I. For exposed natural gas lines other than steel pipe, attach yellow pipe labels with "NATURAL GAS" in black lettering, at maximum 5 foot spacing.
- J. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- K. Where required, bend pipe with pipe bending tools in accordance with procedures intended for that purpose.

2.5 INSTALLATION - VALVES

- A. Install valves with stems upright or horizontal, not inverted.
- B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Install globe valves for throttling or manual flow control services.

2.6 INSTALLATION - PIPING SPECIALTIES

- A. Install pressure gages with pulsation dampers. Provide needle valve to isolate each gage. Extend nipples to allow clearance from insulation.

- B. Install gages in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- C. Adjust gages to final angle, clean windows and lenses, and calibrate to zero.

2.7 INSTALLATION - FUEL PIPING

- A. Install Natural piping in accordance with NFPA 54.
- B. Size and install gas piping to provide sufficient gas to supply maximum appliance demand at pressure higher than appliance minimum inlet pressure.
- C. Provide clearance for installation of insulation and access to valves and fittings.
- D. Establish elevations of buried piping outside building to provide not less than 3ft of cover.
- E. Provide support for utility meters in accordance with requirements of utility company.
- F. Pipe vents from gas pressure reducing valves to outdoors and terminate in weatherproof hood. Protect vent against entry of insects and foreign material.
 - 1. Minimum Vent Size: Connection size at regulator vent connection.
 - 2. Run individual vent line from each relief device, independent of breather vents.
 - 3. Breather vents may be manifolded together with piping sized for combined appliance vent requirements.
- G. Test Natural Gas piping in accordance with NFPA 54.

2.8 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping sheet lead packing between hanger or support and piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

2.9 SERVICE CONNECTIONS

- A. Install new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 8 inch wg. Install regulators on each line serving appliances, sized in accordance with equipment.

2.10 SCHEDULES

PIPES AND TUBES			
	Buried	Above Grade	
A. Natural Gas		1.7. B. 1	

PIPE HANGER SPACING				
PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 2)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4
8	16	19	3/4	3/4
10	18	22	3/4	7/8
12	19	23	3/4	7/8
14	22	25	7/8	1
16	23	27	7/8	1

18	25	28	1	1
20	27	30	1	1-1/4
24	28	32	1-1/4	1-1/4

Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

END OF SECTION

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SCOPE OF WORK

- A. Complete, operational, plumbing systems, including, but not limited to, waste and vent piping, hot and cold water, gas piping, fixtures, trim, supports, accessories, etc., as required.
- B. Plumbing Specialties.
- C. Plumbing Fixtures.
- D. Plumbing Equipment.
- E. Plumbing System Disinfection.

1.3 RELATED WORK

- A. Section 220500 - General Provisions - Mechanical.
- B. Section 220700 - Insulation Systems.
- C. Toilet and Bath Accessories by other Divisions of this Specification.
- D. Cabinet Tops prepared for sinks by other Divisions of this Specification.

1.4 REFERENCES

- A. IPC - International Plumbing Code 2015 with CT. 2018 Supplements.
- B. ANSI/ASME A112.6.1M-1997 - Supports for Off-The-Floor Plumbing Fixtures for Public Use.
- C. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
- D. ANSI/ASME A112.19.2 - Vitreous China Plumbing Fixtures.
- E. ANSI/ASME A112.19.3 - Stainless Steel Plumbing Fixtures.
- F. ANSI/ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.
- G. ANSI A112.21.1 - Floor Drains.
- H. ANSI A112.26.1 - Water Hammer Arresters.
- I. ANSI, A117.1-2003 For Buildings and Facilities - Providing Accessibility and Usability for Physically Handicapped People.
- J. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.

- K. ANSI/ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.
- L. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.
- M. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
- N. UFAS, FED-STD-795 - Uniform Federal Accessibility Standards.
- O. AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.
- P. PDI WH-201 Water Hammer Arrestors.
- Q. ANSI/NFPA 30 - Flammable and Combustible Liquids Code.
- R. ANSI/NFPA 54 - National Fuel Gas Code.
- S. ANSI/NFPA 70 - National Electric Code.
- T. ANSI A112.21.2 - Roof Drains.

1.5 QUALITY ASSURANCE

- A. All items provided under this Section shall be new, of domestic manufacturer, and shall be the products of recognized manufacturers of that item.
- B. All items of a similar class shall be the products of the same manufacturer. That is, all plumbing fixtures, all accessory items, etc. shall be from the same source.

1.6 SUBMITTALS

- A. Submit product data under provisions of Section 220500.
- B. Include fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's installation instructions.

1.7 DEFINITIONS

- A. Accessory: Device that adds effectiveness, convenience or improved appearance to a fixture but is not essential to its operation.
- B. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.
- C. Fixture: Installed receptor connected to the water distribution system, that received and makes available potable water and discharges the used liquid or liquid borne wastes directly or indirectly into the drainage system.
- D. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required.
- E. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

1.8 OPERATION AND MAINTENANCE DATA

- A. Submit Operation and Maintenance Data under provisions of Section 220500.
- B. Include fixture trim exploded view and replacement parts lists.

1.9 WARRANTY

- A. Fixtures and Trim: Five years.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.11 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.
- B. Confirm that millwork is constructed with adequate provisions for the installation of counter top lavatories and sinks.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The following material describes the requirements and materials for various items included in the Project's Plumbing Systems.
- B. It should be noted that this particular Project may not include all of the items listed. Refer to the Plumbing Drawings.

2.2 PLUMBING SPECIALTIES

A. ACCEPTABLE MANUFACTURERS

- 1. J. R. Smith.
- 2. Mifab
- 3. Zurn.
- 4. Watts.
- 5. Febco.
- 6. Symmons.
- 7. Woodford.
- 8. Substitutes shall be approved by the Engineer.

B. FLOOR DRAINS

- 1. Floor Drain FD: ANSI A112.21.1; Concrete Locations - cast iron body with drainage flange, weep holes, 1/2" trap primer, sediment bucket and round adjustable nickel-bronze strainer. Floor drain shall be Model #2005-B as manufactured by J.R.Smith. Provide with trap seal inserts.

2. Floor Drain FD: wood locations - PVC body with round nickel bronze strainer and mounting flange, sediment bucket and funnel (as requires). Floor drain shall be Model #FD9 or FD10 based on floor types as manufactured by Watts. Provide with trap seal inserts.

C. CLEANOUTS

1. Interior Finished Floor Areas: Cast iron body with square adjustable scoriated secured nickel-bronze top, and vandal proof screws. Cleanout shall be model #4040 as manufactured by J.R.Smith, or approved equal.
2. Interior Finished Wall Areas: Line type with lacquered cast iron body and epoxy coated gasketed cover and round stainless steel access cover secured with machine screw. Cleanout shall be Model #4422 as manufactured by J.R.Smith, or approved equal.
3. Interior Unfinished Accessible Areas: Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.or approved equal.
4. Floor Grade Cleanout (F.G.C.O.): Duco cast iron heavy duty secured with scoriated cast iron cover. Cover shall be provided with lifting device and vandal proof screws. F.G.C.O. shall be model series #4250 or 4260 (as required) as manufactured by J.R. Smith or approved equal.

E. H.B.I

1. "Woodford" Model #21CP automatic draining, anti-siphon vacuum breaker wall faucet.

F. HYDRANTS (Type H.B.E.)

1. Wall Hydrant: ANSI/ASSE 1019; non-freeze, self-draining type with chrome plated hose thread spout, lock shield and removable key, and integral vacuum breaker. Hydrant shall be Model #25C as manufactured by Woodford, or approved equal.

G. BACKFLOW PREVENTERS

1. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013 (AWWA C506); bronze body, two independently operating, spring loaded check valves. Diaphragm type differential pressure relief valve located between check valves; assembled with two gate valves, strainer, and test cocks. Backflow preventer shall be Model #009QT as manufactured by Watts, or approved equal.

H. WATER HAMMER ARRESTORS

1. ANSI A112.26.1; sized in accordance with PDI, precharged, suitable for operation in temperature range -100 to 300 degrees F (-73 to 149 degrees C) and maximum 250 psig working pressure. Water hammer arrestor shall be Hydrotrol series 5000 as manufactured by J.R. Smith, or approved equal.

I. THERMOSTATIC MIXING VALVE

1. Provide thermostatic mixing valve, capacity 15 gallon per minute at 45 psi differential, with check valve, volume control shut-off on outlet, stem type thermometer on outlet, strainer stop check on inlet. Manufacturer to provide ASSE 1017-86 compliance stamped on valve body.

J. TRAP PRIMER

1. Provide trap primers machined from CDA 360 corrosion resistant brass. Activation at 5 to 10 psig.

Operating range is 35 to 75 psig. Primer Rite Model PR-500 as manufactured by PPP, or approved equal.

K. AIR GAP FITTINGS

1. Full drain line size, J.R. Smith Series 3950 or approved equal.
2. Inlet connection non-threaded, having set screw to position inlet pipe within air gap.
3. Cut inlet pipe at 45 degree angle.
4. Maintain Code required air gap when installing.

2.3 PLUMBING FIXTURES & TRIM

A. ACCEPTABLE MANUFACTURERS

1. Niagra.
2. Kohler.
3. Elkay.
4. Moen.
5. Symmons.
6. Aquarius
7. Zurn.
8. Substitutes shall be approved by the Engineer.

B. ACCESSIBLE FIXTURES:

All accessible fixtures shall be provided and installed compliant with ANSI A117.1-2009.

1. SEE SHEETS FP-200 FOR FIXTURE SCHEDULE

PART 3 - EXECUTION

3.1 INSPECTION

- A. Review cabinet work shop drawings. Confirm location and size of cut-out for sink before rough-in.
- B. Verify that adjacent construction is ready to receive rough-in work of this Section.

3.2 PLUMBING SPECIALTIES INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B. Extend cleanouts to finished floor or wall surface. Coordinate with quarry tile floor pattern. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Pipe relief from backflow preventer to nearest drain.
- D. Install backflow preventer in an accessible location, a maximum of 5 feet above finished floor.
- E. Install water hammer arresters complete on all supply piping to fixtures with a flush valve.

- F. Install water hammer arrestors complete with an accessible isolation valve.
- G. All low voltage wiring to fixtures & faucets to be provided and installed by contractor.

3.3 PLUMBING FIXTURE INSTALLATION

- A. Install each fixture with trap, easily removable for cleaning and service.
- B. Provide chrome plated flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with carrier supports.
- E. Seal fixtures to walls and floors with sealant, color to match fixture, type as approved by Architect.
- F. Maintain fixture heights above finished floor in accordance with codes and with architectural details.
- G. All faucets that can be used with a hose shall have anti-siphon devices bearing seal of ASSE.
- H. Maintain ratings of new and existing walls. Provide sleeves and fire sealants as required.

3.4 PUMP INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide air cock and drain connection on casing.
- C. Provide line sized isolating valves and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
- D. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump so that no weight is carried on pump casing.
- E. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.5 DISINFECTION SEQUENCE - POTABLE WATER SYSTEMS

- A. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.
- B. The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million of chlorine and allowed to stand for 3 hours.
- C. Following the allowed standing time, the system shall be flushed with clean potable water until chlorine does not remain in the water coming from the system.
- D. The procedure shall be repeated if it is shown by a bacteriological examination by the authority that contamination is still present in the system.

END OF SECTION

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The following Drawings indicate the work required under this Division.

All Drawings associated with this project.

And all other Contract Drawings.

- B. Certain items of work pertaining to the work of this Division are provided under other Divisions of the Specification. These include, but are not limited to the following:

1. Concrete work for equipment bases, etc.
2. Installation of access doors in finished construction.
3. Wiring of mechanical equipment. (Motor starters furnished under this Section.)
4. Framing of openings in walls, floors, roof for ductwork, piping, fans, etc.
5. Chases, soffits, furred spaces required to conceal work of this Division.

- C. Materials furnished under other Divisions and installed by this Division include, but are not limited to:

1. Refer to Architectural Specifications and Drawings to determine items furnished under other Sections that will require work under this Division and include such work.

- D. Complete Utility connections as indicated or needed, extension to Project, metering as required, and connection to building systems, including:

1. Apply for all services and pay for all fees, assessments, and charges of the Utility for each connection, all in a timely manner and according to the Project Schedule.
2. Provide and install all metering, valves, accessories as required by Utility. Install entire service in accordance with the Utility's requirements or other applicable regulation.
3. All necessary coordination with Utility to determine scope of work provided by Utility and the part provided by Contractor so that a complete Utility connection is made.

- E. Provide coordination for Mechanical and Electrical installations. Provide additional coordination drawings, as directed by Architect, in areas of potential interferences.

- F. All work shall comply with applicable codes and regulations, including, but not limited to the following:

1. Connecticut Building, Fire Safety, and Health Codes, as amended, including all codes, standards and regulations referenced therein.
2. Requirements of Local, State, and Federal authorities having jurisdiction over the work

3. Current regulations of the Occupational Safety and Health Administration (OSHA).
 4. Requirements of affected Public Utility Companies.
 5. Special requirements set down by the Owner, the Owner's Insurance Carrier, or other concerned entities.
- G. Mechanical Contractors must be ACCA Quality Assured (QA). The ACCA QA program is a self-certification activity for professional HVAC contracting businesses. QA participants attest that they satisfy the requirements for the EPA ENERGY STAR Qualified New Homes Program (Version 3).

1.2 RELATED DOCUMENTS

- A. Instructions to Bidders, the General Conditions of The Contract, and General Requirements shall apply and be binding to the Contractor and their subcontractors, vendors or suppliers who performs work under this Division.
- B. Where items of the General or Special Conditions are repeated in this Section, it is intended to call particular attention to or qualify them. It is not intended that any parts of the General or Special Conditions be assumed to be omitted if not repeated in this Section.

1.3 INTENT

- A. Intent of the Specifications and Drawings is to call for finished work, tested and ready for operation.
- B. Material and equipment mentioned in Specifications or shown on the Drawings shall be furnished new, completely installed and adjusted, and left in a clean, safe, and satisfactory condition ready for operation. All supplied appliances and connections of every sort necessary shall be furnished and installed to the satisfaction of the Architect and Owner.
- C. Apparatus, appliances, material, or work not shown on the Drawings but mentioned in Specifications, or vice versa, or any incidental accessory items such as valves, unions, fittings, etc., necessary to make the work complete, serviceable, and perfect in all respects and ready for operation, even though not particularly specified or shown, shall be provided and installed without additional cost to the Owner.
- D. Minor details not usually shown or specified, but necessary for the proper installation and operation of the work shall be included as if specified herein.
- E. Prior to submission of bids, give written notice to Architect of any materials or apparatus believed to be inadequate, unsuitable, or in violation of laws, ordinances, rules, or regulations of the authorities having jurisdiction over the work; or any necessary items believed omitted. In absence of such notice, it is mutually agreed that the cost of all required and necessary items has been included in the bid and that all systems specified and shown will function satisfactorily without claim for additional cost to the Owner.

1.4 DEFINITIONS

- A. The following words or terms contractions used for convenience throughout this specification are, unless specifically noted to the contrary, defined as follows:
 1. "Architect" means Stephen Jager Associates, 4 Grand View Drive, Enfield, CT 06082.
 2. "Engineer" means Acorn Consulting Engineers, Inc., 244 Farms Village Road, P.O. Box 311, West Simsbury, Connecticut 06092.
 3. "contractor" , as used herein, means the Prime Sub-contractor responsible for the work of that specific section of Division 23.

4. "furnish" or "provide" or "supply" means to supply, erect, install, connect, test, and place into operation the particular item or work referred to unless otherwise specified.
5. "work" means all of the labor, material, equipment, and supplies needed to fully execute the intent of this Specification.
6. "Regulating authorities" or "authorities", means all governmental, utility and insuring authorities having jurisdiction.
7. "piping" includes all pipe, fittings, valves, hangers, insulation, and other accessories relating to piping, and the labor to install same.
8. "concealed" means hidden from view in chases, furred spaces, hung ceilings, embedded in construction, or buried underground. It is intended that all piping, equipment, and accessory items be concealed unless specifically indicated otherwise on the Drawings.
9. "exposed" means "not concealed" as defined above. work in tunnels, crawl spaces, within cabinetry, or otherwise accessible to view shall be considered "exposed" unless specifically noted otherwise.
10. "ductwork" means, in addition to ducts, all fittings, dampers, air control devices, hangers, flexible connectors and other accessories related to such ductwork.

1.5 DRAWINGS

- A. Drawings are generally diagrammatic and are intended to convey the scope and general arrangement of the work. Deviations from the depicted arrangement shall be approved by the Architect.
- B. Location of items shown on the Drawings, or called for in the Specifications, not definitely fixed by dimension, are approximate only. Exact location necessary to secure the best conditions and serviceability shall be determined in the field and shall have the review of the Architect.
- C. Follow the Drawings in laying out the work. Check Architectural, Structural, and other trade Drawings to verify spaces available so that maximum head room and service access can be maintained. Where space conditions appear inadequate, notify Architect before proceeding with the work.
- D. Work on the Drawings is intended to be approximately correct to the scale of the Drawings. Figured dimensions and large scale details shall take precedence over layouts on smaller scale Drawings. Dimensional information shall be taken only from the Architectural or Structural Drawings and details.
- E. Typical details shall apply to each and every occurrence of the item. Drawings make use of symbols and schematic diagrams to indicate and define various items of work. These have no dimensional significance, nor do they necessarily delineate each and every item required to make the work complete. Work shall be installed according to the diagrammatic intent of the Drawings, in conformity with the applicable dimensions, and as required by the finally approved shop and fabrication drawings.
- F. No interpretation shall be made from the limitations of symbols and diagrams that any necessary element or work has been excluded.
- G. If directed by the Architect or Owner, make reasonable modifications in the layout of the work to avoid conflict with work of other trades or for better execution of the work.
- H. Refer to Drawings and Specifications of all other trades to ascertain if any items provided or installed therein require work under this Division so that the final installation will be a complete job, ready for operation, completely coordinated

and interconnected. It is understood that indication of any item on the Drawings or in the Specifications carries with it the instruction to furnish and install completely, regardless of whether this instruction is explicitly stated.

- I. No statement in Drawings or Specifications, or any omission in either should be misunderstood as relieving the Contractor from providing a complete job. No inclusion, exclusion or limitation in the language of the Drawings or Specifications shall be interpreted as meaning that any required item or accessory necessary to complete any required system is omitted.
- J. The use of words in the singular shall not be considered as limiting where other indications allude to more than one item being needed.

1.6 VISITING THE SITE

- A. Prior to submitting a bid, visit the site of the work, inspect the Existing Building and conditions so as to determine if these conditions will affect the work. Bidders are cautioned that they will be held responsible for any assumptions made regarding existing conditions.

1.7 SUBSTITUTIONS

- A. Within thirty (30) days after Award of Contract, submit to the Architect for review a list of manufacturers of all materials and equipment proposed for use on the project. Indicate on submittal which items are substitutions.
- B. A review, without exception, of this list does not constitute approval, nor does it guarantee acceptance of the shop drawings when submitted.
- C. The Contractor's intent to purchase the exact make specified does not relieve him from the responsibility to submit this list. Failure to submit this list will require the Contractor to supply the exact item specified as the basis for design.
- D. Submittal of items which differ from those specified or indicated as the basis for design carries the implicit guarantee that the substituted item will provide the intended service and is compatible with other items or systems interfacing with it.
- E. When proposing a substitute item, the Contractor shall be responsible for all costs of accommodating the substitution, including, but not limited to, space and accessibility, modifications required to other systems, structural adequacy and the like.
- F. If substitutions require the Architect or Engineer to prepare sketches or revised drawings in order to become acceptable, the cost of such sketches, drawings, or engineering shall be borne by the Contractor.
- G. When substitutions require Engineer or Architect to spend an inordinate time for review of substitutions, the cost of review over four (4) hours will be charged to the Contractor who made the submittal.

1.8 SHOP DRAWINGS

- A. After acceptance of List of Manufacturers required under paragraph 1.07(A) of this Section, and prior to delivery of materials and equipment to the project site, submit shop drawings of each item for review by the Architect.
- B. Each submittal shall contain a complete list of all materials contained within. Include intended use for each item.
- C. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature and complete characteristics of equipment, including, but not limited to, dimensions, capacity, code compliance, motor and drive and testing, construction, electrical characteristics, support, all as required for this project.
- D. Architect may designate submittal of physical samples for review on items where actual color, texture or other charac-

teristics might not be adequately described by a drawing or written material. Upon approval of a sample, each and every item of that sort must be identical to the approved sample.

- E. Certified performance curves shall be submitted for all fan and pumping equipment. Certified ratings shall be submitted for all operating equipment.
- F. Samples, drawings, specifications, catalogs, etc., submitted for review shall be labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specification governing, Contractor's name and name of project.
- G. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the Contractor from his responsibility of furnishing material or performing work according to Contract Documents.
- H. Failure to submit shop drawings in ample time for checking shall not be cause for an extension of Contract Time, and no claim by reason of such default will be allowed.
- I. Submittals for all systems which require the interconnection of three or more devices shall include a system block diagram. The diagram shall be of the one line type and with sufficient detail to show interfaces and method of operation.
- J. Material or equipment installed prior to review shall be liable for removal and replacement at no extra charge to the Owner if the material or equipment does not meet the intent of Drawings and Specifications.

1.9 EQUIPMENT AND MATERIALS

- A. Equipment and materials furnished or required shall be new, without blemish or fault. Equipment shall bear labels attesting to approval by Underwriters Laboratories, AGA, or other recognized testing laboratory where specified or required to have such approval.
- B. Where no specific indication as to type or quality is indicated, a first-class article shall be furnished.
- C. All equipment of a type shall be products of a single manufacturer.
- D. Each item shall bear the manufacturer's nameplate showing name, ratings, model numbers and serial numbers. Nameplates of suppliers or distributors will not be acceptable.
- E. Provide line sized valves and unions or flanges on each pipe connection to items of equipment requiring piped connections.

1.10 RECORD DRAWINGS

- A. Obtain from the Architect a clean set of blue-line prints of the work and during construction indicate any deviations in routing, arrangement, elevation or size thereon.
- B. "As-Built" drawings shall be kept up to date concurrently with the execution of the work and turned over to the Architect for review and approval at the conclusion of the project. Failure to keep up to date on these drawings will require the Contractor to reconstruct his installations, make whatever investigations to accurately locate the installed work are needed, even if he has to cut into finished construction. All costs for this work shall be borne by the Contractor who failed to keep "as-built" drawings up to date.
- C. These drawings shall indicate the exact location and elevation of all utilities, sewers under floor slabs or buried on the site. Dimensions shall refer to the finished walls of the building or to finished grade or floor level. Include, as well, the

final location of ducts and pipes concealed in chases, walls or above permanent ceilings.

- D. The location of all valves and cleanouts shall be indicated by dimension.

1.11 LAWS, ORDINANCES, CODES, PERMITS, FEES AND REGULATIONS

- A. Give all necessary notices, obtain all permits, pay all taxes and fees in connection with the work. File all Contract Documents, prepare documents and obtain all approvals of governmental departments having jurisdiction over the work. Obtain Certificates of Inspection and deliver to Architect before Application for Final Payment.
- B. Materials and workmanship shall comply with the rules and regulations of the National Board of Fire Underwriters, applicable Building and Life Safety Codes, the requirements of Boards of Health, Fire Insurance Rating Organizations, Local and State Fire Marshal, and the requirements of all governmental departments having jurisdiction. If contract requirements are in excess of the minimum standards of Codes, the Contract Provisions shall apply.
- C. Provide complete, working utility connections as described in 1.01 (D) above.

1.12 ROYALTIES AND PATENTS

- A. Pay all royalties and defend all suits and claims for infringement of any patent rights and save the Owner harmless on account thereof.
- B. If it is observed that a process or article specified is an infringement of a valid patent, promptly notify the Architect in writing. If work is performed knowing it is an infringement of a patent, all costs arising therefrom shall be borne by the Contractor.

1.13 STANDARD REFERENCES

- A. Certain items may be specified or indicated by reference to recognized standards. These may include the following:

AGA	American Gas Association
API	American Petroleum Institute
ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
AMCA	Air Moving and Conditioning Association
NBFU	National Board of Fire Underwriters
SBI	Steel Boiler Institute
IBR	Institute of Boiler and Radiator Manufacturers
STI	Steel Tank Institute
NACR	National Association of Corrosion Engineers
NEC	National Electrical Code
ETL	Electrical Testing Laboratories
NEMA	National Electrical Manufacturer's Association
PFMA	Power Fan Manufacturer's Association
UL	Underwriters Laboratories, Inc.
NFPA	National Fire Protection Association
FM	Factory Mutual Insurance Company
IRI	Industrial Risk Insurers

AABC Associated Air Balance Council

- B. The particular standard referred to shall be the latest legally defined revision to that standard.

1.14 INTERPRETATION OF PLANS AND SPECIFICATIONS

- A. Questions or disagreements arising as to interpretation of the intent of the Contract Documents, or the kind and quality of work required, shall be decided by the Architect whose interpretation shall be final, conclusive, and binding.

1.15 PROCEDURE OF WORK

- A. Work shall proceed in a planned, orderly manner as approved by the Architect.
- B. Procedure and scheduling of the work shall be coordinated with other trades as approved by the Architect and may be adjusted from time to time to meet job conditions.

1.16 CHANGES TO THE WORK

- A. During the progress of the work, the Architect may make changes, alterations, additions or deletions to the drawn or specified work after having agreed to an equitable allowance to be added or deducted from the contract price.
- B. Claims for extra cost to cover extra work will not be allowed unless specifically authorized in writing by the Architect prior to the execution of such additional work.

1.17 COORDINATION OF TRADES

- A. Cooperate with other trades in the interchange of information and requirements in a timely manner.
- B. Participate in preparation of Project Coordination Drawings as more fully described in 1.01 (E), above.

1.18 PROTECTION OF WORK AND PROPERTY

- A. Be responsible for maintaining and protecting equipment and materials stored or installed at the project site, from loss or damage of all causes, until final acceptance by Owner.
- B. Be responsible for protection of finished work of other trades from damage or defacement caused by operations. Remedy all such damages at no cost to Owner.
- C. New roof penetrations shall conform with the existing roof system manufacturer's requirements. Provide documentation from the existing roofing system manufacturer at the completion of the project to indicate the integrity of roofing system has been maintained, and that the roof warranty is in force for the remaining warranty period. Provide all material, labor, testing and expenses necessary to satisfy the roofing system manufacturer's requirements so to maintain the Owner's roof bond.

1.19 CUTTING, PATCHING, PAINTING, EXCAVATING AND BACKFILLING

- A. Cutting, patching, painting, excavating and backfilling shall be done under other Divisions unless specifically noted otherwise.
- B. Make sure that sleeves are set, chases and openings provided for, and trenching requirements are established so not to delay progress of the project.
- C. Failure to provide information to other trades making it necessary to cut or patch finished work shall be cause for the cost of the cutting and patching to be borne by the Contractor failing to provide the information.

1.20 TEMPORARY OPENINGS

- A. Determine if any temporary openings will be required for admission of equipment or materials and notify the Architect of these requirements.
- B. Failure to give sufficient notice to arrange for these openings shall result in this Contractor's assumption of all costs associated with making and repairing such temporary openings.

1.21 PIPE EXPANSION

- A. Install piping systems to allow for freedom of movement during expansion and contraction without springing. Provide swing joints, expansion joints, loops, or compensators, complete with guides, where necessary to allow for expansion or contraction.

1.22 INSTRUCTION BOOKS AND OPERATING INSTRUCTIONS

- A. Furnish three (3) sets of Operating and Maintenance Manuals in hard cover covering all Mechanical Systems in the project. Include manufacturer's approved submittal of each item. Submit for review of Architect.
- B. Manuals shall contain, as a minimum, the following:
 - 1. Description of the project and major sub-systems.
 - 2. Descriptive text covering the filling, purging, starting, and adjusting of each system, and procedures for shutting down and making systems secure.
 - 3. Copies of all valve tag lists and equipment schedules.
 - 4. Copies of all control system diagrams and description of operation.
 - 5. A schedule of maintenance based on the manufacturer's recommendations, showing what work is to be performed and at what intervals.
 - 6. Copies of the finally approved submittal for each item, together with the manufacturer's installation, operation, and maintenance instructions and parts lists.
 - 7. List of Firm names, addresses, telephone numbers to be contacted for regular or emergency service, or purchase of parts.
- C. Manuals shall be arranged in one or more three-ring binders, completely indexed as follows:
 - 1. General information; Items 1, 2, 3, & 7 above.
 - 2. Control system information; Item 4.
 - 3. Approved submittal, maintenance, and parts information; Items 5 & 6.
 - 4. Each Section shall be identified by a permanent index tab.
 - 5. Each item within a major Section shall be separately indexed for quick reference.
- D. Provide adequate written and/or verbal instructions to the Owner's operating personnel and such others as the Owner may designate. As a minimum, provide for three (3), eight hour working days of instructions. Individual equipment or

systems may require additional or different periods of instruction.

1.23 ACCESSIBILITY

- A. Install work so that all parts are readily accessible for inspection, maintenance and service.
- B. Locate connections, valves, unions, strainers, etc. so as to be readily accessible.
- C. Where items are located in non-access spaces (ceilings, tunnels, chases), provide approved access doors or panels. Group items requiring access to limit the number of access points.
- D. Access doors shall have the same fire rating as the wall, floor, or ceiling involved. Doors shall be of size required, but no less than 12" X 12" minimum size. Access doors shall be delivered to the Contractor for installation.

1.24 ELECTRICAL WORK FOR MECHANICAL TRADES

- A. Each trade supplying electrically operated equipment for installation and wiring under Division 16 shall furnish sufficiently detailed information and wiring diagrams in a timely manner.
- B. Equipment including a number of electrical items in a single enclosure or a common base shall be supplied internally wired as a unit to numbered terminals.
- C. Electrical devices having a mechanical element such as a float valve, pressure switch, etc., shall be installed and mechanically connected under this Division and left ready for wiring under Division 16.

1.25 MOTORS AND MOTOR CONTROLS

- A. Motors shall conform to all applicable regulations and be suitable for the load, duty, voltage characteristics, service, and location intended.
- B. Unless otherwise specified, motors shall be rated for continuous duty at rated service factor with a temperature rise not exceeding NEMA standards. Motors shall be able to withstand momentary overloads of 125% of rating without damage or overheating.
- C. Motors 1/3 HP and smaller shall be capacitor start, capacitor run or permanent split capacitor type, designed to run at 120 volts, 1 phase, 60 hertz.
- D. Each trade furnishing motor driven equipment shall provide an approved starting device and deliver same to electrical Contractor for installation and wiring.
- E. Single phase motor starters shall be manual "TT" type toggle switch with melting alloy overload device, unless otherwise indicated.
- F. Polyphase motor starters shall be solid state type soft start equivalent to Allen-Bradley SMC-Flex. The starter shall include electronic overload, integral bypass, modular communication capabilities, motor starting capabilities for both star-delta and standard squirrel-cage induction motors, advanced protection and diagnostics in a compact, maintainable, modular package. The bypass minimizes heat generation during run time and automatically closes when the motor reaches its nominal speed. Features shall include built-in SCR bypass/run contactor, built-in electronic motor overload protection, CT on each phase, metering, LCD display, keypad programming and four programmable auxiliary contacts. Starters shall meet and have the approval of the following standards: UL 508, EN/IEC 60947-4-2, CE Marked (open type) per EMC Directive and Low Voltage Directive. The following are the modes of operation to be provided: Soft Start. Selectable kick-start, current limit start, dual ramp start, full voltage start, linear speed acceleration, preset slow speed, and pump control-start & stop. The starter shall provide the following motor control features: electronic motor overload protection, stall protection and jam detection, underload protection, undervoltage protection, overvoltage

protection, voltage unbalance protection, excessive start protection. The starter shall meter current for each phase, power factor, voltage for each phase, motor thermal capacity usage, power in KW, elapse time and power usage in kWH. A serial interface port shall allow connection to a Bulletin 20 Human Interface Module.

- G. Single phase motors requiring automatic control interlocking shall be solid state type soft start having the same requirements as polyphase motor starters.
- H. Provide, for each starter requiring automatic control, one normally open and one normally closed auxiliary contact.
- I. All motor starters shall be furnished in NEMA 1 enclosure with reset button in cover unless otherwise indicated elsewhere.
- J. Certain large or special purpose motors may require reduced voltage starting. In this case, the appropriate section of the equipment specifications will give complete specifications on the type of motor controller required.
- K. All motor starters being automatically controlled shall be provided with a fused control circuit transformer, 120 or 24 volts as required by control system. Control circuit transformers shall also be provided in all starters operating at line voltages over 250 volts, whether or not automatically controlled.
- L. Provide premium energy efficient motors. Motor name plates shall indicate the nominal efficiency per NEMA Standard MG-12.54. Minimum efficiency shall be as follows:

<u>Horsepower</u>	<u>Nominal Efficiency</u>
1.0	85.5
1.5	86.5
2.0	86.5
3.0	89.5
5.0	89.5
7.5	91.0
10.0	91.7
15.0	93.0
20.0	93.0
25.0	93.6
30.0	94.1
40.0	94.1
50.0	94.5

1.26 TESTS

- A. Test all piping and equipment as required by the various Sections of the Specifications.
- B. Tests to be witnessed by and be to the satisfaction of the Architect or his designee, and others having legal jurisdiction.
- C. Pressure tests shall be applied to piping before insulating and before connecting to equipment having pressure ratings lower than the test pressure.
- D. Work shall be tested, repaired, and retested until an approved test is achieved.
- E. Damages caused by testing or failure of a test shall be repaired to the satisfaction of the Architect, at no cost to the Owner.

- F. In general, piping systems shall be tested to 150% of the maximum expected operating or surge pressure, or 125 psi, whichever is greater. Utility connections shall be tested in accordance with the Utility's requirements.
- G. Completed systems shall be tested to demonstrate proper operation, capacity, and acceptable noise and vibration levels. Insofar as possible, systems normally operated during certain seasons of the year shall be tested during that season.
- H. Costs for all testing shall be borne by the appropriate Contractor.

1.27 QUIET OPERATION

- A. Fans and motors shall be isolated from the building structure by approved means. Noise and hum of equipment shall be absorbed or attenuated so as not to be objectionable.
- B. Where noise or vibration levels are considered objectionable by the Architect, they shall be corrected at no additional cost to the Owner.

1.28 USE OF INSTALLATION BY OWNER

- A. Owner shall have the privilege of using any part of the work when sufficiently complete, but such use shall not be considered as an acceptance of the work in lieu of a written certificate from the Architect.

1.29 CLEANUP

- A. Piping, ducts and equipment shall be thoroughly cleaned, inside and out, before being placed into operation.
- B. Any stoppage in a system shall be removed and any work damaged in the course of such removal shall be restored to its original condition at no additional cost to the Owner.
- C. Keep site free from accumulation of waste materials or rubbish. Periodically clean work areas. At conclusion of work remove all tools, construction equipment, surplus materials from the site and leave in clean condition.

1.30 GUARANTEE AND SERVICE

- A. Guarantee all work to be free from defects in workmanship and/or materials and that all apparatus will achieve the capacity and characteristics specified. If during the period of One (1) Year (or other term specified elsewhere) from certificate of completion of the work, defects appear, remedy such defects without cost to the Owner. In default thereof, the Owner may have such corrective work done and charge the cost to the Contractor. Indemnify Owner for property damage which might result from such a defect which made repairs necessary.
- B. Certain equipment will require guarantee periods exceeding one year due to the need for seasonal operation. In such case, the guarantee period shall extend through one, complete, continuous operating season.
- C. Air conditioning compressors shall be furnished with the Manufacturer's Extended Warranty covering five (5) years from date of project acceptance. Deliver warranty certificate to Owner's authorized representative.

1.31 INSURANCE

- A. Fully insure all employees, material and finished work as required by the General Conditions of the Contract.

1.32 SCAFFOLDING, RIGGING, HOISTING

- A. Unless otherwise indicated, the work or each Section shall include all scaffolding, rigging, hoisting and services

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necessary to deliver, install, erect in place all items of equipment. Remove such handling materials when no longer needed.

END OF SECTION 230500

SECTION 23 07 00 - INSULATION SYSTEMS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. This Section describes various insulation materials and accessories used for the Project's Mechanical Systems.
- B. Refer to the Schedules at the end of this Section for the selection of insulation systems applicable to this Project.

1.3 RELATED WORK

- A. This Section is to be used in conjunction with the provisions of all other Sections of Division 23, especially Section 230500, Common Work Results for HVAC.

1.4 SUBMITTALS

- A. Provide submittals for review in accordance with the provisions of Section 230500.
- B. Submit schedule of insulating materials to be utilized.
- C. Submit manufacturer's installation instructions under provisions of Section 230500.
- D. Describe installation methods that will be used to install duct insulation, liners and accessories.

1.5 QUALITY ASSURANCE

- A. All items provided under the provisions of this Section shall be new and shall be the products of recognized manufacturers of that item.
- B. Applicator shall be a Company specializing in insulation applications with a minimum of three years' experience.
- C. Material flame spread/fuel contributed/smoke developed rating of 25/50/50 in accordance with NFPA 255. Insulation jacket shall be legibly printed by the manufacturer to show nominal thickness, r-value, type insulation, flame spread and smoke development.

1.6 DELIVERY, STORAGE AND PROTECTION OF MATERIAL

- A. All insulation material and accessories shall be stored in a safe, dry location. No insulation material shall be installed that has become damaged in any way.
- B. If any insulation material has become wet because of job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. Any installed insulation material that has become wet after installation shall be replaced with new insulation.
- C. Maintain ambient temperatures and conditions required by manufacturers of adhesive and insulation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The following material describes the requirements and materials for various items included in the Project's Mechanical systems.
- B. It should be noted that this particular Project may not include all of the items listed. Refer to the Schedules at the end of this Section for those items specific to this Project.
- C. Insulation material and accessories shall be products of nationally recognized manufacturers.

2.2 TYPE 'A' PIPE INSULATION

- A. Preformed glass fiber insulation jacketed with reinforced all service vapor retarder jacketing; 'k' value of 0.23 at 75 degrees F; operating temperature range is 0 degrees F to 850 degrees F.
- B. Insulation jacketing shall have a factory applied double pressure sensitive adhesive lap system which provides positive closure and vapor sealing of the longitudinal joint. Joints between insulation sections are sealed with butt strips which also have a two component adhesive system. Jacket closure system shall provide an effective vapor seal. Pipe insulation not employing a dual adhesive lap sealing system must have the laps sealed down with a contact adhesive. Stapling and / or taping will not be permitted.
- C. PVC Fitting Covers and Pipe Jacket: High-impact, ultra-violet resistant polyvinyl chloride weatherable covering. White in color, 20 mil thick, PVC jacketing and covers shall be an inherent vapor retarder and will be able to withstand water and low solvency chemical wash-downs. Fittings shall be one piece, pre-molded specifically for each fitting type, including elbows, tees, valves, flanges, reducers, end caps, hubs, traps, mechanical pipe couplings, roof drain sump, etc. Covers and jackets shall be capable of being finished with acrylic latex paint. Product physical properties shall be compliant with ASTM E 84, ASTM D 638, and ASTM D 790. Additionally, within food preparation and service areas, the pipe covering shall comply with USDA requirements.

2.3 TYPE 'B' PIPE INSULATION

- A. Preformed flexible elastomeric cellular thermal insulation; 'k' value of 0.27 at 75 °F; operating range of -40 °F to 220 °F.
- B. Adhesive: air-drying contact adhesive to join seams and butt joints.
- C. Insulation tape is made of the same elastomeric cellular material as the insulation. Tape is supplied in 2 inch wide by 1/8 inch thick form.
- D. Protective finish: white water-based latex enamel suitable for both indoor and outdoor application to insulation. Finish shall be exceptionally durable and resistant to weather.

2.4 TYPE 'C' - NOT USED

2.5 TYPE 'D' ACOUSTICAL DUCTWORK LINER

- A. Flexible glass fiber; ASTM C 553; 'k' value of 0.28 at 75 degrees F; 1.5 lb/cu ft density; 30 °F to 250 °F temperature range. Coated air side for maximum 4,000 ft/min air velocity. Ductwork shall have black pigmented coating on the airstream side to resist damage during installation and in service. Edges shall be factory coated with the same black pigmented coating. The duct liner shall have a mat facing on the airstream side to resist damage during installation and in service.

2.6 TYPE 'E' DUCTWORK INSULATION

- A. Flexible glass fiber; ASTM C 553; commercial grade 'k' value of 0.29 at 75 degrees F; 1.0 lb/cu. ft. density; 40 °F to 250 °F temperature range. Insulation is factory applied to reinforced foil kraft scrim (FRK) vapor retarder jacket facing.

2.7 TYPE 'F' DUCTWORK INSULATION

- A. Rigid glass fiber; ASTM C 553, 'k' value of 0.23 at 75 degrees F; 6.0 lb/cu. ft. density; 0 °F to 250 °F temperature range. Insulation is factory applied to reinforced foil kraft scrim (FRK) jacket facing.
- B. Weatherproof and protect duct insulation systems exposed to the outdoors or areas of buildings which have a wet environment. Protective coating shall be equivalent to Manville Insulkote ET, with a water vapor penetration of 0.06 perms for a 1/4 inch applied thickness. Primer shall be equivalent to Manville Insulkote Primer E.

2.8 EQUIPMENT INSULATION

- A. Type H: Rigid mineral fiber board; ANSI/ASTM C612; 'k' value of 0.23 at 75 degrees F; 6.0 lb/cu.ft.
- B. Type I: Cellular glass; ANSI/ASTM C552; 'k' value of 0.35 at 75 degrees F; 8.0 lb/cu.ft.

2.9 ACCESSORY MATERIAL

- A. Accessory materials installed as part of insulation work under this Section shall include but not be limited to closure materials, insulation bands, insulating cement, finishing cement, jacketing materials, support materials, fasteners, and adhesives.
- B. All accessory materials shall be installed in accordance with the Contract Drawings, manufacturer's instructions and/or conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ensure that all surfaces over which insulation is to be applied are clean and dry.
- B. Ensure that insulation is clean, dry and in good mechanical condition with vapor or weather barriers intact and undamaged.
- C. Ensure that testing mechanical systems have been completed prior to installing insulation.

3.2 GENERAL INSTALLATION

- A. Install materials in accordance with manufacturer's printed instructions.
- B. Continue insulation having vapor barrier through penetrations and sleeves undiminished in thickness. Extend insulation without interruption through walls, floors, and similar pipe penetrations, except where otherwise specified. Extend ductwork insulation without interruption through walls and floors, except where interrupted by fire and smoke dampers, and where noted otherwise.

- C. Locate insulation and cover seams in least visible locations.
- D. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. On insulated piping without vapor barrier and piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment connections, but bevel and seal ends of insulation at such locations.
- F. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at point of support. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.
- G. Neatly finish insulation at supports, protrusions, and interruptions. Install insulation, covers and accessories so that they have an attractive, neat appearance.
- H. All insulation ends shall be tapered and sealed, regardless of service.
- I. Maintain the integrity of factory-applied vapor barrier jacketing on all insulation, protecting it against puncture, tears or other damage. All staples used on cooling or dual temperature ductwork insulation shall be coated with suitable sealant (as recommended by the insulation manufacturer) to maintain vapor barrier integrity.
- J. Install insulation and covering so that it has an attractive, neat appearance.
- K. Install insulation materials with smooth and even surfaces. Butt joints firmly together to ensure complete and tight fit over surfaces to be covered.
- L. Protect outdoor insulation from weather by installing outdoor protective finish or jacketing as recommended by the insulation manufacturer.
- M. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.
- N. When equipment with insulation requires periodical opening for maintenance, repair, or cleaning, install insulation in such a manner that it can be easily removed and replaced without damage.
- O. All exhaust piping within building and piping within 12 feet of grade at the building exterior shall be insulated and jacketed. Jacketing located outdoors shall be sealed water-tight. Exhaust piping 12 feet and higher above grade shall not be insulated.

3.3 TYPE 'A' PIPE INSULATION

- A. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete a run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit over all piping surfaces.
- B. Butt pipe insulation against hanger inserts. For hot pipes, apply 3" wide vapor barrier tape and band over butt joints. For cold water piping apply wet coat of vapor barrier lap adhesive on butt joints and seal joints with 3" wide vapor barrier tape.
- C. Cover valves, flanges, tees, elbows, reducers, end caps, hubs, traps, mechanical pipe fittings and other similar items with PVC fitting covers insulated with material equal in thickness and composition to adjoining insulation.
- D. Cover exposed vertical piping within the building, exposed piping located in Janitor Closets, and any other location

designated in the Contract Documents, with PVC jacketing. PVC fitting covers and pipe jacketing shall be bonded together with the manufacturers recommended adhesive to form a completely sealed insulation covering system.

3.4 TYPE 'B' PIPE INSULATION

- A. Unslit tubular form can be slipped onto piping before it is connected, or can be slit length wise and applied over piping already connected. Fitting covers are fabricated from miter-cut tubular form. Butt joint and seams are to be joined with insulation manufacturer's supplied adhesive and sealed with the manufacturer's supplied tape. Cover valves, flanges, etc. with oversized insulation.
- B. Provide the insulation manufacturer's protective finish on pipe insulation exposed to the outdoors.
- C. Provide PVC fitting covers/pipe jacketing on insulated piping and fittings exposed within the building. PVC fitting covers and jacketing shall be bonded together with the manufacturer's recommended adhesive to form a completely sealed covering system.

3.5 TYPE 'C' HANDICAP LAVATORY & SINK INSULATION SYSTEM - NOT USED

3.6 TYPE 'D' ACOUSTICAL DUCTWORK LINER

- A. Duct liner insulation shall be applied with all joints tightly butted using 90% coverage of adhesive meeting the requirements of ASTM C 916, plus mechanical fasteners spaced according to the liner manufacturer's schedule for the interior width of the plenum, housing, or air shaft.
- B. Provide continuous sheet metal edging at insulation to secure the leading edge of duct liner.

3.7 TYPE 'E' DUCTWORK INSULATION

- A. Duct wrap insulation shall be applied with all joints butted firmly together. All joints in the insulation covering shall be sealed with adhesive. Duct wrap insulation shall be secured to bottom of rectangular or oval ducts over 24 inches wide with mechanical fasteners on 16 inch centers to prevent sagging. All joints and seams and other penetrations shall be closed with 3 inch pressure-sensitive tape matching the facing or a vapor barrier mastic reinforced with 3 inch glass scrim tape.

3.8 TYPE 'F' DUCTWORK INSULATION

- A. Rigid insulation shall be secured to ductwork with adhesive or impaled over welded pins and secured with insulation caps and washers matching the color of the vapor barrier facing. All seams, joints and other penetrations shall be firmly butted and sealed with 3 inch pressure-sensitive vapor barrier tape matching the facing or a vapor barrier mastic reinforced with 3 inch glass scrim tape.
- B. Corner angles shall be installed on all external corners of rigid duct insulation before jacketing.
- D. For outdoor duct systems and duct systems exposed to a wet environment in the building, the standard facing shall be overcoated with a suitable primer and weather barrier mastic protective coating, reinforced with fabric or mesh, that is equivalent to Manville Insulkote ET. Apply two (2) layers of the protective coating for a total thickness of 1/4 inch. Taper insulation at top of duct to permit moisture runoff.

3.9 ACCESSORY MATERIALS

- A. All accessory materials shall be installed in accordance with the Contract Documents, the manufacturer's printed installation instructions, and in conformance with the current edition of the Midwest Insulation Contractors Association

(MICA) "Commercial & Industrial Insulation Standards".

3.10 DUCTWORK INSULATION SCHEDULE

<u>SYSTEM</u>	<u>TYPE</u>	<u>THICKNESS</u>	<u>FINISH</u>
Supply Ducts	E	1-1/2" (R-8)	Foil Scrim
Outside Air Ducts	E	1-1/2"	Foil Scrim
Return Ducts	D	1"	Neoprene
Supply Duct Exposed on Roof	F	2" (R-13)	Weather-Proof Coating

END OF SECTION

SECTION 23 08 00 - COMMISSIONING OF SYSTEMS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SCOPE OF WORK

- A. Testing, Balancing and Adjusting of Air Systems.
- B. Testing, Balancing and Adjusting Water Systems.
- C. Owner Instructions.
- D. Operation and Maintenance Manuals.
- E. "As Built" Drawings.

1.3 REQUIREMENTS INCLUDED

- A. Provide testing, balancing and adjusting (TBA) services for all operating mechanical systems.
- B. Provide report covering results of TBA procedures.

1.4 RELATED DOCUMENTS

- A. Section 230500 - Common Work Results for HVAC.
- B. All other Sections in Division 23.

1.5 QUALITY ASSURANCE

- A. Work to be performed by testing agency having at least 3 years' experience in TBA procedures for equivalent projects.
- B. Air System TBA by personnel certified by Associated Air Balance Council (AABC).
- C. Instrumentation used to have documented calibration.
- D. Operation and Maintenance Manuals and "As-Built Drawings" shall be reviewed by the Engineer prior to turning over to Owner. Refer to Section 230500 - Commons Work Results -HVAC.

1.6 PROCEDURES

- A. Comply with procedural standards of AABC.
- B. Two weeks prior to start of TBA procedures submit for approval the following: Copies of written procedures to be used, forms to be used, instrument calibration documents, qualifications of testing personnel and a schedule of hydronic terminal units water flow rates.
- C. Cooperate with installing subcontractor.

- D. Submit final report within one week of completion of TBA procedures.

1.7 CONTRACTOR RESPONSIBILITIES

- A. Prepare system for testing, balancing and adjusting (TBA).
- B. Cooperate with Testing organization to provide access to equipment. Operate system at required times and under conditions required for effective TBA.
- C. Prior to start of TBA work, make sure air systems have all dampers open and water systems have all balancing valves open and all bypass valves closed.
- D. Ensure that all systems have been cleaned and filters serviced and otherwise ready for TBA.
- E. Provide manufacturer's testing and start-up report for each rooftop unit.
- F. Provide certification from the roofing system manufacturer that roof bond has been maintained.

PART 2 - PRODUCTS

2.1 None required.

PART 3 - EXECUTION

3.1 AIR HANDLING SYSTEMS AIR BALANCING

- A. Test, Balance and Adjust all systems having fans, ducts and air terminals.
- B. Minimum Data and Services required:
 - 1. Confirm that all air filters are clean.
 - 2. Test and record motor amperage (all phases).
 - 3. Make pilot tube traverse of each main supply duct and obtain CFM delivered by fans.
 - 4. Test and record static pressures, suction and discharge.
 - 5. Adjust system for design CFM of recirculated air.
 - 6. Test and adjust system for design CFM of outside air.
 - 7. Test and record entering and leaving temperatures for each heating/cooling unit, recording dry and wet bulbs.
 - 8. Adjust all main and branch ducts to design air quantity.
 - 9. Test and adjust each and every supply, return and exhaust terminal to within 5% of design quantity.
 - 10. Identify each air terminal as to size/type and location and reference manufacturer's procedure for determination of CFM.
 - 11. Record initial readings and CFM and finally adjusted CFM for each air terminal.

12. In cooperation with Automatic Control System representative, set and adjust automatic dampers and louvers to operate as specified and to proper CFM.
 13. Adjust each air terminal for proper throw and pattern to achieve intended coverage and to minimize drafts.
- C. Make any needed changes to motors, pulleys, drives or belts, add any needed dampers as required to achieve the correct system balance. All at no additional cost to the Owner.
- D. Provide extended services on balancing for 90 days during which time any resetting, re-adjustment or rebalancing shall be performed to any terminal, fan or zone to correct comfort conditions or to confirm information submitted in balance report. Provide technicians as needed to assist Engineer in making any tests he may require during this time.

END OF SECTION

SECTION 23 30 00 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. This Section describes various basic materials and equipment for use in the Project's Mechanical Systems.
- B. Refer to the Schedules at the end of this Section for the selection of vibration isolation, piping systems and valves applicable to this Project.
- C. Work included under this Section shall include, but not be limited to: Piping and fittings, ductwork, valves, backflow preventers, hangers, supports, sleeves, fire stopping systems, mechanical identification, seismic bracing, vibration isolation, ductwork access doors, volume dampers, fire dampers, and combination fire/smoke dampers.
- D. Coordination utilizing ductwork erection drawings.

1.3 RELATED WORK

- A. This Section is to be used in conjunction with the provisions of all other Sections of Division 23, especially Section 230500, General Provisions - Mechanical.
- B. Refer also to any applicable portions of Division 26, Electrical Work.

1.4 SUBMITTALS

- A. Provide submittals for review in accordance with the provisions of Section 230500.
- B. Submit manufacturers installation instructions under Section 230500.
- C. Submittals are required for the following:
 - 1. Schedule of valve types proposed for each scheduled service.
 - 2. Schedule of pipe and fitting types proposed for each service scheduled.
 - 3. Schedule of vibration isolation for each unit and service scheduled.
- D. Submit sketches of proposed seismic bracing systems for equipment, including loads, etc. Sketches and calculation submittals shall bear the seal and signature of a structural engineer licensed in the State of Connecticut.
- E. Provide documentation that vibration isolators and anchor bolts will have properties sufficient to withstand required forces.
- F. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- G. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

- H. Submit a shop drawing indicating vibration isolator locations, with static and dynamic load on each isolator and description of product data.
- I. Submit shop drawings and samples of duct fittings, including particulars such as gage sizes, welds, sealants, and configurations prior to start of work.
- J. Grooved joint couplings and fittings shall be shown on drawings and product submittals and shall be specifically identified with the applicable Victaulic style or series number.

1.5 QUALITY ASSURANCE

- A. All items provided under the provisions of this Section shall be new and shall be the products of recognized manufacturers of that item.
- B. All items of a similar class shall be the products of the same manufacturer. That is, all valves, all accessory items, etc. shall be from the same source.
- C. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- D. Welding Materials and Procedures: Conform to ASME Code and applicable State labor regulations.
- E. Employ licensed welders in accordance with Connecticut Occupational Licensing Laws .
- F. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition for selection of vibration isolators.
- G. Firestopping shall conform to ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire Stops".
- H. Cleaning of inlet and outlets shall conform with The National Air Duct Cleaners Association's Standard - Mechanical Cleaning of Non-Porus Air Conveyance System Components.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The following describes the requirements and materials for various items included in the Project's Mechanical systems.
- B. It should be noted that this particular Project may not include all of the items listed. Refer to the Valve and Materials Schedules at the end of this Section for those items specific to this Project.

2.2 PIPE AND TUBING

Schedule at end of this Section will refer to required types of pipe or tubing by letter designation according to the following list:

- A. Steel, Black & Galvanized; ASTM A-53 or A-120; Plain or threaded ends. Each length mill coated and capped.
- B. Copper Tube; Types K, L, M, and DWV, seamless. Shall be of domestic origin. Contractor shall provide certificate of origin for all copper tube used for potable water system.

- C. Stainless Steel; Type 304/304L, Schedule 5S, ASTM A312, EFW. Full finish annealed pipe with plain ends.
- D. Plastic; Polyvinyl Chloride (PVC), ASTM D1785, Weight as scheduled.
- E. Plastic; Chlorinated Polyvinyl Chloride (CPVC), ASTM D1784, Weight as scheduled.
- F. Steel, Black & Galvanized; ASTM A-53 or A-120; Plain or threaded ends. Each length mill coated and capped.

2.3 PIPE FITTINGS

Schedule at end of this Section will refer to required types of pipe or tubing fittings by letter designation according to the following list:

- A. Malleable Iron, threaded, ANSI/ASME B16.3, weight as scheduled
- B. Forged Steel, welding ends, FS WW-P-521, for butt welding.
- C. Wrought Copper, solder joint, pressure fittings, ANSI/ASME B16.22.
- D. Wrought Copper and Wrought Copper Alloy, solder joint drainage fittings, ANSI/ASME B16.29.
- E. Mechanical joints and fittings for hard copper tubing systems: Victaulic fittings shall be manufactured from wrought copper ANSI/ASME B16.22 or bronze castings ANSI/ASME B16.18, manufactured to copper tube dimensions, with grooved ends designed to accept Victaulic couplings. (Flaring of tube or fitting ends to IPS dimensions is not allowed).
- F. Stainless steel fittings, precision, cold drawn, austenitic stainless steel, type 304/304L, with elastomer O-ring seals. (UL classified in accordance with ANSI/NSF-61 certified for hot and cold potable water service.)
- H. Mechanical joints and fittings for steel piping systems, Victaulic, or engineer approved equal. Fittings shall be manufactured of ductile iron conforming to ASTM A536; wrought steel conforming to ASTM A234; or factory fabricated from carbon steel pipe conforming to ASTM A53; with standard or AGS grooved ends designed to accept Victaulic couplings.
- I. Press fittings for copper and copper alloy piping systems, Viega, or engineered approved equal. Fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing element for press fittings shall be EPDM. Sealing elements shall be factory installed or alternatively supplied by the fitting manufacturer. Press end shall have Smart Connect (SC) feature design, which functions to provide the installer a quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2.4 UNIONS AND COUPLINGS

- A. Pipe Size 2 inches and Under: 150 psi malleable iron for threaded ferrous piping; bronze for copper or brass pipe soldered joints, or 300 psi stainless steel threaded type with Vic-Press 304 ends for stainless steel pipe.
- B. Pipe Size Over 2 inches: 150 psi forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; synthetic rubber gaskets for gas service; 1/16 inch thick preformed synthetic rubber bonded to asbestos elsewhere.
- C. Grooved and Shouldered Pipe Ends: Ductile iron housing clamps to engage and lock, designed to permit some angular deflection, contraction and expansion where required; composition sealing gasket, steel bolts, nuts and washers; galvanized couplings for galvanized pipe.

1. IPS Steel Piping:

a. 2" through 12":

- 1) Rigid Type: Housings cast with offsetting, angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9.
 - a) 2" through 8": "Installation Ready" stab-on rigid coupling designed for direct 'stab' installation onto grooved end pipe without prior field disassembly and no loose parts. Gasket shall be Grade "EHP" EPDM with maximum temperature rating of +250°F (UL listed and ANSI/NSF-61 certified for hot and cold potable water service). Victaulic Style 107 "QuickVic™".
 - b) 10" and 12": Standard rigid coupling with Grade "E" EPDM gasket with a maximum temperature rating of +230°F (UL listed and ANSI/NSF-61 certified for hot and cold potable water service). Victaulic Style 07.
- 2) Flexible Type: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors at equipment connections. Three (3) couplings, for each connector, shall be placed in close proximity to the source of vibration. Victaulic Style 77.
- 3) Flange Adapters: Flat face, for direct connection to ANSI Class 125, 150, or 300 flanged components. Victaulic Style 741 or 743.

b. 14" through 24": Victaulic AGS Series with lead-in chamfer on housing key, flat bolt pads, and wide width gasket, Grade "E" EPDM, FlushSeal® design (UL listed and ANSI/NSF-61 certified for hot and cold potable water systems).

- 1) Rigid Type: Provides rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9. Victaulic Style W07.
- 2) Flexible Type: Allows for linear and angular movement, vibration isolation and stress relief. Victaulic Style W77.
- 3) Flange Adapter: Flat face, ASTM A536 ductile iron, Class 125/150 bolt-hole pattern, AGS grooved end pipe. Victaulic Style W741.

2. Hard Copper Tube:

- a. 2" through 8": "Installation Ready" rigid coupling designed for direct 'stab' installation onto roll grooved copper tube without prior field disassembly and no loose parts. Housings shall be cast with offsetting, angle-pattern, bolt pads coated with copper colored alkyd enamel. Gasket shall be Grade "EHP" EPDM with a maximum temperature rating of +250°F (UL listed and ANSI/NSF-61 certified for hot and cold potable water service), and plated steel bolts and nuts. Victaulic Style 607 "QuickVic™".
- b. Copper flange adapters will be cast of ductile iron coated with copper-colored enamel, flat face, for engaging into roll grooved copper tube and fittings and bolting directly to flanged with ANSI Class 125 and 150 bolt-hole patterns. Victaulic Style 641.

2.5 VALVES

Unless otherwise indicated, use valves suitable for 125 minimum psig WSP and 450 F. Valves for fire protection suitable for 175 psig WOG, UL approved. Grooved end valves shall be suitable for 300 psig CWP, UL approved.

A. Valve Connections:

1. Provide valves suitable to connect to adjoining piping as specified for pipe joints. Use valves of full pipe

line size.

2. Thread pipe sizes up to 2 inches.
3. Flange pipe sizes over 2 inches.
4. Solder end, grooved end, or push-to-connect valves on copper tubing.
5. Use grooved body valves with mechanical grooved jointed piping.
6. Use Vic-Press 304 end valves with stainless steel piping up to 2 inches.

B. Rated Gate, Globe, Check Valves:

1. Gate Valves: Bronze, rising stem, inside screw, solid wedge, solder or screwed ends. Iron body, bronze trim, rising stem, OS&Y, solid wedge, flanged ends.
2. Globe Valves: Bronze, rising stem, inside screw, composite renewable disc, solder or screwed ends. Iron body, rising stem, bronze trim, OS&Y, renewable composition disc, flanged ends.
3. Check Valves:
 - a. Bronze, swing disc, solder or screwed ends. Iron body, bronze trim, spring loaded, renewable composite disc, flanged ends.
 - b. Bronze, lift disc, push-to-connect ends, spring loaded, 301 stainless steel disc. Victaulic PermaLynx™ 510 Series.
 - c. Ductile iron, spring-assisted, aluminum bronze or elastomer encapsulated ductile iron disc, stainless steel spring and shaft, PPS coated or welded-in nickel seat, grooved ends. Victaulic Series 716 or Series 779 with Venturi taps for flow measurement accuracy.
 - d. Ductile iron, spring-actuated, stainless steel dual disc, with stainless steel spring and shaft, EPDM seat, AGS grooved ends. Victaulic Series W715.

C. Ball Valve:

1. Bronze body and brass ball, push-to-connect, solder or screwing rods.
2. Forged brass body, chrome-plated brass ball and brass stem, PTFE seat rings, push-to-connect ends. Victaulic PermaLynx™ 300 Series.
3. Forged brass body, chrome plated brass ball and stem, TFE seats and Vic-Press 304™ ends. Victaulic Series 589.
4. Ductile iron body, chrome plated steel ball and stem, TFE seats and grooved ends. Victaulic Series 726.

D. Butterfly Valves:

1. IPS Size:
 - a. Ductile iron body, offset electroless nickel plated ductile iron disc, offset, providing 360-degree continuous seating, pressure responsive EPDM seat, 416 stainless steel stem and TFE lined fiberglass bearings. Victaulic Vic-300 MasterSeal™.
 - b. PPS coated ductile iron body, offset PPS coated ductile iron disc and seat, disc mounted seal, 17-4PH hardened stainless steel stem and reinforced PTFE bearings. Victaulic Vic®-300 AGS.
2. Hard Copper Tube: Cast bronze body, elastomer encapsulated ductile iron disc, with integrally cast stem, and copper-tube dimensioned grooved ends. Victaulic Series 608.

E. Cocks and Plug Valves:

1. Iron body, brass plugs and washers, air tested, solder or screwed ends. Iron body and plug, pressure lubricated type, flanged ends.
2. Ductile iron body, elastomer encapsulated ductile iron plug, eccentric non-lubricated type with stainless steel backed TFE self-lubricating bearings, and grooved ends. Victaulic Series 377.

F. Drain Valve

1. Bronze or red brass, replaceable disc, hose spout end, chrome plated where installed exposed.
2. Non-freeze type with polished bronze recessed box, hose thread spout, removable key. Length to place seat completely within building.

G. Reduced Pressure Backflow Preventer:

1. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013 (AWWA C506); bronze body, two independently operating, spring loaded check valves. Diaphragm type differential pressure relief valve located between check valves; assembled with two gate valves, strainer, and test cocks. Backflow preventer shall be Model #909 as manufactured by Watts.
2. Double Check Valve Assembly: ANSI/ASSE 1012 (AWWA C506); bronze body with corrosion resistant internal parts and stainless steel springs, two independently operating check valves. Valve assembly shall be Model #709 as manufactured by Watts.

2.6 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with Schedule 40 steel pipe.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Schedule 40 steel pipe.
- D. Sleeves for Round Ductwork: Form with galvanized steel.
- E. Sleeves for Rectangular Ductwork: Form with galvanized steel.

2.7 FIRESTOPPING SYSTEMS

- A. Provide material/system classified by UL to provide firestopping equal to time rating of construction being penetrated.
- B. Firestopping system shall not emit toxic or combustible fumes and be capable of maintaining an effective barrier against flame, smoke water and toxic gases in compliance with ASTM E-814 under their designation of UL 1479.
- C. Firestopping systems shall be flexible to allow for normal movement of building structure and penetrating items without affecting the adhesion or integrity of the system.
- D. Stuffing and Fire Stopping Insulation: Glass fiber type, non-combustible.
- E. Firestop Sealant: An adhesive, one-part, silicone based, elastomeric sealant.
- F. Intumescent Wrap: An aluminum foil-backed intumescent strip for plastic pipe, insulated pipe or other combustible penetrating items.
- G. Damming Material: Adhesive filling and sealing foam, fire-resistant mineral fiber.

2.8 PIPE AND EQUIPMENT SUPPORTS

- A. Hangers for Pipe Sizes ½ to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
- C. Hangers for Pipe Sizes 5 Inches and Over: Adjustable steel yoke, cast iron roll, double rod hanger.
- D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for pipe sizes 6 inches and over.
- E. Wall Support for Pipe Sizes ½ to 2 Inches: Welded steel bracket and wrought steel clamp; adjustable clevis.
- F. Vertical Support: Steel riser clamp, adjusting screws sizes 4 inches and larger.
- G. Floor Support for Pipe Sizes 2-1/2 to 5 Inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.
- H. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- I. Copper Pipe Support: Carbon steel clevis, adjustable, copper plated.
- J. Shield for Insulated Piping 2 Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- K. Shield for Insulated Piping 2-1/2 Inches and Larger (Except Cold Water Piping): Pipe covering protective saddles.
- L. Shields for Insulated Cold Water Piping 2-1/2 Inches and Larger; Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.
- M.. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.9 INSERTS

- A. Inserts: Malleable iron or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.10 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.11 IDENTIFICATION MATERIALS

- A. Unless specified otherwise, identification shall conform with ANSI/ASME A13.1.
- B. Plastic Nameplates: Laminated three-layer plastic with engraved white letters on dark contrasting background.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- D. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, performed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

- E. Plastic Pipe Tape Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.12 DUCTWORK

A. Material:

1. Ducts Galvanized steel, lock-forming quality, having zinc coating of 1.25 ounces per square foot for each side.
2. Fasteners: Use rivets and bolts throughout; sheet metal screws accepted on low pressure ducts. Gasketed clamping systems may be used provided they are rated for the pressure level of the system used on.
3. Sealant: Water resistant, fire resistive, opaque, compatible with mating materials.
4. Flexible Ductwork: Buckley Flexmaster Aluminum Triple-lock, UL Listed, Class 1 air duct with 1 inch thick fiberglass insulation and polyethylene jacket.

B. Fabrication:

1. Fabricate in accordance with SMACNA duct manuals and ASHRAE handbooks. Fittings shall conform to the configuration shown on the Drawings.
2. Construct ductwork to NFPA 90A, NFPA 90B.
3. Size round ducts installed in place of rectangular ducts from ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
4. Complete metal ducts within themselves with no single partition between ducts. Where width of duct exceeds 18 inches cross break for rigidity. Open corners are not acceptable.
5. Lap metal ducts in direction of air flow. Hammer down edges and slips to leave smooth duct interior.
6. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on center line. Where not possible and where rectangular elbows used, provide air foil type turning vanes. Where acoustical lining is required, provide turning vanes of perforated metal type with glass fiber inside.
7. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Maximum total divergence upstream of equipment to be 30 degrees and 45 degrees convergence downstream.
8. Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so as not to breathe, rattle, vibrate, or sag. Calk duct joints and connections with sealant as ducts are being assembled.
9. Provide easements where low pressure ductwork conflicts with piping and structure where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.
10. Provide necessary baffling in mixed air chambers to insure good mixing of recirculated and outside air streams.
11. Ensure all seams and joints are air tight. Provide gasketed connections between joints or seal with approved duct sealing compound equivalent to EC800. Sealant shall not be of clear, transparent type, but shall have a distinctive color so as to be readily visible. Mastic Tapes meeting UL-181A will be allowed.

C. Duct Gages:

1. Low Pressure Ducts: Medium gages for metal. Add cross bracing, angle stiffeners, etc. where recommended by SMACNA.

Maximum Width

Minimum

Minimum

In Inches	USS Gage Steel	US Gage Aluminum
Up to 12	26	24
13 to 30	24	22
31 to 54	22	20

2.13 DUCTWORK ACCESSORIES

A. Access Doors

1. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.
2. Provide two hinges and two sash locks for sizes up to 18 inch square, two hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inch. Provide an additional hinge for larger sizes.

B. Dampers

1. Fabricate of galvanized steel, minimum 16 gage and provide with quadrants or adjustment rod and lock screw.
2. Fabricate splitter dampers of double thickness sheet metal to streamline shape, properly stiffened to avoid vibration. Size on basis of straight air volume proportioning. Use of splitter dampers is to be avoided. Use manual volume dampers in both branches wherever possible.
3. Fabricate single blade dampers for duct sizes to 8 x 18 inch.

C. Flexible Connections

1. Fabricate of neoprene coated flameproof fabric approximately 2 inch wide tightly crimped into metal edging strip and attach to ducting and equipment by screws or bolts at 6 inch intervals.

D. Fire Dampers

1. Fabricate low resistance fusible link fire dampers in accordance with Connecticut Building Code, NFPA-90A and UL approved procedures. Each fire damper shall possess a 1-1/2 hour standard fire rating and shall bear the UL label attesting to this.
2. Fire damper shall meet all UL and NFPA requirements for primary fire dampers, and shall be approved for use where ducts penetrate partitions with resistance ratings of two hours or less, per UL Standard 555.
3. Construction: Frame shall be a 4-8/7" maximum constructed of 20 gauge minimum galvanized steel channel. Blades shall be curtain type constructed of 24 gauge galvanized steel. Provide a 212 F UL listed fusible link. Provide 165 F fusible links where directed.
4. Damper curtain shall be located out of the air stream.

E. Combination Fire Smoke Damper

1. Furnish and install at locations shown on plans, or as described in schedules, round combination fire/smoke dampers. Frames shall be a minimum of 20 gage galvanized steel and the blade shall be two piece of two piece, equivalent to 14 gauge minimum galvanized steel. Bearings shall be stainless steel sleeved turning in an extruded hole in the frame. Blade seals shall be silicone edge designed to withstand 450 F mechanically fastened and fully encompassing blade edge. Damper must have an integral 20 gauge sleeve and 20 gauge retaining plate for damper mounting.
2. Each combination fire/smoke damper shall be classified for use for fire resistance ratings of less than 3 hours, in accordance with UL standard 555, and shall further be classified by Underwriters Laboratories

as a Smoke Damper for use in smoke control systems in accordance with the latest version of UL555S, and bear a UL label attesting to the same. The leakage rating under UL555S shall be leakage Class 1 (8cfm/sq. ft. at 4"w.g.).

3. The dampers and their actuators shall be qualified under UL555S to an elevated temperature of 250 F or 350 F depending upon the actuator. Appropriate electric actuators shall be installed by the damper manufacturer at time of damper fabrication. Electric actuators shall be rated for energized hold open position periods of 6 months or more. Damper and actuator shall be supplied as a single entity which meets all applicable UL555 and UL555S qualifications for both dampers and actuators.
4. Each combination fire/smoke damper shall be equipped with a "controlled closure" quick detect heat-actuated release device to prevent duct and HVAC component damage. Instantaneous damper closure is unacceptable.
5. Each fire/smoke damper shall be Ruskin model FSDR25. Each fire/smoke damper shall have an EFL (Electric Fuse Link) device to permit controlled closure through the damper actuator. The EFL shall be 120 VAC and powered from a fused circuit.
6. Each fire/smoke damper shall be operated by the building's fire alarm system and powered by a local 120 volt source, both provided by Division 26. Electrical Drawings for the Duct Smoke Detector Damper Wiring Diagram for additional information.
7. Each fire/smoke damper shall be the same size as the duct it is connecting to.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Install in accordance with manufacturer's printed installation instructions.
- B. Offsetting/Pitching/Drains & Vents

3.2 PIPE INSTALLATION

- A. Preparation:
 1. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
 2. Remove scale and dirt, inside and outside, before assembly.
 3. Remove welding slag or foreign material from pipe and fitting materials.
- B. Steel Pipe Connections:
 1. Screw joint steel piping up to and including 2 inch. Weld piping 2-1/2 inch and larger, including branch connections.
 2. Die cut screwed joints with full cut standard taper pipe threads with teflon tape or other non-toxic joint compound applied to male threads only.
 3. Use main sized saddle branch connections, or directly connect branch lines to mains in steel piping if main is one pipe size larger than the branch for up to 6 inch mains and if main is two pipe sizes larger than branch for 8 inch and larger mains. Do not project branch pipes inside the main pipe. Branch nozzles to be contoured to shape of main pipe, then beveled for welding.
 4. On 250 psi and higher service, all takeoffs and branches from mains shall be made with standard, forged steel reducing butt welding fittings.
 5. Small connections to main piping (up to 1-1/2 inch pipe size) may be made using weldolet, elbolet, sockolet, or thredolet fittings. Bore main full pipe size for branch connections before attachment of welding outlet.
 6. Joints for Plain End Pipe: Grooved or Welded.

7. Joints for Threaded End Pipe: Teflon tape or approved pipe lubricant compound.

C. Copper Pipe Connections:

1. Form hot soldered joints in copper, brass, or bronze fittings with non-lead solder. Clean joints prior to fluxing. Use only non-acid fluxes.
2. Make connections to equipment and branch mains with unions. (Unions are not required in installations using grooved mechanical couplings. (The couplings shall serve as unions.)
3. Plastic Pipe connections.
4. Other pipe connections.
5. Press connections: copper press fitting joints shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

D. Stainless Steel Vic-Press 304™ Pipe Connections:

1. Install Vic-Press 304™ in accordance with the manufacturer's latest installation instructions.
2. Pipe shall be square cut, +/-0.030", properly deburred, and cleaned.
3. Mark pipe ends at the required location, using a gauge supplied by Victaulic, to ensure full insertion into the coupling or fitting during assembly.
4. Use a Victaulic 'PFT' series tool with the proper sized jaw for pressing.

E. Grooved Pipe Connections:

1. Grooved joint couplings and fittings shall be installed in accordance with the manufacturer's written installation instructions.
2. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
3. Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be molded and produced by the coupling manufacturer.
4. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products.
5. The manufacturer's representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.
6. A distributor's representative is not considered qualified to conduct the training.
7. Install the Victaulic AGS piping system in accordance with the latest Victaulic installation instructions. Use Victaulic grooving tools with AGS roll sets to groove the pipe. Follow Victaulic guidelines for tool selection and operation. Coupling installation shall be complete when visual metal-to-metal contact is reached. AGS products shall not be installed with standard grooved end pipe or components. Installing AGS products in combination with standard grooved end products could result in joint separation and/or leakage.

F. Vent Pipe in Air Plenum Space:

1. All vent piping routed through an air plenum space shall be CPVC piping.
2. Piping shall meet all the requirements of ASTM D1784 and UL 1887.
3. Piping shall be Blazemaster CPVC or approved equal.

3.3 HANGER INSTALLATION

- A. No chains, wood blocks, wire, or cold bent brackets may be used for support.

- B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- C. Place a hanger within 12 inches of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment. Provide jam nut to lock adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Design hangers to be adjustable or removable without disconnecting of supported pipe.
- J. Provide copper plated hangers and supports for copper piping.

3.4 SLEEVE/INSERT INSTALLATION

- A. Set sleeves in position in form work. Provide reinforcing around sleeves as required.
- B. Extend sleeves through floors 2 inches above finished floor level. Calk sleeves full depth. In dry finished areas set sleeves flush with floor, calk, and provide approved escutcheon plate.
- C. Where piping or ductwork penetrates floor, ceiling or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and sealant. Provide close fitting chrome plated escutcheon covers at both sides of penetration. Sealant and packing shall be of a type which shall maintain the fire resistive rating of the member being penetrated.
- D. Install chrome plated steel escutcheons at finished surfaces.
- E. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- F. Size sleeves for insulated piping and ductwork to allow insulation to pass through sleeve undiminished in thickness. Provide intumescent fire stopping at fire rated walls.

3.5 VALVE INSTALLATION

- A. Install gate or butterfly valves at inlet and outlet of each item of equipment, whether shown on Drawings or not.
- B. Install shutoff valves at each division or connection to main and at the base of each riser passing through more than one floor.
- C. Install valves with stems upright to horizontal, not inverted.
- D. Install ball or butterfly for shut-off and isolating service, to isolate equipment, parts of systems, or vertical risers.
- E. Use plug cocks for gas service.

- F. Use plug cocks in water systems for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.
- G. Ball valves may be used for shut-off and throttling service in sizes 2" and smaller.
- H. Provide drain valves at main shut-off valves, and low points of piping and apparatus.
- I. Pipe relief from backflow preventer to nearest drain.

3.6 IDENTIFICATION INSTALLATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive. Drilled holes for mechanical fasteners, NO holes if adhesive is used.
- C. Metal Tags: Install with corrosive-resistant chain.
- D. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.
- E. Plastic Tape Pipe Markers: Install completely around pipe in accordance with manufacturer's instructions.
- F. Equipment: Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices such as in-line pumps, may be identified with metal tags.
- G. Controls: Identify control panels and major control components outside of panels with plastic nameplates.
- H. Valves: Identify valves in main and branch piping with tags.
- I. Piping: Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.
- J. Provide valve chart and schedule in aluminum frame with clear plastic shield. Chart to include valve number, service, size, and purpose of valve. Install where directed.
- K. Submit valve charts and schedules for review prior to installation. Include copies in Maintenance Manuals.

3.7 TESTING

- A. Test all piping and equipment as required by the various Sections of the Specifications.
- B. Tests to be witnessed by and be to the satisfaction of the Architect or his designee, and others having legal jurisdiction.
- C. Pressure tests shall be applied to piping before insulating and before connecting to equipment having pressure ratings lower than the test pressure.
- D. Work shall be tested, repaired, and retested until an approved test is achieved.
- E. Damages caused by testing or failure of a test shall be repaired to the satisfaction of the Architect, at no cost

to the Owner.

- F. In general, piping systems shall be tested to 150% of the maximum expected operating or surge pressure, or 125 psi, whichever is greater. Utility connections shall be tested in accordance with the Utility's requirements.
- G. Completed systems shall be tested to demonstrate proper operation, capacity, and acceptable noise and vibration levels. Insofar as possible, systems normally operated during certain seasons of the year shall be tested during that season.
- H. Costs for all testing shall be borne by the contractor.

3.8 FIRESTOPPING INSTALLATION

- A. Furnish all materials and labor required for installation of through penetration firestop systems around pipe, duct, cable, conduit, and tubing openings at fire-rated walls, floors, partitions, and floor/ceiling assemblies.
- B. Each penetration shall be reviewed by the Contractor as to its UL designation and construction conditions and the appropriate firestop system applied to maintain the required rating

3.9 DUCTWORK INSTALLATION

- A. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- B. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning.
- C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- D. At each point where ducts pass through walls or floors, seal joints around duct with non-combustible material. If penetrating fire rated construction, provide sealants to maintain the required ratings.
- E. Construct and install ductwork so as to limit leakage to a maximum of 2% of total air quantity for ductwork.
- F. Cap open ducts during construction to prevent entry of dirt, dust, or debris.

3.10 DUCTWORK ACCESSORIES

- A. Provide access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, and elsewhere as indicated. Review locations prior to fabrication.
- B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing.
- C. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and equipment subject to forced vibration.
- D. Fire dampers shall provide a free opening the full size of the duct in which installed.

- E. Install fire dampers in accordance with regulations of NFPA, using hardware, angles, bolts, etc., as required to maintain the intended rating.
- F. Coordinate the installation of fire smoke dampers with Division 26 to ensure component and operating compatibility.

3.11 PIPING SCHEDULE

<u>SERVICE</u>	<u>SIZE</u>	<u>MATERIAL</u>	<u>FITTINGS</u>	<u>JOINT</u>
Refrigerant*	All Type 'L'	Copper	Wrought	Blazed or Zoom-Lock

* Refrigerant pipe cleaned and sealed for refrigerant service.

† Pro-Press mechanical joining method is also allowed.

3.12 VALVE SCHEDULE - NOT USED

END OF SECTION

SECTION 23 37 00 - HVAC EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. This Section describes equipment for use in the Project's Mechanical Systems.
- B. Refer to the Equipment Schedules on the Drawings.
- C. Work included under this Section shall include, but not be limited to, exhaust fans, air terminals, electric wall heaters, fan coil units, heating specialties, refrigerant specialties and gas flue vents., wall hung boilers.

1.3 RELATED WORK

- A. This Section is to be used in conjunction with the provisions of all other Sections of Division 23, especially Section 230500, General Provisions - Mechanical.
- B. Refer also to any applicable portions of Division 26, Electrical Work.

1.4 SUBMITTALS

- A. Provide submittals for review in accordance with the provisions of Section 230500.
- B. Submit Manufacturer's Installation Instructions under provisions of Section 230500. Include Manufacturer's wiring and piping diagrams prepared for this project.
- C. Submit samples under provisions of Section 230500.

1.5 QUALITY ASSURANCE

- A. All items provided under the provisions of this Section shall be new and shall be the products of recognized manufacturers of that item.
- B. All items of a similar class shall be the products of the same manufacturer. That is, all accessory items, etc. shall be from the same source.
- C. Fans shall conform to AMCA Bulletins regarding construction and testing. Fans shall bear AMCA certified rating seal.

1.6 REGULATORY REQUIREMENTS

- A. Comply with applicable regulations.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Protect equipment from physical damage by storing in protected areas and leaving factory covers in place.
- B. Do not operate fans for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings

lubricated, and fan has been run under observation.

1.8 SEQUENCING AND SCHEDULING

- A. Sequence and schedule work to match the finishing schedule for the project.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The following material describes the requirements and materials for various items included in the Project's Mechanical systems.
- B. It should be noted that this particular Project may not include all of the items listed. Refer to the Schedules on the Drawings for those items specific to this Project.

2.2 AIR TERMINALS

- A. Drawings based on products manufactured by Price. Terminals manufactured by Nailor, Barber-Colman, Metalaire and Anemostat will be considered.
- B. Diffusers and registers shall be tested in accordance with ANSI/ASHRAE Standard 70-2013. Base terminal application on space noise criteria (NC) of 30 maximum.
- C. Terminal finish shall be #26 white, except where noted to be selected by the Architect. The finish shall be an anodic acrylic paint, baked at 315 F for 30 minutes. The pencil hardness shall be HB to H. The paint shall also pass the ASTM D-2794 Reverse Impact Cracking Test with a 50 inch pound force applied. The paint must pass a 250-hour ASTM-870 water immersion test.

2.3 EXHAUST FANS

- A. Drawings based on products manufactured by Panasonic and Greenheck. Products manufactured by Penn, Broan, and Cook, Delta will be considered.
 - B. Belt Drive Fans: The fan and inlet cone shall be aluminum and of the high performance, centrifugal blower type. Wheels shall overlap the spun venturi for maximum performance. Wheels shall be statically and dynamically balanced to assure smooth and vibration-free operation.
 - C. Motors shall be of the heavy duty type with permanently lubricated, sealed ball bearings. The wheel shaft shall be ground and polished steel and shall be mounted in heavy duty, permanently sealed pillow block ball bearings. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron typ, keyed and securely attached to the wheel and motor shafts. The motor pulley shall be adjustable for final system balancing. The entire drive assembly shall be mounted on vibration isolators. Direct drive motors shall be heavy duty type. Motors and centrifugal wheels shall be mounted on vibration isolators.
- A. All fans shall bear the AMCA Certified Ratings Seal for both sound and air.
 - B. Provide gravity back-draft damper, motor cover and flanged inlet/outlet for each fan.

2.4 REFRIGERATION SPECIALTIES

- A. Acceptable Manufacturers:
1. Sporlan Valve Company
 2. Alco Valve Company
 3. Henry Valve Company
- B. Specialties provided by equipment manufacturer as a part of packaged equipment shall be used. Additional items needed shall comply with the following specification.
- C. Liquid Indicators:
1. Provide combination liquid and moisture indicator.
 2. Double port type with copper or brass body and flared or solder ends.
 3. Provide removable seal caps on each port for inspection of refrigerant condition.
 4. Provide full size liquid indicators in main liquid line leaving condenser. If receiver is used, install in liquid line leaving receiver.
- D. Strainers:
1. Angle type with brass shell and replaceable cartridge.
 2. Suitable for refrigerant and piping material utilized in the system.
 3. Provide full size strainer ahead of each expansion or solenoid valve. Where multiple expansion valves with integral strainers are used install single main liquid line strainer.
 4. On steel piping systems provide strainer in suction line to remove scale and rust.
 5. Provide shut-off valve on each side of strainer to facilitate maintenance.
- E. Refrigerant Driers:
1. In-line or angle type with copper or brass shell.
 2. Employ replaceable desiccant drier material.
 3. Provide full flow permanent refrigerant drier in low temperature systems and systems utilizing hermetic compressors.
 4. Provide three-valve bypass assembly.
- F. Filter-Driers:
1. Angle type, with brass shell and using combined straining and drying material.
 2. Employ replaceable desiccant material.
 3. Acceptable in lieu of separate strainers and driers.
 4. Provide three-valve bypass assembly.

G. Solenoid Valves:

1. Copper or brass body with flared or soldered ends.
2. Use replaceable coil assembly.
3. Provide a manually operated stem to permit operation in case of coil failure on valves over 3/4 inch line size.
4. Provide solenoid valves in liquid line of system operating with single pump-out or pump-down compressor control, in each liquid circuit of evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

H. Expansion Valves:

1. Angle type or straight through design suitable for the refrigerant utilized in the system.
2. Brass body, internal or external equalizer, and adjustable superheat setting, complete with capillary tube and remote sensing bulb. Flared, solder or flanged connections.
3. Size expansion valves to avoid being undersized at full load and excessively oversized at partial load.
4. Evaluate refrigerant pressure drop through system to determine the available pressure drop across each valve.
5. Select valves for maximum load at design operating differential pressure and minimum of 12 degrees F of Superheat.

I. Charging Valves:

1. General purpose type with brass body, flared or solder ends, cap and chain.
2. Provide valve inlet with quick SAE thread for standard manifold hose.
3. Provide refrigerant charging connections in liquid line between receiver shut-off valve and drier.

J. Flexible Connectors:

1. Close pitch corrugated bronze hose with single layer of exterior braiding.
2. At least 9 inches long with bronze fittings.
3. Utilize only at or near compressors where it is not physically possible to absorb vibration within piping configuration.

K. Refrigerant Hand Valves:

1. 7/8 inch O.D. line size and smaller: Packless type, solder or flare connections.
2. 1-1/8 inch O.D. line size and larger: Packed stem with adjustable packing nut and seal cap. Sizes 3-1/8 inch O.D. and larger, provide wing handle seal cap; solder connections.

2.5 CEILING EXHAUST FAN

- A. Ceiling mounted exhaust fans shall be of the centrifugal direct drive type., Panasonic The fan housing shall be

constructed of steel. The steel duct collar shall be 6 inches diameter to accept 6 in round ductwork and shall include a backdraft damper. The grille shall be constructed of non-yellowing high impact polystyrene and attached to the housing with screws. The access for wiring shall be external. The motor disconnect shall be internal and of the plug in type. The motor shall be mounted on vibration isolators. The fan wheel shall be of the forward curved centrifugal type, constructed of calcium carbonate filled polypropylene and dynamically balanced.

- B. All fans shall be licensed to bear the AMCA Certified Ratings Seals for sound and air performance and shall be U.L. Listed and C.S.A. approved.

2.6 ELECTRIC HEATERS

- A. Fan-forced electric air heater shall be U.L. Listed and field rated for 208 volts. Heating unit shall contain steel tube, brazed, spiral finned shielded element(s), a unit bearing, impedance and fuse protected motor, which is mounted on elastomeric polymer vibration isolating bushings and drive a 6.25" nylon backward curved centrifugal fan.
- B. The heating unit shall install into a rough-in wall can with a single screw. The wall can shall be 20 gauge steel and have four knockouts, an attached grounding wire, a junction box volume of 82 cubic inches and fit between standard 16" on-center studs. All fabricated metal parts shall be finished and protected by a complete powder coating method.
- C. A microprocessor-controlled electronic temperature/dual setback thermostat, and "On/Off" rocker switch shall be an integral part of the heating unit. The fan motor speed and element power shall be separately controlled by the thermostat and capable of regulating temperature to within one degree F. Separate temperature-sensing devices shall control the fan and element output. Three separate sensors provide over-temperature protection. The control will be located behind the grill and accessible through a push-to-open door in the lower half of the grill. The grill shall be two-piece white thermo plastic material and attach to heating unit with three hidden screws.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Install in accordance with manufacturer's printed installation instructions.
- B. Protect units with protective covers during balance of construction.
- C. Provide hydronic units with shut-off valve on supply and lockshield balancing valve on return piping, except where provided by unit manufacturer.

3.2 EXAMINATION

- A. Verify that surfaces are ready to receive work and opening dimensions are as instructed by the manufacturer.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Beginning of installation means installer accepts existing surfaces.

3.3 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of units.
- B. Touch-up marred or scratched surfaces of factory-finished cabinets and covers, using finish materials furnished by manufacturer.

3.4 AIR TERMINALS

- A. Paint ductwork visible behind air terminals matte black.

3.5 HYDRONIC SPECIALTIES

A. Air Vents:

1. Where large air quantities can accumulate, provide enlarged air collection standpipes.
2. For float type air vents in ceiling spaces or other concealed locations, provide 1/4" soft copper vent tubing to nearest drain.

B. Relief Valves:

1. Pipe relief valve outlet to terminate 6" above nearest floor drain.
2. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

C. Thermometers and Wells:

1. Install thermometers upright, in location for convenient viewing. Where two temperatures must be read to evaluate a piece of equipment, locate so that both can be viewed from the same location.
2. Locate wells so that thermometer can be easily installed without interference from adjacent construction.

D. Gages and Gage Cocks:

1. Install gages and tappings so that gage, when installed, will be upright.
2. Arrange tappings for convenient viewing.
3. Locate tappings so gage may be installed without conflict with adjacent construction.

E. Expansion Tanks:

1. Support tanks inside building from structure.

3.6 EXHAUST FANS

- A. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.
- B. Perform all measures necessary to protect the Owner's property and to secure the work area.
- C. Set bathroom ceiling exhaust fan at continuous CFM per drawings.

3.7 REFRIGERATION SPECIALTIES

A. Refrigerant Driers:

1. Mount drier vertically in liquid line adjacent to receiver with bypass assembly to permit isolation of drier for

servicing.

2. In replacement core driers, mount with access cover pointing downward.

B. Filter-Driers:

1. Install with bypass assembly to permit isolation for servicing.
2. Install with removable access cover facing downward.

C. Expansion Valves:

1. Locate expansion valve sensing bulb immediately after evaporator outlet on suction line.
2. Remove power element and cage assembly when soldering expansion valve into line.
3. Connect external equalizer line to evaporator suction outlet at top of horizontal or side of vertical suction pipe.
4. Securely clamp bulb to suction line using two mechanical clamps. Locate bulb at 7 o'clock on horizontal suction pipe.
5. Insulate suction line and bulb.

D. Flexible Connectors:

1. Install so that there is no strain placed on adjacent equipment.

E. Refrigerant Hand Valve:

1. Install solder end valves with valves fully open while applying heat.

F. Refrigerant Piping:

1. Install according to requirements of equipment manufacturer, but provide NO LESS than the following procedures.
2. Braze all joints using medium temperature brazing alloy, "Silfos" or equivalent, using an appropriate flux.
3. All tubing to be factory cleaned and capped for refrigeration use. All fittings to be long sweep, wrought copper type.
4. Perform all brazing operations while flowing an inert gas (anhydrous nitrogen) through the joint being brazed.
5. Pressure test completed piping to 400 psig on high side and to 200 psig on low side. Isolate or remove control elements or system components not rated to withstand these pressures. Pressurize piping by raising pressure to 50 psig using new, clean refrigerant, then raise level to test pressure using anhydrous nitrogen. Check each and every joint for tightness using an electronic halide leak detector set at maximum sensitivity. Repair any leaks found, repressurize and re-test until tight.
6. Remove test pressure and evacuate system to 500 microns or lower. Use minimum of 1/2 HP vacuum pump and 3/4" connection to system. After reaching 500 micron level, continue to pump for four (4) hours to evacuate residual moisture. Isolate system and remove pump. If system vacuum rises above 400 microns after four (4) hours, reconnect pump and re-evacuate to 500 microns holding for four (4) hours. If system vacuum remains below 400 microns after four (4) hours with vacuum pump disconnected, it may be charged.

7. Remove pump, break vacuum with new, dry Refrigerant 22 gas and permit system to achieve equilibrium (probably 50 to 70 psig). Complete charging to operating level in accordance with equipment manufacturer's recommendations.
8. If outdoor temperatures are below 60F, it may be necessary to apply heat to the air cooled condenser coils to insure boil-off of residual moisture. This may be done using heat lamps, taking care to avoid overheating of coils.

END OF SECTION

SECTION 23 81 00 - HEAT PUMP MINI-SPLIT SYSTEMS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SYSTEMS DESCRIPTION

- A. The variable capacity, heat pump air conditioning system shall be a Samsung Electronics System. The systems shall be (cool/heat) split system heat pump. The heat pump system shall consist of a single outdoor condensing unit, single indoor unit, and optional wired or wireless controller. The condensing unit shall be a horizontal discharge, 208/230V, 1Ph, 60Hz. The evaporator shall be recessed, ceiling cassette type, wall-mounted (high-wall) type, or concealed duct type.
- B. Carrier, LG, Daikin, Fujitsu and Mitsubishi will be considered.
- C. All systems shall be complete with all components including refrigerant specialties, operating controls, and piping/installation accessories.

1.3 WORK INCLUDED

- A. Outdoor heat pump units & indoor units.
- B. Refrigerant system including piping & valves.
- C. Operating controls and control wiring.
- D. Refrigerant.
- E. Indoor unit condensate pump where gravity draining of condensate is not possible.
- F. Central monitoring control system.
- G. Line-set/Control wiring Cover System for both interior and exterior applications.
- H. Outdoor unit wall support system.

1.4 RELATED WORK

- A. This Section is to be used in conjunction with the provisions of all other Sections of Division 23, especially Section 230500 Common Work Results for HVAC.
- B. Refer also to any applicable portions of Division 26, Electrical Work.

1.5 SUBMITTALS

- A. Provide submittals for review in accordance with the provisions of Section 230500.
- B. Submit Manufacturer's Installation Instructions under provisions of Section 230500. Include Manufacturer's wiring

and piping diagrams prepared for this project.

- C. Submit samples under provisions of Section 230500.

1.6 QUALITY ASSURANCE

- A. All items provided under the provisions of this Section shall be new and shall be the products of recognized manufacturers of that item.
- B. All items of a similar class shall be the products of the same manufacturer. That is, all accessory items, etc. shall be from the same source.
- C. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
- D. All wiring shall be in accordance with the National Electric Code (NEC).
- E. The shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210 and bear the ARI label.
- F. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- G. The outdoor unit will be factory charged for a length of 33 feet of refrigerant with R410A refrigerant.
- H. A dry air holding charge shall be provided in the evaporator.
- I. System efficiency shall meet or exceed 16.0 SEER.

1.7 REGULATORY REQUIREMENTS

- A. Comply with applicable regulations.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Protect equipment from physical damage by storing in protected areas and leaving factory covers in place.
- B. Do not operate systems for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated, and fan has been run under observation.
- C. Units shall be stored and handled in accordance with the manufacturer's recommendations.

1.9 WARRANTY

- A. 3/4 ton to 1 ton nominal capacity units shall have a manufacturer's warranty for a period of five (5) years from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of US Corporation according to 's Terms and Conditions.
- B. 1-1/4 ton to 2 ton units shall have a manufacturer's warranty for a period of five (5) years from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of US Corporation according to 's Terms and Conditions.

- C. 2-1/2 ton to 4 ton units shall have a manufacturer's warranty for a period of one (1) year from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressors shall have a warranty of six (6) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of US Corporation according to 's Terms and Conditions.

PART 2 - PRODUCTS

2.1 OUTDOOR UNIT

- A. General:
Factory assembled, single piece, air-cooled outdoor unit. Contained within the unit enclosure is all the factory wiring, piping, controls, and the compressor.
- B. Unit Cabinet:
1. Unit cabinet is constructed of galvanized steel, bonderized and coated with a baked-enamel finish on the inside and outside.
 2. Unit access panels is removable with minimal screws and provides full access to the compressor, fan, and control components.
 3. The outdoor compartment is isolated and has an acoustic lining to assure quiet operation.
- C. Fans:
1. Outdoor fans are the direct drive propeller type, and discharges air horizontally. Fans draw air through the outdoor coil.
 2. Outdoor fan motors are totally enclosed, single phase motors with class E insulation and permanently lubricated ball bearings. Motor shall be protected by internal thermal overload protection.
 3. The shaft has inherent corrosion resistance.
 4. Fan blades are non-metallic and statically and dynamically balanced.
 5. Outdoor fan openings are equipped with a PVC metal/mesh coated protection grille over the fan.
- D. Compressor:
1. Compressor is the fully hermetic rotary type.
 2. Compressor is equipped with an oil system, operating oil charge, and a motor.
 3. Motor is NEMA rated class E, suitable for operation in a refrigerant atmosphere.
 4. Compressor assembly is installed on rubber vibration isolators.
- E. Outdoor Coil:
1. The coil is constructed of aluminum hydrophilic pre-coated fins mechanically bonded to seamless copper tubes, which are cleaned, dehydrated, and sealed.
- F. Refrigeration Components:
1. Refrigerant circuit components include a brass external liquid line service valve with service gage port connections, a suction line service valve with a service gage connection port, service gage port connections on compressor suction and discharge lines with Schrader type fittings with brass caps, accumulator, reversing valve.
- G. Controls and Safeties:
Operating controls and safeties are factory selected, assembled, and tested. The minimum control functions include the following:
1. Controls:
 - i. A time delay control sequence is provided standard through the fan coil board
 - ii. Automatic outdoor fan motor protection.
 2. Safeties:
 - i. System diagnostics
 - ii. Compressor motor current and temperature overload protection
 - iii. Outdoor fan failure protection.
- H. Electrical Requirements:

1. Unit operates on single-phase, 60 Hz power at 115V for unit size 12 and 208/230V for unit sizes 09, 12, 18, 24, 30 and 36, as specified.
2. Unit electrical power has a single point connection.
3. Unit Control voltage to the indoor fan coil is 0-15V DC.
4. All power and control wiring must be installed per NEC and all local electrical codes.
5. The unit has high and low voltage terminal block connections.

2.2 INDOOR UNIT

A. General:

Indoor, direct-expansion, ceiling-mounted fan coil. Unit is complete with a cooling/heating coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and an integral temperature sensing.

B. Unit Cabinet:

Cabinet is constructed of zinc-coated steel. Fully insulated discharge and inlet grilles are attractively styled, high-impact polystyrene. Grille has hinges and can be opened to obtain access to the cleanable filters, indoor fan motor and control box.

C. Fans:

1. The fan is a centrifugal direct-drive blower type with an air intake in the center of the unit and a discharge at the perimeter. An automatic, motor-driven vertical air sweep is provided standard. Automatic motor-driven louvers are provided standard and are adjustable for a 2, 3 or 4-way discharge.
2. The air sweep operation is user selectable.

D. Coil:

The coil is a copper tube with aluminum fins and galvanized steel tube sheets. Fins are bonded to the tubes by mechanical expansion and specially golden hydrophilic pre-coated for enhanced wet-ability. A drip pan under the coil has a factory installed condensate lift pump and a drain connection for a hose attachment to remove condensate.

E. Motors:

Motors are open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motors are 7-speed.

F. Controls:

Controls consist of a microprocessor-based control system which controls the space temperature, determines the optimum fan speed, and runs self diagnostics. The temperature control range is 62F to 86F (17C to 30C) in increments of 1F or 1C, and has a 46F Heating Mode (Heating Setback). The wireless remote controller, has the ability to act as the temperature sensing location for room comfort.

The unit shall have the following functions as a minimum:

1. An automatic restart after a power failure at the same operating conditions as at failure.
2. A timer function to provide a minimum 24-hour timer cycle for the system's Auto Start/Stop.
3. Temperature-sensing controls sense the return air temperature.
4. Indoor coil freeze protection.
5. Wireless infrared remote control to enter set points and operating conditions.
6. Automatic air sweep control to provide on or off activation of air sweep louvers.
7. Dehumidification mode which provides increased latent removal capability by modulating system operation and set point temperature.
8. A fan-only operation to provide room air circulation when no cooling is required.
9. Diagnostics to provide continuous checks of the unit operation and warn of possible malfunctions. Any error messages are displayed at the unit.
10. The fan speed control is user-selectable: high, medium, low, or microprocessor controlled automatic operation during all operating modes.
11. Automatic heating-to-cooling changeover in the heat pump mode. Control includes deadband to prevent rapid mode cycling between heating and cooling.
12. Indoor coil high temperature protection is provided to detect excessive indoor discharge temperature when unit is in the heat pump mode.

G. Filters: The unit has a filter track with factory-supplied cleanable filters.

H. Electrical Requirements: The indoor fan motor operates on 208-230V on model sizes 09- 48, as specified. Power is

supplied from the outdoor unit.

- I. Operating Characteristics: The 40MBCQ system has a minimum SEER (Seasonal Energy Efficiency Ratio) and HSPF at AHRI conditions, as listed on the specifications table.
- J. Refrigerant Lines: All units should have refrigerant lines that can be oriented to connect from the left, right or back of unit. Both refrigerant lines must be insulated

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Install in accordance with manufacturer's printed installation instructions.
- B. Protect units with protective covers during balance of construction.

3.2 EXAMINATION

- A. Verify that surfaces are ready to receive work and opening dimensions are as instructed by the manufacturer.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Beginning of installation means installer accepts existing surfaces.

3.3 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of units.
- B. Touch-up marred or scratched surfaces of factory-finished cabinets and covers, using finish materials furnished by manufacturer.

END OF SECTION

SECTION 238109 - PACKAGED ROOFTOP HEATING & COOLING UNITS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SECTION INCLUDES

- A. Package HVAC unit.
- B. Natural gas heat exchanger.
- C. Refrigeration components.
- D. Unit operating and safety controls.
- E. Electrical power connections and control wire.

1.3 RELATED SECTIONS

- A. Section 230500 - Common Work Results for HVAC
- B. Section 230800 – Commissioning of Systems..
- C. All other sections of Division 22, 23.
- D. Division 26 – Electrical..

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain unit with all appurtenant components or accessories from a single manufacturer.
- B. For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.
- C. Product Options: Drawings must indicate size, profiles and dimensional requirements of Energy Recovery Unit and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".
- D. Certifications
 - 1. Blowers shall be AMCA Certified for air flow.
 - 2. Entire unit shall be ETL Certified per U.L. 1995 and bear an ETL sticker.
 - 3. Energy Wheel shall be AHRI Certified, per Standard 1060.
 - 4. Coils shall be Recognized Components for ANSI/UL 1995, CAN / CSA C22.2 No 236.05. DX and water coils shall be AHRI Certified per standard 410-2001.
 - 5. Indirect gas-fired furnace shall be ETL certified as a component of the unit.

1.5 SUBMITTALS

- A. Product Data: For each type or model include the following:
 - 1. Complete fan performance curves for Supply and Exhaust Air, with system operating conditions indicated, as

- tested on an AMCA Certified Chamber.
- 2. Sound performance data for Supply Air, as tested on an AMCA Certified chamber.
- 3. Motor ratings, electrical characteristics and motor and fan accessories.
- 4. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
- 5. Estimated gross weight of each installed unit.
- 6. Installation, Operating and Maintenance manual (IOM) for each model.
- 7. Factory packaged Microprocessor Controller (DDC) specifications to include available options and operating protocols. Include complete data on all factory-supplied input devices. If unit is to be controlled by a BMS, verify compatibility of operating protocol. See also: "Operating Protocol" in this document.
- 8. Remote Panel description to include all functions
- 9. AHRI Certified coil performance ratings with system operating conditions indicated. Ratings shall be in accordance with Standard 410.
- 10. Color chart including a palette of available standard paint finishes.

1.6 COORDINATION

- A. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.
- B. Coordinate location of water system fittings to ensure correct positioning for connection to the water coil and condensate drain pipe.
- C. Coordinate sequencing of construction of associated plumbing, HVAC, electrical supply with the roofing contractor.

1.7 DELIVERY, STORAGE and HANDLING

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
- B. Protect units from physical damage. Leave factory shipping covers in place until installation.

1.8 WARRANTY

- A. Provide parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.
- B. Provide five year extended warranty for compressors.
- C. Provide ten year heat exchanger limited warranty.
- D. The energy recovery wheel is warranted to be free from defects in material and workmanship for a period of five (5) years from date of acceptance by the Owner.

1.9 MAINTENANCE SERVICE

- A. Furnish complete parts and labor service and maintenance of packaged roof top units for one year from Date of Substantial Completion by contractor.
- B. Provide maintenance service with a two month interval as maximum time period between calls. Provide 24 hour emergency service on breakdowns and malfunctions.
- C. Include maintenance items as outlined in manufacturer's operating and maintenance data.
- D. Submit copy of service call work order or report and include description of work performed.

1.10 EXTRA MATERIALS

- A. Provide one set of filters.
- B. Furnish a complete set of fan motor drive belts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:
 - 1. Carrier
 - 2. York
 - 3. Trane
 - 4. Lennox

2.2 MANUFACTURED UNITS

- A. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, downturn outdoor air intake with metal mesh filter assembly, exhaust air blower, evaporator coil, condensate drain pan, P trap, Energy wheel, hot gas reheat coil, indirect gas furnace, packaged DX system, phase and brownout protection, motorized dampers, motorized recirculating damper, sensors, curb assembly, service receptacle, filter assembly for intake air, supply air blower assembly, exhaust/relief blower assembly, filter assembly for exhaust air and an electrical control center. All specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

2.3 CABINET

- A. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
 - 1. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Pre-painted components as supplied by the factory shall have polyester on G60 galvanized steel.
 - 2. Internal assemblies: 24 gauge, galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.
- B. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
 - 1. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
 - a) Thickness: 2 inch (25 mm)
 - b) Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
- C. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvanized steel.
- D. Supply Air blower assemblies: Blower assembly shall consist of an electric motor as specified by A / E and a direct-drive fan.

- E. Exhaust Air blower: Blower assembly shall consist of an electric motor as specified by A / E and a direct-drive fan.
- F. Evaporator Coil: Evaporator coil shall be AHRI Certified and shall be silver soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.
- G. Control panel / connections: Rooftop Ventilator units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. RTU shall be equipped with a Unit Disconnect Switch
- H. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall. Condensate drain pan is necessary whenever a cooling function is part of the unit.
- I. P trap: If the unit is equipped with a condensate drain pan, contractor shall provide, or fabricate, and install an appropriate P trap, in accordance with all local and area codes and Best Practices]. State whether P trap must be insulated or have electric heat tape for freeze protection. Indicate whether the condensate can drip onto the roof or if a drain pipe must be run.
- J. Indirect gas furnace:
 - 1. Shall be ETL Certified as a component of the unit.
 - 2. Shall have an integral combustion gas blower.
 - 3. Shall be ETL Certified for installation downstream of a cooling coil.
 - 4. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
 - 5. Shall have 4-pass tubular heat exchangers, constructed of [aluminized steel] [type 409 stainless steel]. Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported by a minimum of two fabricated assemblies that support the tubes and also permit expansion and contraction of the tubes]. Welded connections between heat exchanger tubes and the vest plate are known to be a source of failure due to expansion and contraction. 409 stainless steel is considered the most suitable material for high temperature gases, such as automotive exhausts. Manufacturer recommends the use of stainless steel heat exchangers for applications with a temperature rise of 60° F or more. Tubular heat exchangers are considered the industry standard, but some manufacturers are known to construct "clamshell" or other type exchangers. The same requirements for material types and assembly methods and supports should apply to all.
 - 6. Stainless steel heat exchanger shall have a 10 year extended warranty.
 - 7. Furnace control shall be [4:1 Modulating]
 - 8. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal lift-off door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly and exhaust blower. Indicate any other requirements such as furnace output, controls, etc.
 - 9. Shall have solid state controls permitting stand-alone operation or control by building controllers.
- K. Packaged DX System: unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Condenser fan motors shall be three phase, type 56 frame, Open Air Over and Shaft Up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be [digital] See Spec Guide Addendum B for supplementary information. hermetic scroll-type and shall be equipped with liquid line filter drier, thermostatic expansion valves (TXV)(s), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Each compressor shall be factory-equipped with an

electric crankcase heater to boil off liquid refrigerant from the oil. The use of an electric crankcase heater is an essential unit-protective device in most climates. See IOM, Subassembly Description. [Hot gas bypass shall be provided on the lead circuit to prevent icing of the evaporator coil under low load conditions]. Hot gas bypass is not used with digital scroll compressors.

- L. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:
 - 1. Global alarm condition (active when there is at least one alarm)
 - 2. Supply Air Proving alarm
 - 3. Dirty Filter Alarm
 - 4. Compressor Trip alarm
 - 5. Compressor Locked Out alarm
 - 6. Supply Air Temperature Low Limit alarm
 - a) Sensor #1 Out of Range (outside air temperature)
 - b) Sensor #2 Out of Range (supply air temperature)
 - c) Sensor #3 Out of Range (cold coil leaving air temperature)
- M. Phase and brownout protection: RTU shall have a factory-installed phase monitor to detect electric supply phase loss and voltage brown-out conditions. Upon detection of a fault, the monitor shall disconnect supply voltage to all motors.
- N. Motorized dampers / Intake Air/ Exhaust Air: Motorized damper of insulated low leakage type shall be factory installed.
- O. Motorized Recirculating Air Damper designed to permit 100% maximum recirculation of return air shall be factory installed.
- P. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed as specified by the A/E. See IOM / Sensors Installed by Factory.

2.4 BLOWER

- A. Blower section construction, Supply Air: direct drive motor and blower shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with spring vibration isolation devices.
- B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
- C. Fan: Airfoil plenum fan statically and dynamically balanced, AMCA certified for air and sound performance, mounted on ground and polished steel fan shafts with ball bearing pillow blocks. Bearings shall be selected for a minimum L10 life in excess of 50,000 hours at maximum catalogued speeds.
- D. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

2.5 MOTORS

- A. General: Blower motors greater than $\frac{3}{4}$ horsepower shall be "NEMA Premium™" unless otherwise indicated. Compliance with EPA minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower and pulleys shall be fully machined cast-type, keyed and fully secured to the fan wheel and motor shafts. Electric motors

of ten horsepower or less shall be supplied with an adjustable drive pulley. Comply with requirements in Division 23 05 13, matched with fan load.

- B. Motors shall be Select one 60 cycle, 3 phase 208 volts. The designation "NEMA Premium™" applies to electric motors with efficiencies that are "better than EPAAct.":

2.6 UNIT CONTROLS

- A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.
- B. Economizer control shall be temperature / dew point, dual enthalpy.
- C. Dirty filter sensor shall be factory-installed.
- D. Operating protocol: The DDC shall be factory-programmed for BACnet MSTP.

2.7 FILTERS

- A. Unit shall have permanent metal filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the intake air stream and MERV 8 filters in the exhaust air stream]. thick MERV 8 filters are standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.
- B. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.
- C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.

3.3 CONNECTIONS

- A. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.
 1. Piping installation requirements are specified in Division 15. Drawings indicate general arrangement of piping, fittings and specialties.
 2. Duct installation and connection requirements in Division 15.
 3. Electrical installation requirements are specified in Division 16 of this document.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM. Insert any other requirements here.

PART 4 - SEQUENCE OF OPERATIONS

4.1 MICROPROCESSOR CONTROLLER

- A. Controller shall be provided with required sensors and programming for each rooftop ventilation unit. Controllers shall be factory programmed, mounted and tested. Controllers shall have an LCD readout for changing set points and monitoring unit operation.
- B. UNIT START COMMAND:
1. Factory mounted and wired outdoor air and recirculated air damper actuators are powered.
 2. Return air damper actuator is powered.
 3. Exhaust fan starts after a 10 second (adjustable) delay.
 4. Supply fan starts 5 seconds (adjustable) after exhaust fan.
 5. Tempering options and energy wheel option to function as described below.
- C. UNIT STOP COMMAND:
1. Supply fan, exhaust fan, energy wheel and tempering options de-energized.
 2. Outdoor air damper actuator is spring return close, and the recirculated air damper actuator is spring open.
 3. Optional return air damper is spring return closed.

END OF SECTION

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The following drawings indicate the work required for this Division of Work:
- All Drawings associated with this project.
All other contract drawings and specifications associated with the project.
- B. Certain items of work pertaining to the work of this Division are provided under other Divisions of the Specification. These include, but are not limited to the following:
1. Excavating and backfilling for underground primary and secondary electric, telephone, television, and other building services provided under this Division.
 2. Concrete work for equipment bases, transformer and switching pads, etc.
 3. Installation of access doors in finished construction.
 4. Installation of pipe sleeves in walls and floors.
 5. Framing of openings in walls, floors, roof.
 6. Chases, soffits, furred spaces required to conceal work of this Division.
- C. Materials furnished under other Divisions and installed and/or wired by this Division include, but are not limited to:
1. Mechanical Equipment. (Motor Starters furnished under Division 23)
 2. Temperature Controls.
 3. Sprinkler tamper and flow switches and accessories.
 4. Miscellaneous architectural items such as overhead doors, projection screens, kitchenette units, etc.
 5. Elevator equipment, including power for machine and controls, trail cable, receptacle and telephone outlet(s) in equipment room, light and receptacle in pit(s).
- D. Complete Utility connections as indicated or needed, extension to Project, metering as required, and connection to building systems. This work includes:
1. Apply for all services and pay for all fees, assessments, and charges of the Utility for each connection, all in a timely manner and according to the Project Schedule.
 2. Provide and install all metering and accessories as required by Utility, make entire service in accordance with the Utility's requirements or other applicable regulation.
 3. All necessary coordination with Utility to determine scope of work provided by Utility and part provided by Contractor so that a complete Utility connection is made.
- E. Participate in coordination of Mechanical and Electrical installations. Provide additional coordination drawings, as directed by Architect, in areas of potential interferences.

- F. All work shall comply with applicable codes and regulations, including, but not limited to the following:
1. Connecticut Building, Fire Safety, and Health Codes, as amended, including all codes, standards and regulations referenced therein.
 2. Requirements of Local, State, and Federal authorities having jurisdiction over the Work.
 3. Current regulations of the Occupational Safety and Health Administration (OSHA).
 4. Requirements of affected Public Utility Companies.
 5. Special requirements set down by the Owner, the Owner's Insurance Carrier, or other concerned entities.
 6. NFPA 70- 2017, National Electrical Code. Contractor shall conform to the latest State of Connecticut approved NFPA 70, codes. Supply, install and wire complete any devices or equipment required by code indicated or excluded.
 7. Contractor shall supply temporary power sufficient enough to carry the load of the building(s) to be renovated. Provide temporary lighting and power in conformance to OSHA regulations.

1.2 RELATED DOCUMENTS

- A. Instructions to Bidders, the General Provisions of the Contract, including General Conditions and General Requirements shall apply and be binding to the Contractor and/or Subcontractor who performs this work.
- B. Where items of the General Conditions or Special Conditions are repeated in this Section of the Specifications, it is intended to call particular attention to or to qualify them; it is not intended that any other parts of the General Conditions shall be assumed to be omitted if not repeated herein.

1.3 INTENT

- A. Intent of the specifications and drawings is to call for finished work, tested and ready for operation.
- B. Material, fixtures, and equipment mentioned in specifications or shown on drawings shall be furnished new, completely installed adjusted and left in a clean, safe and satisfactory condition ready for operation. All supplied appliances and connections of every sort necessary shall be furnished and installed to the satisfaction of Architect and Owner.
- C. Apparatus, appliances, material or work not shown on the plans but mentioned in specifications, or vice versa, or any incidental accessories such as electrical disconnect switches, circuit breakers, etc., necessary to make the work complete, serviceable and perfect in all respects and ready for operation, even though not particularly specified, shall be installed without additional expense to the Owner.
- D. Minor details not usually shown or specified, but necessary for proper installation and operation shall be included in the work as though herein specified or shown.
- E. Prior to submission of bids, give written notice to Architect of any materials or apparatus believed to be inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; or any necessary items or work omitted. In the absence of such written notice, it is mutually agreed that the cost of all required items has been included and that all systems will function satisfactorily without extra compensation.

1.4 DEFINITIONS

- A. "Architect" means Stephen Jager Associates LLC , 4 Grand View Drive, Enfield, CT 06082.

- B. "Engineer" means Acorn Consulting Engineers, Inc., 244 Farms Village Road, West Simsbury, CT 06092.
- C. "regulating authorities" or "authorities", means all Governmental, Utility, and Insuring Authorities having jurisdiction.
- D. "Subcontractor or Contractor", means specifically the Subcontractor working under his respective Section of Specifications.
- E. "furnish" or "provide" means to supply, erect, install and connect up complete in readiness for regular operation the particular work referred to, unless otherwise specified.
- F. "conduit" includes in addition to pipe, all fittings, connectors, hangers, and other accessories relating to such and the plant and labor necessary to install same.
- G. "concealed" means hidden from sight in chases, furred spaces, hung ceilings, embedded in construction, or buried underground.
- H. "exposed" means not "concealed" as defined above. Trenches, crawl spaces and tunnels shall be considered "Exposed" unless specifically noted otherwise.
- I. "wire" or "wire up" means to properly connect the related item to the appropriate source of power including all needed connectors, circuit breakers, switches and other items necessary for normal operation of the item.
- J. "temperature control" means, in addition to thermostats all heating, ventilating, air conditioning motorized dampers, solenoid valves, electrical air device actuators, relays and other electrical accessories related to HVAC and other mechanical systems.
- K. "concealed" means hidden from sight as in chases, furred spaces, shafts, or above ceilings.

1.5 DRAWINGS

- A. Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement. Deviations from the depicted arrangement shall be approved by the Architect.
- B. Location of all items shown on drawings or called for in specifications, not definitely fixed by dimension, are approximate only. Exact location necessary to secure best conditions and results shall be determined at the project and shall have the approval of the Architect.
- C. Follow the drawings in laying out work. Check drawings of other trades to verify spaces in which work will be installed to insure maximum headroom and space conditions. Where headroom or space conditions appear inadequate, the Architect shall be notified before proceeding with installation.
- D. Work shown on the drawings is intended to be approximately correct to the scale of the drawings. Figured dimensions and detailed drawings are in all cases to take precedence over them. Typical details shall apply to each and every item of the project where such items are incorporated. Drawings utilize symbols and schematic diagrams to indicate various items of work. These have no dimensional significance, nor do they delineate every item required for the intended installation. Work shall be installed in accordance with the diagrammatic intent of the Electrical drawings, and in conformity with the dimensions indicated on final Architectural and Structural working drawings and on equipment shop drawings.
- E. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.
- F. Details appear on the drawings which are specific with the regard to the dimensioning and positioning of the work. These are intended for the purpose of establishing general feasibility. They do not obviate field coordination.

- G. If directed by the Architect or Owner, make reasonable modifications in the layout to prevent conflict with work of other trades or for proper execution of the work.
- H. Abide by and comply with the true intent of the drawings and specifications taken as a whole, to provide a complete job ready for operation. "Drawings and specifications taken as a whole" means all contract plans and specifications -- Architectural, Structural and all Subcontractors' drawings and specifications. Refer to drawings and specifications of other trades to check if equipment or items included under other Sections will require work in order to comply with the statement above "to provide a complete job ready for operation". This work shall be included in the Base Contract. It shall be understood that the indication and/or description of any item, on the drawings or specifications, or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated.
- I. No statement in the specifications or any omission in either plans or specifications should be misunderstood as relieving the contractor from providing a complete job ready for operation. All existing circuits and devices shall be energized and tested before the completion of the project, contractor shall supply all the required material, labor and equipment necessary for a complete installation. No exclusions from, or limitations in, the language used in drawings or specifications shall be interpreted as meaning that the items or accessories necessary to complete any required system or item of equipment are to be omitted.
- J. Information as to the general construction shall be derived from Structural and Architectural Drawings and Specifications only.
- K. The use of words in the singular shall not be considered as limiting where other indications indicate that more than one item is referred to.

1.6 VISITING THE SITE FOR SURVEYS AND MEASUREMENTS

- A. Before submitting a Bid, visit the site and become thoroughly familiar with all conditions under which the Work will be installed. Contractor will be held responsible for any assumptions, omissions or errors made as a result of failure to become familiar with the site and the Contract Documents.
- B. Base all measurements, both horizontal and vertical, from established benchmarks. Reference all Work from these established lines and levels. Verify all measurements at site and check the correctness of same as related to Work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the Drawings and Specifications, notify the Engineer and do not proceed with the Work until instructions have been received from the Engineer.

1.7 SUBSTITUTIONS

- A. Within sixty (60) days after award of contract, submit, through the General Contractor, to the Architect for review, a list of manufacturers of all materials and equipment proposed for use on the project. Indicate on submittal which items are substituted.
- B. A review, without exception, of this list does not constitute approval, nor does it guarantee acceptance of the shop drawings when submitted.
- C. The contractor's intent to purchase the exact make specified does not relieve him from the responsibility to submit this list. Failure to submit this list will require the contractor to supply the exact item specified as the basis for design.
- D. Submittal of items which differ from those specified or indicated as the basis for design carries the implicit guarantee that the substituted item will provide the intended service and is compatible with other items or

systems interfacing with it.

- E. When proposing a substitute item, the contractor is responsible for all costs of accommodating the substitution, including, but not limited to, space and accessibility, modifications required to other systems, structural adequacy and the like.
- F. If substitutions require the Architect or Engineer to prepare sketches or revised drawings in order to become acceptable, the cost of such sketches, drawings, or engineering shall be borne by the contractor.
- G. When substitutions require Engineer or Architect to spend an inordinate time for review or substitutions, the cost of review over four (4) hours will be charged to the contractor who made the submittal.

1.8 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the Work, except as otherwise specified, must be new and of first-class quality and be furnished, delivered, erected, connected and finished in every detail and so selected and arranged as to fit properly into the building spaces. Where no specific kind of quality of material is given, furnish a first-class standard article as accepted by the Engineer.
- B. Furnish the services of an experienced superintendent who is constantly in charge of the installation of the Work, and present on site at all times during the Work. Furnish all skilled Workmen, helpers and labor required to install, unload, transfer, erect, connect up, adjust, start, operate and test each system.
- C. Unless otherwise specifically indicated on the Drawings or in the Specifications, all equipment and materials must be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- D. Quality of Work must be consistent with good trade practice and installed in a neat Workmanlike manner. The Engineer reserved the right to reject any Work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. Replacement of said Work, in satisfactory manner, will be at no extra charge to the Owner.

1.9 SHOP DRAWINGS

- A. After acceptance of List of Manufacturers required under paragraph 1.07(A) of this Section, and prior to delivery of materials and equipment to the project site, submit eight (8) copies of shop drawings of each item for review by the Architect.
- B. Each submittal shall contain a complete list of all materials contained within. Include intended use for each item.
- C. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature and complete characteristics of equipment, including, but not limited to, dimensions, capacity, code compliance, motor and drive and testing, construction, electrical characteristics, support, all as required for this project.
- D. Architect may designate submittal of physical samples for review on items where actual color, texture or other characteristics might not be adequately described by a drawing or written material. Upon approval of a sample, each and every item of that sort must be identical to the approved sample.
- E. Samples, drawings, specifications, catalogs, etc., submitted for review shall be labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specification governing, Subcontractor's name and name of project.
- F. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the Subcontractor from his responsibility of furnishing material or

performing work according to Contract Documents.

- G. Failure to submit shop drawings in ample time for checking shall not be cause for an extension of contract time, and no claim by reason of such default will be allowed.
- H. Submittals for all systems which require the interconnection of three or more devices shall include a system block diagram. The diagram shall be of the one line type and with sufficient detail to show interfaces and method of operation.
- I. Material or equipment installed prior to review shall be liable for removal and replacement at no extra charge to the Owner if the material or equipment does not meet the intent of Drawings and Specifications.

1.10 RECORD DRAWINGS

- A. Maintain a record set of Electrical Drawings at the job site on which any changes in location of equipment, devices, panels and major conduits are recorded.
- B. At the end of construction, provide the Owner with a complete set of As-Built Drawings, including all power and lighting plans (indicating as-built circuiting), power and special systems riser diagrams and panel schedules and fire alarm use. Prepare As-Built documentation utilizing the most recent version of AutoCAD. Provide the Owner with a "CD ROM" disk and one set of reproducible mylar documents.
- C. If electronic copies of the contract documents are made available to the Contractor for use in production of As-Built documentation, the Contractor assumes responsibility for completeness and accuracy of the As-Built documents. Translation or manipulation of electronic documents provided to the Contractor is the responsibility of the Contractor.
- D. Exact location of all conduits and utilities under floor slabs shall be indicated and dimensioned on these drawings, as well as the final arrangement of conduits and junction boxes in concealed chases, concealed in walls or above ceilings.

1.11 LAWS, ORDINANCES, CODES, PERMITS AND FEES

- A. Give all necessary notices, obtain all permits and pay all governmental taxes, fees and other costs in connection with the work. File all necessary plans, prepare all documents and obtain all necessary approvals of governmental departments having jurisdiction. Obtain all required Certificate of Inspection of the work and deliver to Architect prior to application for final payment.
- B. Materials furnished and work installed shall comply with the rules and recommendations of the National Board of Fire Underwriters, with all requirements of utility companies, with the Board of Health, with the recommendations of the fire insurance rating organization having jurisdiction, with the local and state building codes, and with the requirements of all governmental departments having jurisdiction. If contract requirements are in excess of applicable codes, rules or regulations, contract provisions shall be given precedence.
- C. Provide utility services as required and as indicated on Drawings and in 1.01(D), above.

1.12 ROYALTIES AND PATENTS

- A. Pay all royalties and defend all suits and claims for infringement of any patent rights and save the Owner harmless on account thereof.
- B. If it is observed that a process or article specified is an infringement of a patent, promptly notify the Architect in writing. If any work is performed knowing it is to be an infringement of a patent, all costs arising therefrom shall be borne by the Contractor.

1.13 STANDARD SPECIFICATIONS

- A. Certain standard and staple materials may be described by reference to standard specifications. The standards referred to are as follows:

ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
UL	Underwriters Laboratories, Inc.
NFPA	National Fire Protection Association
FM	Factory Mutual Insurance Company
IRI	Industrial Risk Insurers (Formerly FIA)
IES	Illuminating Engineering Society
IEEE	Institute of Electrical and Electronic Engineers

- B. The particular specification will be identified by appropriate prefix and number only, with the latest or legally defined revision being applicable.

1.14 INTERPRETATION OF PLANS AND SPECIFICATIONS

- A. Questions or disagreements arising as to the intent of the specifications or the drawings, or the kind and quality of work required thereby, shall be decided by the Architect whose interpretation thereof shall be final, conclusive and binding on all parties.

1.15 PROCEDURE OF WORK

- A. All work shall proceed in a manner approved by the Architect.
- B. Determination of the required job procedure will be made by the Architect in the best interests of the job and may be adjusted to meet job conditions.

1.16 CHANGES TO WORK

- A. During the progress of the work, the Architect may make any changes, alterations, additions or omissions to work drawn or specified after having agreed on an equitable allowance to be added to or deducted from the contract price. Claims for extra cost to cover extra work will not be allowed unless specifically authorized in writing by the Architect prior to the execution of such additional work.

1.17 COORDINATION OF TRADES

- A. Give full cooperation to other trades and furnish any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.

1.18 PROTECTION OF WORK AND PROPERTY

- A. Be responsible for the maintenance and protection of equipment, materials and tools stored or installed on the job site, from loss or damage of all causes, until final acceptance by the Owner.
- B. Be responsible for the protection of finished work of other trades from damage or defacement and remedy any such injury at no additional cost to the Owner.

1.19 CUTTING, PATCHING AND PAINTINGS

- A. Cutting, patching and painting shall be done by the General Contractor unless otherwise noted on plans or specifications.
- B. Cooperate with the General Contractor in making sure that sleeves are set and chases provided for the installation of the work. If failure to do so makes it necessary to cut and patch any part of the completed structure, this shall be done at the expense of the subcontractor having jurisdiction over the work.

1.20 TEMPORARY OPENINGS

- A. Ascertain whether any special temporary openings in the building will be required for the admission of apparatus and notify the Contractor accordingly.
- B. Failure to give sufficient notice to the Contractor in time to arrange for these openings during construction, shall result in this subcontractor's assumption of all costs pertaining to making and repairing any such temporary openings.

1.21 MANUFACTURER'S IDENTIFICATION

- A. Manufacturer's nameplate, name or trademark shall be permanently affixed to all material and equipment furnished under this specification. The nameplate of a subcontractor or distributor will not be acceptable.

1.22 MANUFACTURERS IDENTIFICATION

- A. Identify each control and item of equipment with a permanently attached nameplate made of black surface, white core laminated plastic with incised letters, bearing the name of the equipment item and designation of the item taken from the drawings or schedules.
- B. Identify electrical feeders and risers where they enter or leave a junction box or cabinet with fiber tags having the cable designation stamped thereon and tied securely to each cable or by means of printed plastic self-adhering labels attached to the cable sheath.
- C. Subcontractor shall label all cabinet, panels, pull boxes, etc., in the electrical system using the designations shown on the plans and schedules such as -- "PANEL H1", "MDP-1", etc., using incised laminated plastic nameplates securely attached.
- D. Provide typewritten directory cards in all electric panels showing circuit numbers and area or load serviced.
- E. Refer to Section 260553.

1.23 INSTRUCTION BOOKS AND OPERATING INSTRUCTIONS

- A. Furnish three (3) sets of operating and maintenance manuals in hard cover covering all electrical systems in the project. Include manufacturer's approved submittal of each item. Submit for review of Architect.
- B. Manuals shall contain, as a minimum, the following:
 - 1. Description of the project and major subsystems.
 - 2. Descriptive text covering the startup, adjustment, trouble-shooting, and safe shutdown for each system.
 - 3. Copies of each typewritten panel directory.

4. Copies of lighting control wiring diagrams and description of operation.
 5. A schedule of maintenance based on the manufacturer's recommendations, showing what work is to be performed and at what intervals.
 6. Copies of the finally approved submittal for each item, together with the manufacturer's installation, operation, and maintenance instructions and parts lists.
 7. List of Firm names, addresses, telephone numbers to be contacted for regular or emergency service, or purchase of parts.
- C. Manuals shall be arranged in one or more three-ring binders, completely indexed as follows:
1. General information; Items 1, 2, 3, & 7 above.
 2. Control system information; Item 4.
 3. Approved submittal, maintenance, and parts information; Items 5 & 6.
 4. Each section shall be identified by a permanent index tab.
 5. Each item within a major section shall be separately indexed for quick reference.
- D. Provide adequate written and/or verbal instructions to the Owner's operating personnel and such others as the Owner may designate. As a minimum, contractor shall provide for three (3), eight hour working days of instructions. Individual equipment or system Specifications may require additional or different periods of instruction.

1.24 SLEEVES, INSERTS AND ANCHOR BOLTS

- A. Be responsible for the location and proper position of sleeves and anchor bolts. If failure to do so requires cutting and patching of finished work, it shall be done at the Subcontractor's expense.
- B. Conduits passing through concrete or masonry floors, walls or partitions shall be provided with sleeves having an internal diameter 1/2" larger than the outside of the conduit.
- C. Sleeves through concrete floors or interior masonry walls shall be Schedule 40 black steel pipe, set flush with wall, floor or ceiling surface. Sleeve through floors shall be packed with a fireproof, resilient material to maintain the fire rating integrity of the assembly and caulked with waterproof compound to the approval of the Architect.
- D. Sleeves through floors of wet areas such as equipment rooms, toilets, etc., shall extend 2" above finished floor surface and be sealed watertight.

1.25 ACCESSIBILITY

- A. Install work so that all parts are readily accessible for inspection, maintenance and repair.
- B. Be fully informed regarding peculiarities and limitations of space available for the installation of materials and apparatus.
- C. See that all equipment items are made easily accessible for adjustment and operation.
- D. Where such items must be located over non-access ceilings, in chases or other inaccessible places, access doors and/or panels of a type and size approved by the Architect shall be supplied and delivered to the General Contractor for installation.

- E. Items requiring access are to be grouped to keep size and quantity of access doors to a minimum.
- F. Access doors installed in walls, floors or ceilings shall have the same fire rating as the wall, floor or ceiling.

1.26 ELECTRICAL WORK

- A. Install and wire up complete all electrical switches, starters and unmounted motors and other electrical equipment supplied by other trades.
- B. Furnish separate disconnect switches for all motors controlled by magnetic starters.
- C. Each trade supplying electrically operated equipment for installation and wiring by this Subcontractor is to furnish sufficiently detailed instructions and wiring diagrams for their installation.
- D. Control devices that include mechanical elements such as float switches, alternators, temperature and pressure switches or controls, damper operators or the like, shall be installed by the trade furnishing them, ready for wiring by this Subcontractor, unless otherwise indicated.
- E. Equipment including a number of electrical items in a single enclosure or common base shall be supplied to the job site internally wired as a unit, to numbered terminals, ready for wiring connections.

1.27 ELECTRIC MOTORS

- A. Motors shall conform to all applicable regulations and be suitable for the load, duty, voltage, phase, frequency, service and location intended.

1.28 TEMPORARY POWER

- A. Furnish and install all required temporary electrical services, including lighting and ground-fault circuit-interrupter receptacles as required for construction purposes.
- B. In all of the above cases, furnish the appropriate trades, well in advance of their work schedule, with all information, dimensions, templates, wiring diagrams and devices necessary to coordinate the work.
- C. Be responsible for any additional costs incurred as a result of his failure to furnish information sufficiently in advance to allow for proper coordination.

1.29 TESTS

- A. Test systems and equipment as required by the various Sections of the Specifications.
- B. Tests to be witnessed by and to the satisfaction of the Architect or his representative and such others as may have legal jurisdiction.
- C. Work shall be tested, repaired and retested until an approved test is achieved.
- D. Damages resulting from tests shall be repaired or damaged work replaced to the satisfaction of Architect and Owner.
- E. Testing must be completed successfully prior to concealment of the work.
- F. Completed systems shall be tested for proper operation, capacity and function. Insofar as possible, systems normally operated during certain seasons of the year shall be tested during the appropriate season.

G. Costs of all tests shall be borne by the appropriate Contractor.

1.30 QUIET OPERATION

A. All equipment shall be isolated from the building structure by approved means. Noises and hum of equipment shall be absorbed or attenuated so as not to be objectionable.

B. Where sound or vibration levels are considered objectionable by the Architect, they shall be corrected in a manner approved by the Architect, at no additional cost to the Owner.

1.31 USE OF INSTALLATION BY OWNER

A. Owner shall have the privilege of using any part of the work when sufficiently complete, but such use shall not be considered as an acceptance of the work in lieu of the written certificate from the Architect.

1.32 CLEANUP

A. Systems, enclosures, and equipment shall be thoroughly cleaned, inside and out, before being placed into operation.

B. Keep the site free from accumulation of waste materials or rubbish. At conclusion of the work, remove all surplus materials, tools, construction equipment and rubbish from the site and leave the premises in a clean condition.

1.33 GUARANTEE AND SERVICE

A. Guarantee that all work will be free from defects in workmanship and/or materials and that all apparatus will achieve the capacities and characteristics specified. If, during the period of one (1) year, or as otherwise indicated, from certificate of completion of the work, defects in material or workmanship appear, remedy such defects without cost to the Owner. In default thereof, the Owner may have such work done and charge the cost to the appropriate Contractor or Subcontractor. Also, indemnify the Owner for any property damage which might result from such a defect which made repairs necessary.

B. Certain equipment will require guarantee periods exceeding one year due to the need for seasonal operation. In such case, the guarantee will extend through at least one full, continuous season.

C. Any fault in a system shall be corrected, and any work damaged in the course of this correction shall be repaired, replaced and restored to its original condition at no additional cost to the Owner.

1.34 INSURANCE

A. Fully insure all employees, material and finished work as required by the General Conditions of the Contract.

1.35 SCAFFOLDING, RIGGING AND HOISTING

A. Unless otherwise indicated, the work of each Section includes all scaffolding, rigging, hoisting and services necessary for the delivery, erection and installation in place of all equipment and apparatus furnished and the removal of same when no longer required.

1.36 PROGRESS SCHEDULE

A. Keep informed of progress schedules of all other trades and work in accordance with the project schedule to ensure timely completion of this work.

1.37 WORKMANSHIP

- A. All work shall be performed in a neat and workmanlike manner and shall conform to the best trade practices for such work.

END OF SECTION

SECTION 26 05 05 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

- A. This Section includes the following electrical materials and methods:

1. Supporting devices for electrical components.
2. Concrete equipment bases.
3. Cutting and patching for electrical construction.
4. Touch-up painting.
5. Meter sockets.
6. Seismic Bracing
7. Electrical Devices
8. Cabinets and Enclosures
9. Grounding
10. Coordination Study and Test

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing fabrication and installation of supports and anchorage for electrical items in accordance of the requirements in section 260500.
- D. Coordination Drawings for electrical installation.
1. Prepare Coordination Drawings according to Division 1 Section "Submittals" to 1/4-inch-equals-1-foot scale for floor plans, 3/8-inch equals 1-foot scale for Mechanical/Electrical rooms or larger, same scale as other trades. Detail major elements, components, and systems of electrical equipment and materials in relation to each other and to other systems, installations, and building components. Indicate locations and space requirements for installation, access, and working clearance. Show where sequence and coordination of installations are important to the efficient flow of the Work. Coordinate drawing preparation with effort specified in other Specification Section. Include the following:
 - a. Provisions for scheduling, sequencing, moving, and positioning large equipment in the building during construction.
 - b. Floor plans, elevations, and details, including the following:
 - 1) Clearances to meet safety requirements and for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
 - 2) Equipment support details.
 - 3) Exterior wall, roof, and foundation penetrations of cable and raceway; and their relation to other penetrations and installations.
 - 4) Fire-rated interior and floor penetrations by electrical installations.

- 5) Sizes and locations of required concrete pads and bases.
 - c. Reflected ceiling plans to coordinate and integrate installing air outlets and inlets, light fixtures, alarm and communication systems components, sprinklers, and other ceiling-mounted items.
 - E. Samples of color, lettering style, and other graphic representation required for each identification product for Project.
 - F. Short circuit analysis, coordination study and test.
- 1.4 QUALITY ASSURANCE
- A. Comply with current NFPA 70 for components and installation.
 - B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

1.5 SEQUENCING AND SCHEDULING

- A. Coordinate electrical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.
- C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.
- E. Coordinate connecting electrical service to components finished under other Sections.
- F. Coordinate connecting electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors where electrical items requiring access are concealed by finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors".

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.
 - 1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
 - 2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.
- B. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 - 1. Fittings and accessories mate and match with channels and are from the same manufacturer.

- C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets. Spring steel clamps or "click"-type hangers are not allowed.
- D. Sheet-Metal Sleeves: 0.276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot-dip galvanized finish.
- G. Expansion Anchors: Carbon-steel wedge or sleeve type.
- H. Toggle Bolts: All-steel springhead type.
- I. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 SEISMIC BRACING

- A. Bracing shall be fabricated from standard structural or trade sections.
- B. Attachments to masonry walls shall be by means of expansion shields and bolts.
- C. Attachment to building structure shall meet approval of Structural Engineer.

2.3 CONCRETE EQUIPMENT BASES

- A. Forms and Reinforcing Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete".

2.4 METER SOCKETS

- A. Meter sockets comply with serving utility company requirements.

2.5 GROUNDING GRID

- A. Provide grounding grids consisting of 3/4 inch by 10 ft copper clad steel driven rods with No. 3/0 bare stranded copper interconnecting cable.

2.6 GROUND BUS

- A. (2 x 1/4) inch copper minimum, mounted on insulating standoffs, complete with lugs for connecting grounding cables.

2.7 SWITCHES AND RECEPTACLES

- A. Switches:
 - 1. 20 Amp - 1P, Hubbell #1221-I.
 - 2. 20 Amp - 2P, Hubbell #1222-I.
 - 3. 20 Amp - 3-Way, Hubbell #1223-I.
 - 4. 20 Amp - 4-Way, Hubbell #1224-I

5. 20 Amp - With Pilot Light, Hubbell #1221-IL.

B. Receptacles: Specification Grade duplex, three wire, 125 volt, grounding:

1. 20 Amp - Hubbell #5462-I - Ivory.

C. Face Plates: (With the required number of gangs): Smooth thermoplastic (color selected by Architect) or satin finish stainless 203/204.

D. Face Plates: (Wet or Damp Locations) Cast aluminum, gasketed, with double lift covers, Hubbell #5205WO.

2.8 GROUND FAULT INTERRUPTER RECEPTACLES

A. Duplex, 20A, 125 volt AC, specification grade Ivory, ANSI C73.12, NEMA 5-20K, Hubbell #GF5362-I.

B. Face Plates: Nylon, Ivory, Hubbell #PJ-26 or satin stainless steel 302/304.

C. Face Plates: (Wet or Damp Locations) Gray cast aluminum, vertical, standard box mounting, gasketed, Hubbell #

2.9 TIMERS

A. Mark Time Catalogue M9006 - 30 Minute Off.

2.10 DIMMERS

A. Incandescent 600W to 1000W, Lutron N-1000.

B. Fluorescent: Two (2) to twenty (20) 40 watt lamps, Lutron FD-20 (I20) (277).

C. Matching faceplates by Lutron.

D. Fluorescent dimmer ballasts to be as required by dimmer manufacturer.

E. Rating: Sizes listed are minimum, larger size to accommodate load shown on Contract Drawings.

F. Dimmer Boxes: Size as required by dimmer manufacturer and space to avoid derating of dimmer, or break-off of faceplate cooling fins.

2.11 FLOOR TYPE SERVICE FITTINGS

A. Above floor power service fitting for greater than 3 inch pour.

1. Satin aluminum housing, 3/4 inch nipple, with stainless device plates and 20 amp duplex receptacle, Hubbell SC3091 for one receptacle and Hubbell SC3092 for two duplex receptacles back to back.

2. Full adjustable stamped steel floor box for greater than 3" depth of pour, Hubbell B-2527 shallow (B-2536 deep) with S-2525 cover.

B. Above floor telephone service fitting for greater than 3 inch pour.

1. Satin aluminum housing, 3/4 inch nipple with stainless steel plate with brushed hole, Hubbell SC3190, (Hubbell 3192 back to back) with floor box (same as for power).

C. Flush type power floor outlet.

1. Fully adjustable pressed steel floor box with 20 amp, 120 volt grounding type duplex receptacle, Hubbell B2529.
 2. Flush cover for duplex receptacle: Brass flush cover suitable for floor box with flap opening. Provide brass carpet (linoleum) (terrazzo) rings.
- D. Flush type telephone floor outlet.
1. Fully adjustable pressed steel floor box, Hubbell B-2529. Provide brass flush telephone cover with brass plug, and brass carpet (linoleum) (terrazzo) ring.
- E. Fire rated poke-through outlets.
1. Power: Brushed aluminum cast housing, stainless cover plates, two 20 amp duplex receptacles, Hubbell PT7PP2.
 2. Telephone: Brushed aluminum cast housing with stainless cover plate, Hubbell PT7TT.
- F. Floor fittings - Size for depth of floor pour. Submit product data for approval.

2.12 OUTLET BOXES

- A. Outlet boxes and covers shall be pressed steel, except as noted, and protected against corrosion with zinc applied by the electric galvanizing, hot dipping or sheradizing process.
- B. Outlet boxes shall be of sizes and type to accommodate:
1. Structural conditions.
 2. Size and number of raceways and conductors or cable entering.
 3. Device or fixture for which required.
- C. Outside lighting outlets shall have galvanized or cadmium plated cast iron boxes with gaskets, drilled and tapped to take fixture specified for these locations.
- D. Floor boxes where shown on plans shall be adjustable, watertight, cast iron, with brass cover and flange to match floor finish. Box shall be drilled and tapped to accommodate entering conduits and furnished with power or low tension pedestal head as indicated. Furnish in Steel City, National or equal.
- E. Cast Boxes: Cast ferrous alloy, deep type, gasketed cover, threaded hubs.

2.13 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.
- B. Sheet Metal Boxes larger than 12 Inches in any Dimension to be hinged enclosure. Cast.
- C. Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

2.14 BOXES AND FITTINGS

- A. Outlet boxes and fittings shall be installed at each outlet switch or junction point of conduit.
- B. Outlet boxes shall be as manufactured by Steel City, National or Raco.

2.15 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250; Type (1) (3R) (4) steel.
- B. Finish: Manufacturer's standard enamel finish.
- C. Covers: Continuous hinge, held closed by flush latch operable by key.
- D. Panel for Mounting Terminal Blocks or Electrical Components: 14 gage steel, white enamel finish.

2.16 CABINETS

- A. Cabinet Boxes: Galvanized Steel with removable endwalls. Provide 3/4 inch thick plywood backboard painted matte white, for mounting terminal blocks.
- B. Cabinet Fronts: Steel, flush surface type with concealed hinge and flush lock keyed to match branch circuit panelboard; finish in gray baked enamel.

2.17 TERMINAL BLOCKS AND ACCESSORIES

- A. Terminal Blocks: ANSI/NEMA ICS 4; UL listed.
- B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.
- C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

2.18 FABRICATION

- A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.
- B. Provide conduit hubs on enclosures.
- C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

2.19 ELECTRICAL IDENTIFICATION

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- B. Tape Labels: Embossed adhesive tape will not be permitted for any application.
- C. Wire and Cable Marker: Cloth markers, split sleeve or tubing type.

2.20 TOUCH-UP PAINT

- A. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.
- B. For Non equipment Surfaces: Matching type and color of undamaged, existing adjacent finish.
- C. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION REQUIREMENTS

- D. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.
- E. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.
- F. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- G. Give right of way to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING METHODS

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Conform to manufacturer's recommendations for selecting supports.
- D. Strength of Supports: Adequate to carry all present and future loads, times a safety factor of at least 4; 200 lb-minimum design load.

3.3 SEISMIC BRACING

- A. Provide lateral bracing in all directions for all conduit and equipment, sufficient to resist the lateral forces determined under State Building Code.
- B. Bracing calculations shall be based on Seismic Hazard Group I.
- C. A separate calculation shall be made for each equipment item.
- D. Provide bracing for all suspended or base mounted conduit and equipment except as excluded in Table 1610.6.4(1) of the Code.
- E. Attachments to building elements shall only be made at locations having sufficient strength and rigidity to absorb the forces calculated.
- F. For suspended equipment provide bracing such that the effectiveness of the equipment vibration isolators is not reduced.
- G. Vibration isolators, where called for, shall have sufficient lateral stability to resist the forces involved.
- H. Base mounted equipment attached directly to the structure, or on foundation or housekeeping pads, shall be provided with anchor bolts having sufficient strength in shear to absorb the calculated lateral forces in all directions.
- I. Isolated, base mounted equipment shall, in addition to verification of anchor bolt strength, have isolation having lateral stability and snubbing capacity to absorb the calculated lateral forces in all directions.
- J. Locate and install bracing so that access to the equipment for service, maintenance and repair will not be impeded. Bracing shall be arranged so that there will be no impediment to removal or replacement of the entire unit or piece of equipment

3.4 CONCRETE BASES

- A. Unless otherwise specifically noted, the Contractor shall furnish all necessary supports, pads, bases and piers required for all equipment furnished under the Division.
- B. Concrete pads are per the Division 3 Specification for switchboards, generators, motor control centers and other freestanding equipment. All pads extend six (6") inches beyond machine base in all directions with top edge chamfered. Insert steel dowel rods into floors to seismically anchor pads. Submit shop drawings of all foundations and pads to the Engineer for review before they are constructed. Field coordinate all required dimensional and necessary loading information.
- C. Construction of foundations, supports, pads, bases and piers where mounted on the floor is of the same finish quality as the adjacent and surrounding flooring material.
- D. Securely attach all equipment, unless otherwise shown, to the building structure in an acceptable manner. Attachments are of a strong and durable nature; replace any attachments that are insufficient, in the opinion of the Engineer, as directed without additional expense to the Owner.

3.5 INSTALLATION

- A. Install wires in raceway according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Connect outlets and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including, screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.
- C. Install devices to securely and permanently fasten and support electrical components.
- D. Raceway Supports: Comply with NFPA 70 and the following requirements:
 - 1. Conform to manufacturer's recommendation for selecting and installing supports.
 - 2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
 - 4. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
 - 5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
 - 6. Hanger Rods: 1/4-inch diameter or larger threaded steel, except as otherwise indicated.
 - 7. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.
- E. Provide, set in place and be held responsible for the location of all sleeves, inserts and anchor bolts required for the Work. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the Contractor's expense.
- F. Provide all conduits passing through floors, walls or partitions with sleeves having an internal diameter of one (1") inch larger than the outside diameter of the conduit or insulation enclosing the conduit.
- G. Solidly fill with mineral fiber or other acceptable fire-stopping material all penetrations through fire-rated walls, ceilings and all floors except slab on grade) in which conduits, cables or busways pass.
- H. Refer to Division 7 Specification for additional and more specific fire-stopping information.
- I. Submit fire-stopping systems as a shop drawing.

- J. Seal with a UL approved fire-stop fitting classified to an hourly rating equivalent to the fire rating of the wall, ceiling or floor all penetrations through fire-rated walls, ceiling or floors in which cables or conduits pass.
- K. Install seal fittings on conduits and cables, as required by the NEC, which are in or pass through hazardous areas.
- L. Use sealing bushings on conduit and cable ends to effectively prevent the intrusion of water, a damp or corrosive atmosphere, hot or cold air, or dust.
- M. Use thruwall and floor seals to provide a positive means of sealing pipes or conduits which pass through the concrete foundation of a structure below grade or below ground water level. Also use seals at entry points through concrete walls or floors which must be sealed.

3.6 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.
- B. Repair disturbed surfaces to match adjacent undisturbed surfaces.
- C. Contractor is responsible for carrying out the requirements of this section at no additional costs to Owner. Costs of defective, conflicting, ill-timed work, or unnecessary cutting, coring, patching, and repairing are the sole responsibility of the Contractor.
- D. Provide cutting and patching per Division 1 requirements. Furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of Work.
- E. Furnish, locate and set inserts and/or sleeves as required before the floors and walls are built. The Contractor is responsible for the cost of drilling, cutting and patching as required for conduits, etc., where sleeves and inserts were not installed or correctly located. Provide all drilling required for the installation of hangers.
- F. Use extreme caution when installing all holes cut through concrete slabs to avoid cutting or damaging structural members. Cuts no structural members or structural slabs/floors without the written acceptance of the Engineer. Cut structural steel members in a manner directly by the Engineer.

3.7 LOCATION OF OUTLETS

- A. Coordinate work with other trades so that exact roughing locations are available for all devices and equipment.
- B. Locations shown on drawings are subject to modification due to conditions arising during construction. Such changes shall be executed as part of the work of this Section. Verify locations shown on drawings with Architect and/or Owner, correcting discrepancies as they arise, all at no additional cost to the Owner.
- C. Outlets in equipment spaces shall be roughed after final location of piping and equipment has been established.
- D. Dimensions scaled from Electrical or Mechanical Drawings shall not be relied on in locating outlets. Use only Architectural Drawings for the determination of measurement of work in the field.

3.8 DEVICE INSTALLATION

- A. Install wall switches 48 inches above floor, OFF position down.
- B. Install wall dimmers 48 inches above floor. Separate adjacent dimmers as instructed by manufacturer to prevent a requirement for derating of dimmers. Do not use common neutrals.

- C. Install convenience receptacles 18 inches above floor, 6 inches above counters grounding pole on bottom.
- D. Install specific-use receptacles at heights shown on Contract Drawings.
- E. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions.
- F. Install decorative plates on switch, receptacle, and blank outlets in finished are areas, using jumbo size plates for outlets installed in masonry walls.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
- H. Install devices and wall plates flush and level.
- I. Verify all mounting heights with architectural drawings.
- J. Coordinate device locations with architectural details.

3.9 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of boxes and outlets prior to rough-in.
- C. Locate and install boxes to allow access.
- D. Locate and install to maintain headroom and to present a neat appearance.
- E. Locate boxes in masonry walls to require minimum cutting. Coordinate masonry cutting to achieve neat openings for boxes.
- F. Provide knockout closures for unused openings.
- G. Support boxes independently of conduit except for cast boxes that are connected to two rigid metal conduits, both supported within 12 inches of box.
- H. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- I. Align wall-mounted outlet boxes for switches, and similar devices.
- J. Boxes shall set plumb and true in building surface and furnished with suitable plaster rings where so required.

3.10 PULL AND JUNCTION BOX INSTALLATION

- A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
- B. Support pull and junction boxes independent of conduit.

3.11 CABINET INSTALLATION

- A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.

- B. Provide accessory feet for free-standing equipment enclosures. Install trim plumb.

3.12 POWER SYSTEM GROUNDING

- A. Main Electrical Room Grounding Grid: Exoterically weld cable connections and connections to ground rods. From two points on ground grid, provide one No. 350 KCMIL insulated ground conductor in one inch conduit to main ground bus.
- B. Main Distribution System: From ground bus, provide one No. 350 KCMIL insulated (bare) ground conductor in one inch conduit to ground bus within switchgear, to neutral of switchgear, and to non-current carrying parts.
- C. Circuit Grounding: Install grounding bushings, grounding studs, and grounding jumpers at distribution centers pullboxes motor control centers panelboards.
- D. Bonding Jumpers: Provide green insulation, sized correlated with over-current device protecting the wire, attach to grounding bushings on conduit, to lugs on boxes and other enclosures. Connection to neutral only at service neutral bar make separate lug.
- E. Bonding Wire: Install bonding wire when using flexible conduit connected at each end to a grounding bushing.
- F. Busduct Grounding: Ground busduct enclosure to main distribution center ground.
- G. Post Light Grounding: Provide direct-bury ground conductor with green insulation to lighting standards. Connect to corrosion-resistant ground stud or ground clamp to feed-in point ground.

3.13 COMMUNICATION GROUNDING

- A. Telephone:
 - 1. Provide one No. 2 TWH to ground bus in telephone equipment room.
 - 2. Provide one No. 2 TWH to telephone service conduit.
 - 3. Provide one No. 12 TWH to conduits terminating at backboard.
- B. Fire Alarm and Detection:
 - 1. Provide one No. 8 TWH in 1/2 inch conduit to nearest ground bus.
- C. Television Distribution System:
 - 1. Provide one No. 8 TWH in 1/2 inch conduit to nearest ground bus.
- D. Public Address System:
 - 1. Provide one No. 8 TWH in 1/2 inch conduit to nearest ground bus.

3.14 ELECTRICAL IDENTIFICATION INSTALLATION

- A. Degrease and clean surfaces to receive nameplates.
- B. Install nameplates parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.

3.15 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

3.16 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates of minimum letter height as scheduled below.
- B. Panelboards, Switchboards and Motor Control Centers: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating and source.
- C. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 1/8 inch; identify circuit and load served, including location.
- D. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch; identify load served.
- E. Transformers: 1/4 inch; identify equipment designation. 1/8 inch; identify primary and secondary voltages, primary source, and secondary load and location.
- F. Devices, provide 1/8 inch; on receptacles with circuit and panel number.

3.17 PANEL DIRECTORIES

- A. Provide neatly typed directory in door of each branch circuit panelboard identifying each circuit, its use, and breaker size. Prepare directory only after all circuit adjusting for phase balancing has been completed.
- B. Provide typed legend of circuits in each main circuit board and distribution panel.

3.18 TOUCHUP PAINTING

- A. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.
- B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

3.19 SHORT CIRCUIT ANALYSIS, COORDINATION STUDY AND TEST

- A. Provide a complete short circuit analysis of all nodes indicated on power riser diagram.
 - 1. Recommend appropriate AIC ratings for all electrical distribution equipment indicated on Power Riser diagrams.
 - 2. Series rating of equipment is not acceptable.
 - 3. Assume infinite bus on primary of utility transformer.
 - 4. Provide equipment with appropriate AIC ratings per recommendations as part of initial bid.
- B. Provide a complete coordination study of all three phase circuit breakers 100 Amperes or greater.
 - 1. Recommend appropriate trip settings for all adjustable trip circuit breakers and ground fault relays.
 - 2. Fault currents will be based on short circuit study above.
 - 3. Provide modifications to existing design in order to achieve complete selective coordination of the entire system.
- C. Retain services of an independent testing agency to provide a complete bolted short selective coordination test

of every fault path in the coordination study.

1. Adjust trip settings on breakers as required to achieved selective coordination.

D. Perform study before submission of shop drawings for review.

3.20 GROUNDING TEST

A. Measure ground grid resistance with earth test megger and install additional ground rods and conductors as required until resistance to ground complies with Code requirements.

END OF SECTION

SECTION 26 05 19 - WIRE AND CABLE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Building wire.
- B. Cable.
- C. Wiring connections and terminations.

1.3 RELATED WORK

- A. Section 260500 - Common Work Results for Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. NEMA WC 3 - Rubber-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- B. NEMA WC 5 - Thermoplastic-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- C. Refer to section 260500 Common Work Results for Electrical for code references.

1.5 SUBMITTALS

- A. Submit product data for Wire and Cable under provisions of Section 260500.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

- A. Thermoplastic - insulated Building Wire: NEMA WC 5.
- B. Rubber-insulated Building Wire: NEMA WC 3.
- C. Feeders and Branch Circuits Larger Than 6 AWG; Copper, stranded conductor, 600 volt insulation, THW, THHN/THWN.
- D. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation, THW OR THHN/THWN, 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid conductor.
- E. Control Circuits: Copper, stranded conductor 600 volt insulation, THW.
- F. Wire sizes #6 and larger shall be stranded. All sizes called for in the specifications or on the plans are American Wire Gauge sizes. Conductors shall be copper, unless noted differently.

- G. All wire shall be factory color-coded with a separate color for phase, switch and neutral used consistently throughout. The neutral wire of all branch circuits shall be white. Green shall be used for equipment grounding conductors. Feeders shall be phase color coded at all access points.
- H. The use of MC or SER cable for panel feeders is acceptable where concealed. Exposed feeders shall be run in EMT or RGC.
- I. The use of MC cable and NM cable is acceptable as required by code or as unless otherwise noted elsewhere. Where MC cable is permitted under this specification, its use shall be governed by Article 334 of the National Electric Code and approved by authorities having jurisdiction.
- J. Cables are required to be installed per NEC. All installation shall be coordinated with construction types and NEC requirements. Coordinate types of construction with Architectural plans and specifications. Install cables in conduit where required by NEC.
- K. Provide plenum rated cable where required. Coordinate with Div. 23.
- L. All wiring for branch circuits and grounding shall be provided and installed per NEC requirements. Any discrepancies to said requirements on drawings shall be verified during bid process with Engineer.

2.2 REMOTE CONTROL AND SIGNAL CABLE

- A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 90 degree C. individual conductors twisted together, and covered with an overall PVC jacket.
- B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90 degree C, individual conductors twisted together, and covered with a PVC jacket; UL listed.
- C. Section A & B above shall be installed in E.M.T.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

- A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.
- B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.
- C. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
- D. Splice only in junction or outlet boxes.
- E. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- F. Make Conductor lengths for parallel circuits equal.
- G. All wires and cables shall be continuous from origin to destination without running splices. At the end of these wires and cables, a sufficient slack shall be left as may be required for making proper connections.
- H. No grease or other component which contains acids shall be used in pulling wires and cables.
- I. Where solid conductors are to be connected directly to the devices without the use of lugs, such as occurs at lighting switches and plug receptacles, the wire shall be formed into a loop to fit around the screw.

3.2 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricate for pulling 4 AWG and larger wires.
- B. Install wire in raceway after all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.

3.3 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Support cables above accessible ceilings do not rest on ceiling tiles. Use spring metal clips or cable ties to support cables from structure. Include bridle rings or drive rings.
- C. Use suitable cable fittings and connectors.
- D. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.
- E. Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- F. Thoroughly clean wires before installing lugs and connectors.
- G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- H. Terminate spare conductors with electrical tape.

3.4 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Torque test conductor connections and terminations to manufacturer's recommended values.
- C. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.
- D. Conduits must be swabbed out and made thoroughly dry before pulling wire and cable.

END OF SECTION

SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

- A. This section includes grounding of electrical and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Data: For the following:
 - 1. Ground rods.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- D. Field Test Reports: Submit written test reports to include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 1. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Erico Inc.; Electrical Products Group
 - b. Ideal Industries, Inc.
 - c. O-Z/Gedney Co.; a business of the EGS Electrical Group.
 - d. Raco, Inc.; Division of Hubbell
 - e. Thomas & Betts, Electrical
 - f. Burndy Electrical.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."

- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare Copper Conductors: Comply with the following:
 - 1. Solid Conductors: ASTM B3.
 - 2. Assembly of Stranded Conductors: ASTM B8.
 - 3. Tinned Conductors: ASTM B 33.
- G. Copper Bonding Conductors: As follows:
 - 1. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor, unless indicated otherwise.
 - 2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1 5/8 inches wide and 1/16 inch thick (or as shown on the drawings).
- H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators with pre-drilled and tapped holes in NEMA configuration.

2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combination of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.
 - 1. Size: 3/4 by 120 inches.

PART 3 - EXECUTION

3.1 APPLICATION

- A. In raceways, use insulated equipment grounding connectors.
- B. Equipment Grounding Conductor Terminations: Use bolted pressure clamps with at least two bolts.
- C. Ground Rod Clamps at Test Wells: Use bolted pressure clamps.
- D. Grounding Bus: Install in electrical, telephone, CATV and data equipment rooms, and closets, and elsewhere as indicated.
 - 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
 - 2. Length: 24 inches, unless noted otherwise.

- F. Underground Grounding Conductors: Use tinned-copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with current NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-24-inch grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- D. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.
- E. CSST gas piping systems shall be bonded to the electrical service grounding electrode system at the point where the gas service enters the building. The bonding jumper shall not be smaller than 6 AWG copper wire. Coordinate with Div. 15.

3.3 COUNTERPOISE

- A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 500 MCM AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches below grade and 24 inches from building foundation.

3.4 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
 - 1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
 - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding

conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

- E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- F. Install one test well for each service at the ground rod electrically closet to the service entrance. Set top of well flush with finished grade or floor.

3.5 CONNECTIONS

- A. General: Make connection so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections have dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Connections at Test Wells: Use compression-type connectors make bolted-and clamped-type connections between conductors and ground rods.
- F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.6 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

- A. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare,

tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

- B. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

3.7 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
 - a. Equipment Rated 500 kVA and Less: 10 ohms.
 - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - c. Equipment Rated More Than 1000 kVA: 3 ohms.
 - d. Manhole Grounds: 10 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 29 - HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Conduit and equipment supports.
- B. Fastening hardware.

1.3 RELATED WORK

- A. Section 260500 - General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. Refer to section 260500 Common Work Results for Electrical for code references.

1.5 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Support Channel: Galvanized or painted steel.
- B. Hardware: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts or beam clamps.
- B. Use expansion anchors or preset inserts in solid masonry walls, self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- D. Do not use powder-actuated anchors.
- E. Do not drill structural steel or concrete members.
- F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance.

Use hexagon head bolts with spring lock washers under all nuts.

- G. In wet locations install free-standing electrical equipment on concrete pads.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.
- I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

3.2 HANGERS AND ATTACHMENTS

- A. In general, the following methods of fastening of supports to building structure shall be used.
 - 1. Bolts and expansion shields to be used in concrete slabs where weight does not exceed 100 pounds per fastening.
 - 2. Inserts to be used in lightweight concrete structural slabs where weight does not exceed 300 pounds per fastening.
 - 3. Inserts to be used in heavyweight concrete structural slabs where weight does not exceed 500 pounds per fastening.
 - 4. Where the aforementioned fastening methods are not applicable or where inserts have for any reason not been provided, supply a steel fishplate (1/4" thick with area required) with thru-bolt for each fastening. Fishplate assembly shall be chased into slab and grouted flush with top of slab.
- B. Provide such channel or angle iron members as may be necessary to bridge between structural steel and receive supports for fastening. Such auxiliary steel shall be welded to the structural steel.
- C. Supporting racks of angle iron, flat iron and channel iron members shall be provided for electrical work indicated as being supported from walls where such walls are found to be incapable of supporting the weight.
 - 1. Where provided, supporting racks shall be rigidly bolted or welded together and adequately braced to provide a substantial structure. Racks shall be of ample size to provide for a workmanlike arrangement of all equipment thereon.
- D. No metal enclosures of equipment, etc. for surface installation shall be mounted directly on any wall. Provide flat bar members for a minimum of 1/4" space between the wall and metal enclosure shall be installed.

END OF SECTION

SECTION 26 05 33 - CONDUIT

PART 1 GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Rigid metal conduit and fittings.
- B. Intermediate metal conduit (IMC) and fittings.
- C. Electric metallic tube (EMT) and fittings.
- D. Liquidtight flexible metal conduit and fittings.
- E. Surface metal raceways.

1.3 RELATED WORK

- A. Section 260500 - General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated.
- C. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- D. FS WW-C-563 - Electrical Metallic Tubing.
- E. FS WW-C-566 - Specification for Flexible Metal Conduit.
- F. FS WW-C-581 - Specification for Galvanized Rigid Conduit.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT AND FITTINGS

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; threaded type, material to match conduit.

2.2 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

- A. Conduit: Galvanized steel.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; use fittings and conduit bodies specified above for rigid steel

conduit.

2.3 ELECTRICAL METALLIC TUBING (EMT)

- A. Electrical Metallic Tubing.
- B. Fittings and Conduit Bodies: Material to Match.

2.4 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

- A. Conduit: Flexible metal conduit with PVC jacket.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1.

2.5 SURFACE METAL RACEWAYS

- A. As manufactured by Wiremold, Inc., type and size as indicated on Drawings.

2.6 CONDUIT SUPPORTS

- A. Conduit Clamps, Straps, and Supports: Steel or malleable iron. Refer to Section 260505.

2.7 APPROVED MANUFACTURERS

- A. Rigid steel threaded conduit shall be as manufactured by one of the following:
 - 1. Wheatland Tube Company.
 - 2. Youngstown Sheet and Tube Company.
 - 3. Republic Steel Corporation.
 - 4. Triangle.
- B. Electrical metallic tubing shall be steel, electrically welded and galvanized, and shall be as manufactured by one of the following:
 - 1. Youngstown Sheet and Tube Company.
 - 2. Republic Steel Corporation.
 - 3. Wheatland Tube Company.
- C. Couplings and box connectors shall be concrete-tight, set screw type as manufactured by one of the following:
 - 1. Raco, Inc.
 - 2. Appleton electric Company.
 - 3. Efcor Div.
- D. Furnish and install where indicated on drawings steel surface metal raceways and wireways as manufactured by:
 - 1. Wiremold Company.
 - 2. Siemens.
 - 3. Columbia Metal Products.

- E. Flexible steel conduit shall have an integral bond wire for grounding and shall be as manufactured by Sealtite, American Flexible Conduit Company, or Triangle/pwc. Liquid-tight flexible conduit shall be used where flexibility and protection from liquids, vapors, or solids is needed.
- F. Aluminum conduit and fittings will not be allowed unless specifically noted on drawings.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size conduit for conductor type and number installed, 3/4 inch minimum size.
- B. Arrange conduit to maintain headroom and present a neat appearance.
- C. Route exposed conduit and conduit above accessible ceilings, parallel and perpendicular to walls and adjacent piping.
- D. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange conduit supports to prevent distortion or alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
- H. Support conduit per Article 352 of the current National Electrical Code.
- I. All conduits and cable assemblies are to be concealed unless otherwise noted.

3.2 CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipe cutter; de-burr cut ends.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
- D. Install no more than the equivalent of four 90-degree bends between boxes.
- E. Use conduit fittings to make sharp changes in direction, as around beams.
- F. Use hydraulic bender or factory elbows for bends in conduit larger than 2 inch size.
- G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point, all underground conduits shall be water tight to prevent the entrance of subsurface water into the building.
- H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- I. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.
- J. Install expansion joints where conduit crosses building expansion joints.

- K. Where conduit penetrates fire-rated walls and floors, provide mechanical firestop fittings with UL listed fire rating equal to wall or floor rating.

3.3 CONTINUITY

- A. Complete raceway systems shall become metallicly continuous and shall be thoroughly grounded in accordance with requirements of the current National Electrical Code and its latest revisions.

3.4 CONDUIT/RACEWAY SCHEDULE

- A. Wet Interior Locations: Rigid steel.
- B. Dry Concealed Locations: EMT.
- C. Dry Exposed Locations: Rigid steel or IMT, surface metal raceways.
- D. Connections to Transformers and Machinery: 24" Minimum length Sealtite Flexible Conduit.
- E. Below Grade, Below or In Slabs: Rigid steel.

3.5 PVC CONDUITS

- A. Where indicated on Drawings, raceways may be Schedule 40 or Schedule 80 PVC, complete with compatible fittings.
- B. All PVC conduit runs must be electrically continuous using a separate grounding conductor in addition to the conductors specified for the run.

END OF SECTION

SECTION 26 05 48 - SEISMIC BRACING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Lateral seismic bracing for all conduits and equipment, suspended or base mounted.
- B. Include calculations, attachments, bracing members.

1.3 RELATED SECTIONS

- A. Section 260500 - Common Work Results for Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. Refer to section 260500 Common Work Results for Electrical for code references.

1.5 SUBMITTALS

- A. Submit sketches of proposed bracing systems for suspended equipment, including loads, etc.
- B. Provide documentation that vibration isolators and anchor bolts will have properties sufficient to withstand required forces.
- C. Sketches and calculations submittals shall bear the seal and signature of a structural engineer licensed in the State of Connecticut.

1.6 COORDINATION

- A. Coordinate bracing design and installation with work of other Sections.
- B. Bracing schemes may be jointly reviewed by Electrical and Structural Engineer and Architect. Provide whatever detail is required by each.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Bracing shall be fabricated from standard structural or trade sections.
- B. Attachments to masonry walls shall be by means of expansion shields and bolts.
- C. Attachment to building structure shall meet approval of Structural Engineer.

PART 3 - EXECUTION

3.1 PROCEDURE

- A. Provide lateral bracing in all directions for all equipment, piping, ductwork, etc., sufficient to resist the lateral forces determined under Connecticut Building Code.
- B. Bracing calculations shall be based on a **Seismic Hazard Exposure Group II** and a **Seismic Performance Category C**, using the following factors:
 - a. Peak Velocity-Related Acceleration (A_v): 0.13
 - b. Seismic Coefficient (C_e)
 - Emergency and Fire Protection Systems: 2.0
 - Communication systems, bus ducts, primary systems: 2.0
 - All Equipment base mounted, suspended, or attached to building and transformer: 2.0
 - Panelboards and lighting fixtures: 0.67
 - Pendant mounted fixtures: 1.5
 - c. Performance Criteria Factor (P):
 - Emergency and Fire Protection Systems: 1.5
 - Communication systems, bus ducts, primary systems: 1.0
 - All Equipment base mounted, suspended, or attached to building and transformer: 1.0
 - Panelboards and lighting fixtures: 1.0
 - Pendant mounted fixtures: 1.0
 - d. Attachment Amplification Factor (a_e): 2.0
 - e. Operating Weight of Equipment (W_p): As required
- C. Conduit less than 2-1/2 inches need not be seismically braced. Conduit installed within 12 inches from the top of conduit to the supporting building member need not be braced.
- D. The vertical support for a pendant mounted fixture shall have a safety factor of 4.0.
- E. The force calculated shall be applied at the center of gravity of the component nonconcurrently in a horizontal direction. Attachments shall be by positive connection, frictional forces shall be neglected.
- F. A separate calculation shall be made for each equipment item.
- G. Provide bracing for all suspended and/or base mounted equipment and conduit, except as excluded under the Code..
- H. Attachments to building elements shall only be made at locations having sufficient strength and rigidity to absorb the forces calculated.

3.2 SUSPENDED EQUIPMENT

- A. Provide bracing such that the effectiveness of equipment vibration isolators is not reduced.
- B. Vibration isolators, where called for, shall have sufficient lateral stability to resist the forces involved.

3.3 BASE MOUNTED EQUIPMENT

- A. Equipment attached directly to the structure, or on foundation or housekeeping pads, shall be provided with anchor bolts having sufficient strength in shear to absorb the calculated lateral forces in all directions.

- B. Isolated, base mounted equipment shall, in addition to verification of anchor bolt strength, have isolation having lateral stability and snubbing capacity to absorb the calculated lateral forces in all directions.

3.4 CONDUIT BRACING

- A. As defined under 3.01 above.

3.5 ESSENTIAL EQUIPMENT

- A. Essential building equipment including, but not limited to, emergency power and lighting systems, fire protection systems, shall be braced as provided for above, except that the force calculations shall use a Seismic Coefficient of 2.0 and a Performance Criteria factor of 1.5.

3.6 FABRICATION AND INSTALLATION

- A. Fabricate from standard materials.
- B. Locate and install bracing so that access to the equipment for service, maintenance and repair will not be impeded. Bracing shall be arranged so that there will be no impediment to removal or replacement of the entire unit or piece of equipment.

END OF SECTION

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Nameplates and tape labels.
- B. Wire and cable markers.
- C. Panelboard Directories

1.3 RELATED WORK

- A. Section 260500 - General Provisions - Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. Refer to section 260500 Common Work Results for Electrical for code references.

1.5 SUBMITTALS

- A. Submit shop drawings in accordance with requirements of Section 16010.
- B. Include schedule for nameplates and tape labels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- B. Tape Labels: Embossed adhesive tape will not be permitted for any application.
- C. Wire and Cable Marker: Cloth markers, split sleeve or tubing type.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates.
- B. Install nameplates parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.

3.2 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

3.3 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates of minimum letter height as scheduled below.
- B. Panelboards, Switchboards and Motor Control Centers: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating and source.
- C. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 1/8 inch; identify circuit and load served, including location.
- D. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch; identify load served.
- E. Transformers: 1/4 inch; identify equipment designation. 1/8 inch; identify primary and secondary voltages, primary source, and secondary load and location.
- F. Devices, provide 1/8 inch; on receptacles with circuit and panel number.

3.4 PANEL DIRECTORIES

- A. Provide neatly typed directory in door of each branch circuit panelboard identifying each circuit, its use, and breaker size. Prepare directory only after all circuit adjusting for phase balancing has been completed.
- B. Provide typed legend of circuits in each main circuit board and distribution panel.

END OF SECTION

SECTION 26 09 24 - LIGHTING

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SCOPE OF WORK

- A. Furnish and install lighting fixtures, lighting equipment and lamps for all lighting outlets as shown on the plans and listed on the fixture schedule.
- B. Furnish and install all mounting accessories, brackets, stems, etc., required for the complete installation of the lighting fixtures.
- C. Suitable factory cuts, drawings, or photographs (and such samples as may be required) with full description data on all fixtures shall be submitted for approval, copy of faxes will not be acceptable.

1.3 REFERENCES

- A. Refer to section 16010 General Provisions for code references.

PART 2 -PRODUCTS

- 2.1 Fixture wire shall be in strict compliance with the latest National Electrical Code. No fixture wiring shall be smaller than #12 AWG. Wiring shall be protected with tape or tubing at all points where abrasion is liable to occur. All wiring shall be concealed within fixture construction.

2.2 LAMPS

- A. All lamps shall be LED, unless otherwise indicated.

2.3 LED LAMP DRIVERS

- A. General Requirements: Unless otherwise indicated, features include the following:
 - 1. Designed for type and quantity of lamps.
 - 2. Be capable of dimming.
 - 3. Shall produce more than 70% of its initial input after 50,000 hours.
 - 4. Shall have a PF above 0.9.

PART 3 - EXECUTION

- 3.1 Verify all ceiling types and construction before ordering lighting fixtures to confirm that final ceilings approved for installation and the lighting fixtures are compatible to each other in all respects.
- 3.2 Lighting fixtures shall not be installed until finished coat of paint has been applied to ceilings and walls and allowed to dry thoroughly.
- 3.3 Furnish, install and wire a light fixture at every outlet as indicated on the plans. In the event a fixture type designation is

omitted from the drawing, furnish and install the type as designated by the Architect or Engineer.

- 3.4 All fixture units, when installed, shall be free from warps, dents, etc. They shall be clean of dirt, smudges and all foreign matter, and shall be left highly polished.
- 3.5 All lighting fixtures shall be independently supported apart from general ceiling construction.
- 3.6 Upon completion of the installation of the lighting fixtures and lighting equipment, they must be in first-class operating condition and in perfect condition as to finish, etc. At time of final inspection, all fixtures and equipment must be complete with lamps, starters, and required glassware or reflectors, which must be clean and free from defects. Any fixtures, reflectors, or glassware broken prior to the time of final inspection must be restored without cost to the Owner. Just prior to occupancy, all fixtures shall be relamped with new lamps, if needed.
- 3.7 Adjustable lighting fixtures shall be focused and adjusted as directed by the Owner or Engineer.
- 3.8 Exits shall have chevron directional, be visible from all directions, and shall have minimum 6" high and 2" wide letters (letter "I" shall be 3/4" wide), 3/8" spacing between letters. Illuminance shall be 0.06 foot-lamberts minimum. Exit signs shall have battery back-up power, exits shall be visible from 40' in any direction.

END OF SECTION

SECTION 26 24 00 - SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Switchgear, including:
 - 1. Meter banks.
 - 2. Owner's Panel.
- B. Building service is 120/208 3 PH, 60 Hertz, 4 wire.

1.3 SCOPE OF WORK

- A. Work under this Section includes, but is not necessarily limited to, furnishing of all labor, materials, appliances, equipment, tools, transportation, superintendence and services and performing all operations required to construct and install, complete and operative, the electrical work and systems described and/or specified in this Section.

1.4 REFERENCES

- A. Refer to section 260500 Common Work Results for Electrical for code references.

1.5 SUBMITTALS

- A. Submit product data under provisions of Section 260500

PART 2 - PRODUCTS

2.1 SERVICE

- A. The service shall be as indicated on drawings and shall meet all National and Local Codes and the Utility Company's requirements. Electrical contractor is responsible for final coordination, location and layout of electrical equipment with room dimensions and other trades. Electrical contractor shall provide and furnish equipment best suited for space requirements and submit for shop drawing review with dimension and coordinated layout shown.
- B. Primary service and cables will be furnished and installed by the Utility Company. However, this Division shall be responsible for the entire service installation and connection to switchgear and shall include all charges from the Utility Company for service installation, including inspection fees, if any, in the Bid.
- C. Provide metering socket, current transformer provisions, all in type and style as approved by Utility Company.
- D. Secondary service characteristics shall be 3 phase, 4 wire, 120/208 volt, 60 cycle.

2.2 MAIN DISTRIBUTION

- A. Electrical Contractor shall field verify all working clearances before submitting any shop drawings for review.
- B. Main electrical units shall consist of a completely enclosed self-supporting metal structure of the required number of vertical sections, incorporating main and branch circuit breakers and other associated equipment as indicated on the Drawings, completely factory built and bussed for 120/208 volt, 3 phase, 4 wire, full size neutral, 60 cycle, AC service, CT's and main switch.
- C. The equipment shall be NEMA Class II construction finished with a dark gray interior and exterior over all steel surfaces. All sheet metal parts shall be rust free prior to painting. Provide engraved nameplates for each circuit. Exterior equipment shall be Nema3R.
- D. Provide aluminum bussing.
- E. Electrical equipment shall be Siemens, Westinghouse, or Square D.

2.3 GROUNDING AND BONDING

- A. All non-current carrying metallic parts of electrical equipment, machines, appliances and conduits shall be securely grounded to a common ground bus and ground bus shall be connected to the water main, with a copper or brass pipe clamp, on the street side of the water service; jumpers shall be installed by-passing all valves.
- B. All grounding conductors shall be made with as few connections as possible. All connections shall be made with an approved type of solderless connector and shall be protected from mechanical injury.
- C. All contact surfaces shall be thoroughly cleaned before connection is made so as to ensure a good metal-to-metal contact. Connections shall be readily accessible for inspection.
- D. The ground and bonding systems shall be in strict accordance with the National Electrical Code.
- E. Grounding to building steel shall be made with cadweld.

2.4 PANELBOARDS

- A. Panelboards shall be 120/208 volts 1-phase 3-wire 30 circuit flush mounted type. Panelboards shall be rated 22,000 amps RMS symmetrical short circuit current. Coordinate recessed panelboards with architectural drawings for wall stud dimensions..
- B. Circuit Breakers:
 - 1. Circuit breakers shall be UL listed for use with installed electrical distribution equipment. Trip indication shall be clearly shown by the breaker handle taking position between ON and OFF when the breaker is tripped and by Visi-Trip indication. The Visi-Trip indication will consist of a luminous, tripped-circuit indicator. The indicator is to be protected by a window which seals the breaker case. The Visi-Trip indicator shall not be visible when breaker is On or Off. Breakers shall be rated 15,000 amps RMS symmetrical. Supply breakers as needed, see panel schedules and riser for a complete installation even if not indicated in the panel schedules.
- C. Panelboard Bus Assembly:
 - 1. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type. All current-carrying parts of the bus assembly shall be plated. Ratings of mains shall be as shown in the panelboard schedule on the Drawings.
- D. Wiring Terminals:

1. Terminals for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type of conductor specified. Bi-metallic adapters such as Mac-Adapt shall be used for Aluminum cables. Provide sub-feed lugs as shown on drawings.

E. Circuit Numbering:

1. Panelboard circuit numbering shall be such that starting at the top, odd numbers shall be used in sequence down the left-hand side and even numbers shall be used in sequence down the right-hand side.

F. Cabinets and Fronts:

1. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA Standards Publication No. PBI-1971 and UL Standards No. 67 for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel.
2. Fronts shall include doors and have flush, brushed stainless steel. Fronts shall have adjustable indicating trim clamps which shall be completely concealed when the doors are closed. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. The directory card shall provide a space at least 1/4" high by 3" long or equivalent for each circuit. The directory shall be typed to identify the load fed by each circuit. Fronts shall be of code gauge, full finished steel, with rust-inhibiting primer and baked-enamel finish.

G. UL Listing:

1. Panelboards shall be listed by Underwriters' Laboratories and bear the UL label. Panelboards shall be Square D, Eaton, General Electric.

H. Mounting:

1. Panels shall be surface or recessed mounted with type, size, and number of branch circuit breakers as shown on Drawings.
2. Surface mounted panels shall be mounted at least 1" off the wall on suitable backboard which shall not block the vertical flow of air in back of panel. Flush mounted panels shall be installed to align with finished wall surfaces.

- G. Unit load centers shall be 120/208V 125A 1-phase 3-wire 30 circuit flush-mounted type panels UL listed for residential dwelling units.

- H. Owner load centers shall be 120/208V 3-phase 4-wire 30 circuit surface-mounted type panels UL listed for residential use.

PART 3 - EXECUTION

3.1 SERVICE

- A. The service shall be as indicated on the Drawings and shall meet all National and Local Codes and the Utility Company's requirements.
- B. Provide metering socket, current transformer provisions, all in type and style as approved by the Utility Company. Electrician responsible for to procure and install CT's from local utility.

3.2 PANEL SCHEDULES

- A. Refer to drawings for detailed schedules for all distribution panels.

END OF SECTION

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Branch circuit panelboards.

1.3 RELATED WORK

- A. Section 260500- General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 REGULATORY REQUIREMENTS

- A. Refer to section 260500 Common Work Results for Electrical for code references.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Eaton Corp.; Cutler-Hammer Products.
- B. General Electric Co.; Electrical Distribution & Control Div.
- C. Siemens Energy & Automation, Inc.
- D. Square D. Co.

2.2 ENCLOSURES

- A. Panels: Surface or flush mounted complete with panel trim having concealed hinges and trim mounting screws. Provide locking door with flush catch.
- B. Tube: Galvanized.
- C. Keys: Provide two keys for each panel. Make keys interchangeable for panels of same voltage.

2.3 120/208 VOLT PANELBOARDS

- A. Panelboards: 3 phase, 4 wire, solid neutral design with sequence style bussing and full capacity neutral, composed of an assembly of bolt-in-place molded case automatic circuit breakers with thermal and magnetic trip and trip free position separate from either ON or OFF positions. Provide common simultaneous trip for 2 and 3 pole breakers. Provide interrupting ratings of 22,000 AIC for 208 volts.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide mounting brackets, busbar drilling, and filler pieces for unused spaces.
- B. Prepare and affix typewritten directory to inside cover of panelboard indicating loads controlled by each circuit.
- C. Provide breaker for elevator shunt trip.

END OF SECTION

SECTION 26 27 26 - ELECTRICAL DEVICES

PART 1 - GENERAL

1.1 GENERAL

- A. All applicable provisions of the General Conditions, the Supplementary General Conditions and Division 1 shall apply to all work of this Section.

1.2 WORK INCLUDED

- A. Provide, where indicated, specification grade, Underwriters' Laboratories listed, wiring devices.
- B. Furnish all power outlets other than standard duplex receptacles with a matching male cap.
- C. Devices:
 - 1. Wall Switches
 - 2. Receptacles (Standard, Isolated Ground and GFCI Type)
 - 4. Face Plates
 - 5. Wall Dimmer
 - 6. Timer Switches
 - 7. Floor mounted devices

1.3 RELATED WORK

- A. Section 260500 - Common Work Results for Electrical.
- B. All other Sections of Division 26.

1.4 SUBMITTALS

- A. Submit product data under provisions of Section 260500.
- B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

- A. Acceptable Manufacturers:
 - 1. Hubbell
 - 2. Leviton
 - 3. Arrow-Hart
- B. 20 Amp - 1P, Hubbell #1221-I.
- C. 20 Amp - 2P, Hubbell #1222-I.
- D. 20 Amp - 3-Way, Hubbell #1223-I.
- E. 20 Amp - 4-Way, Hubbell #1224-I.
- F. 20 Amp - With Pilot Light, Hubbell #1221-IL.

2.2 RECEPTACLES

- A. Acceptable Manufacturers:
 - 1. Hubbell
 - 2. Leviton
 - 3. Arrow-Hart

- B. Specification Grade, Straight Blade Duplex Receptacle (Hubbell 5362-Ivory or equal)
 - 1. Rating: 125 Volt - 20 Amp
 - 2. Poles and Wires: 2 Pole, 3 Wire, Grounding
 - 3. Nema Type: 5-20R

- C. Specification Grade, Straight Blade Duplex Receptacle with **Isolated Ground** (Hubbell IG5362-Orange or equal)
 - 1. Rating: 125 Volt - 20 Amp
 - 2. Poles and Wires: 2 Pole, 3 Wire, Grounding
 - 3. Nema Type: 5-20R

- D. Specification Grade, Straight Blade, Duplex, **GFCI** Receptacle (Hubbell GFR5352-Ivory or equal)
 - 1. Rating: 125 Volt - 20 Amp
 - 2. Poles and Wires: 2 Pole, 3 Wire, Grounding
 - 3. Nema Type: 5-20R

- E. Specification Grade, Straight Blade, Duplex, **Tamper Resistant Arc Fault** Receptacle (Hubbell AFR20TRI-Ivory or equal)
 - 1. Rating: 125 Volt - 20 Amp
 - 2. Poles and Wires: 2 Pole, 3 Wire
 - 3. Nema Type: 5-20R

2.3 FACEPLATES

- A. Wall Switch Face Plates (With the required number of gangs)
 - 1. Smooth thermoplastic (Ivory) (Brown) (Gray) (White) (Black) (Red).
 - 2. Satin finish stainless
 - 3. Wet Location (Hubbell 1795 or equal)

- B. Receptacle Face Plates (With the required number of gangs)
 - 1. Smooth thermoplastic (Ivory) (Brown) (Gray) (White) (Black) (Red).
 - 2. Satin finish stainless
 - 3. Wet Location (Hubbell WP8M or equal)

2.4 TIMERS

- A. Mark Time Catalogue M9006 - 30 Minute Off.

2.5 DIMMERS

- A. Incandescent 600W to 1000W, Lutron N-1000.

- B. Fluorescent: Two (2) to twenty (20) 40 watt lamps, Lutron FD-20 (I20) (277).

- C. Matching faceplates by Lutron.

- D. Fluorescent dimmer ballasts to be as required by dimmer manufacturer.

- E. Rating: Sizes listed are minimum, larger size to accommodate load shown on Contract Drawings.
- F. Dimmer Boxes: Size as required by dimmer manufacturer and space to avoid derating of dimmer, or break-off of faceplate cooling fins.

2.6 FLOOR TYPE SERVICE FITTINGS

- A. Above floor power service fitting for greater than 3 inch pour.
 - 1. Satin aluminum housing, 3/4 inch nipple, with stainless device plates and 20 amp duplex receptacle, Hubbell SC3091 for one receptacle and Hubbell SC3092 for two duplex receptacles back to back.
 - 2. Full adjustable stamped steel floor box for greater than 3" depth of pour, Hubbell B-2527 shallow (B-2536 deep) with S-2525 cover.
- B. Above floor telephone service fitting for greater than 3 inch pour.
 - 1. Satin aluminum housing, 3/4 inch nipple with stainless steel plate with brushed hole, Hubbell SC3190, (Hubbell 3192 back to back) with floor box (same as for power).
- C. Flush type power floor outlet.
 - 1. Fully adjustable pressed steel floor box with 20 amp, 120 volt grounding type duplex receptacle, Hubbell B2529.
 - 2. Flush cover for duplex receptacle: Brass flush cover suitable for floor box with flap opening. Provide brass carpet (linoleum) (terrazzo) rings.
- D. Flush type telephone floor outlet.
 - 1. Fully adjustable pressed steel floor box, Hubbell B-2529. Provide brass flush telephone cover with brass plug, and brass carpet (linoleum) (terrazzo) ring.
- E. Fire rated poke-through outlets.
 - 1. Power: Brushed aluminum cast housing, stainless cover plates, two 20 amp duplex receptacles, Hubbell PT7PP2.
 - 2. Telephone: Brushed aluminum cast housing with stainless cover plate, Hubbell PT7TT.
- F. Floor fittings - Size for depth of floor pour. Submit product data for approval.
- G. Acceptable Manufacturers:
 - 1. Hubbell.
 - 2. Walker.
 - 3. Steel City.
 - 4. Substitutions: Under provisions of Section 01630.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wall switches 48 inches above floor, OFF position down.
- B. Install wall dimmers 48 inches above floor. Separate adjacent dimmers as instructed by manufacturer to prevent a requirement for derating of dimmers. Do not use common neutrals.

- C. Install convenience receptacles 18 inches above floor, 6 inches above (counters) (backsplash) grounding pole on (top) (bottom).
- D. Install specific-use receptacles at heights shown on Contract Drawings.
- E. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions.
- F. Install decorative plates on switch, receptacle, and blank outlets in finished are areas, using jumbo size plates for outlets installed in masonry walls.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
- H. Install devices and wall plates flush and level.
- I. Verify all mounting heights with architectural drawings.
- J. Coordinate device locations with architectural details.

END OF SECTION

SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 GENERAL

- A. All applicable provisions of the General Conditions, the Supplementary General Conditions and Division 1 shall apply to all work of this Section.

1.2 WORK INCLUDED

- A. Fuses.

1.3 RELATED WORK

- A. Section 260500 - General Provisions-Electrical.
- B. All other Sections of Division 26.

1.4 REFERENCES

- A. Refer to section 260500 Common Work Results for Electrical for code references.

1.5 SUBMITTALS

- A. Submit product data for all fuses.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Bussmann Fuse Company.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All fuses shall be of the same manufacturer, and shall be furnished and installed by this Division in all motor starters, cutouts, switches, and where shown on the Contract Drawings.
- B. In the event the electrical contractor wishes to furnish materials other than those specified, a written request, along with a computer generated short circuit and selective coordination study, shall be submitted to the Engineer for evaluation at least two weeks prior to bid date. Lack of request will indicate that the contractor shall submit fuses as specified.
- C. Fuses shall not be installed until equipment is ready to be energized. All fuses shall be furnished and installed by this Division.
- D. Mains, Feeders and Branch Circuits:
 - 1. Circuits 601 to 6000 ampere shall be protected by current limiting Bussmann Low Peak Time-Delay Fuses KRP-C. Fuses shall employ "O" rings as positive seals between the end bells and the glass melamine fuse barrel. Fuse links shall be pure silver links (99.9% pure) to limit the short circuit current let-thru values to low levels and comply with NEC Sections requiring component protection. The terminals shall be peened. Fuses shall be time-delay and must hold 500% of rated current for a minimum of 4 seconds, clear 20 times rated current in .01 seconds or less and be listed by

Underwriters Laboratories, Inc., with an interrupting rating of 200,000 amperes r.m.s. symmetrical. The fuses shall be UL Class L. Fuses shall be "Low Peak Yellow". Caution labels to alert the end user of the engineered level of protection shall be field installed by the electrician. Labels shall be marked with the proper fuse rating.

2. Circuits 0 to 600 ampere shall be protected by current limiting Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). all dual-element fuses shall have separate overload and short-circuit elements. Fuse shall incorporate a spring activated thermal overload element having a 284 degree F melting point alloy and shall be independent of the short-circuit clearing chamber. The fuse must hold 500% of rated current for a minimum of 10 seconds and be listed by Underwriters Laboratories, Inc., with an interrupting rating of 200,000 amperes r.m.s. symmetrical. The fuses shall be UL Class RK1. Caution labels shall be installed and marked with the proper rating on the equipment. Fuses using a Eutectic Alloy for overload protection will not be considered.
 3. Motor Circuits - All individual motor circuits rated 480 amperes or less shall be protected by Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). The fuses for 1.15 service factor motors shall be installed in ratings approximately 125% of motor full load current except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuse should be 150% to 200% of the motor full load current. Larger HP motors shall be protected by Bussmann Type KRP-C Hi-Cap Time-Delay Fuses of the rating shown on the Drawings. 1.0 service factor motors shall be protected by Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts) installed in ratings approximately 115% of the motor full load current except as noted above. The fuses shall be U.L. Class RK1 or L.
 4. When fused distribution switchgear is specified, circuit breaker panels shall be protected by Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts) as shown on the Drawings. The fuses shall be U.L. Class RK1.
- E. Spares - Upon completion of the building, this Division shall provide the Owner with spare fuses as listed below.
1. 10% (minimum of 3) of each type and rating of installed fuses shall be supplied as spares.
 2. Provide spare fuse cabinet, catalog number SFC, at locations shown on the drawings.

END OF SECTION

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

- A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:
1. Service disconnecting means
 2. Feeder and branch circuit protection
 3. Motor and equipment disconnecting means

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interruptor
- B. RMS: Root mean square
- C. SPDT: Single pole, double throw

1.4 SUBMITTALS

- A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' data on features, performance, electrical characteristics, ratings and finishes.
- B. Shop Drawings: For each switch and circuit breaker.
1. Dimensioned plans, elevations, sections and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Current and voltage ratings.
 - c. Short-circuit current rating
 - d. Features, characteristics, ratings and factory settings of individual overcurrent protective devices and auxiliary components.
 2. Wiring Diagrams: Power, signal and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 260505. Include the following:
1. Basis of Certification: Indicate whether withstand certification is based on actual tests of assembled components or on calculation.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" article.
- E. Manufacturers Field Service Report.
- F. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 section "Closeout Procedures," include the following:
1. Routine maintenance requirements for components.
 2. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.
 3. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA AB 1 and NEMA KS 1.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment and adjacent surfaces. Maintain required work-space clearances and required clearances for equipment access doors and panels

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Fusible Switches:
 - a. Eaton Corp.; Cutler-Hammer Products
 - b. General Electric Co.; Electrical Distribution and Control Division
 - c. Siemens Energy & Automation, Inc.
 - d. Square D Co.
 2. Molded-Case Circuit Breakers
 - a. Eaton Corp.; Cutler-Hammer Products
 - b. General Electric Co.; Electrical Distribution and Control Division
 - c. Siemens Energy & Automation, Inc.
 - d. Square D Co.

2.2 ENCLOSED SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 amps and smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSED CIRCUIT BREAKERS

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low level over-loads, and instantaneous magnetic trip element for short circuits.. Adjustable magnetic trip setting for circuit-breaker frame sizes of 250 amps and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front mounted, field-adjustable trip setting.
 - 3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
 - a. Instantaneous trip
 - b. Long- and short-time pickup levels
 - c. Long- and short-time, time adjustments
 - d. Ground-fault pickup level with time delay
- B. Molded-Case Circuit Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - 1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
 - 2. Application Listing: Appropriate for application; type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - 4. Shunt Trip: 120 volt trip coil energized from searate circuit, set to trip at 55 percent of rated voltage.
 - 5. Under-Voltage Trip: Set to operate at 35 to 75 percent of rated voltage with field adjustable 0.1 to 0.6 second time delay.

2.4 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
 - 1. Outdoor Locations: NEMA 250, Type 3R
 - 2. Kitchen Areas: NEMA 250, Type 4X, stainless steel
 - 3. Wet or Damp Indoor Locations: NEMA 250, Type 4

2.5 FACTORY FINISHES

- A. Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with mounting and anchoring requirements specified in division 260505.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install switches and circuit breakers according to manufacturer's written instructions.
- D. Provide circuit breaker type switches for all equipment for proper means of disconnect per the NEC.
- E. Install switches and circuit breakers level, and plumb, within sight of and no more than 20 feet from equipment being served.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 260505.
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 CONNECTIONS

- A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.
- B. Install wiring between switches and circuit breakers, and control and indication devices.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
 - 2. Test continuity of each line- and load-side circuit.
- B. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Infrared Scanning: After substantial completion, but not more than 60 days after final acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
 - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 2. Record of Infrared Scanning: Prepare a certified report that identifies switches and circuit breakers checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

- A. Set field-adjusted switches and circuit-breaker trip ranges.

3.7 CLEANING

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 26 29 50 - MECHANICAL EQUIPMENT CONTROLS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Miscellaneous mechanical equipment and controls.
- B. 120 volt control power to each Automatic Control System Control Panel furnished under Section of Division 23.

1.3 RELATED WORK

- A. Section 260500 - Common Work Results for Electrical.
- B. Other Sections of Division 26.
- C. Applicable Sections of Division 23.

1.4 REFERENCES

- A. Refer to section 260500 Common Work Results for Electrical for code references.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Refer to applicable sections of Division 26.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Cooperate with Mechanical Contractor in connection of control circuits into Control Terminal Cabinet.
- B. Provide remote control connection to remote devices. (Except Automatic Control System devices)
- C. Provide power wiring to all motors, motor controls, and mechanical components as indicated on drawings or per Div. 23 requirements. Where not indicated on drawings coordinate all requirements with Div 23.

END OF SECTION

SECTION 26 61 00 - COMMISSIONING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SCOPE OF WORK

- A. Testing and Adjusting of electrical systems.
- B. Certification and Demonstration of system operations and performance.
- C. Owner Instruction.
- D. Operations and Maintenance Manuals.
- E. "As-Built" Drawings.

1.3 RELATED DOCUMENTS

- A. Section 260500 - Common Work Results for Electrical.
- B. Section 260505 - Basic Materials and Methods.

1.4 QUALITY ASSURANCE

- A. Perform all testing , demonstration, etc of Fire Alarm, Call-For-Aid and similar systems as required for the satisfaction of local officials.
- B. Perform all testing as required by the equipment manufacturers for acceptance and guarantee of equipment.

PART 2 - PRODUCTS

- 2.1 None Required.

PART 3 - EXECUTION

3.1 TESTING

- A. Refer to specific Section of the Specification governing specific equipment testing.
- B. Coordinate all testing operations with Owner and Architect. Provide sufficient notice to all affected parties and review agencies.
- C. Provide written documentation of results from all tests performed, including appropriate acceptance by equipment/system manufacturer and local building and/or fire officials.

3.2 SCHEDULE AND SEQUENCE OF WORK

- A. Upon the completion of each segment or phase of work that is turned over to the Owner for full or partial occupancy, fully test and certify each system as operational and meeting project performance requirements.

- B. Obtain sign-off from Officials Having Jurisdiction for each system, sub-system, or portion of work as required for Owner's use and occupation of areas of completed work.
- C. Coordinate sequence and schedule of work with the General Contractor and Owner's use of the building.

3.3 DOCUMENTATION

- A. Document all revisions, changes due to field conditions, etc. on a clean set of Drawings during the construction process. Transfer this information onto the final "as-built" documents. Refer to Section 260500 for additional requirements.
- B. Refer to Section 260500 for O & M manual and Owner instruction requirements.
- C. All documentation relating to system testing, sign-off, start-up and commissioning exercises shall be submitted for record to the Owner and Architect. Copies of all such documentation shall be incorporated into the project Operation and Maintenance Manual.

END OF SECTION

SECTION 27 05 00 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The following drawings indicate the work required for this Division of Work:

All Drawings associated with this project.

All other contract drawings and specifications associated with the project.

B. Certain items of work pertaining to the work of this Division are provided under other Divisions of the Specification. These include, but are not limited to the following:

1. Excavating and backfilling for underground primary and secondary electric, telephone, television, and other building services provided under this Division.
2. Concrete work for equipment bases, transformer and switching pads, etc.
3. Installation of access doors in finished construction.
4. Installation of pipe sleeves in walls and floors.
5. Framing of openings in walls, floors, roof.
6. Chases, soffits, furred spaces required to conceal work of this Division.

C. Materials furnished under other Divisions and installed and/or wired by this Division include, but are not limited to:

1. Mechanical Equipment. (Motor Starters furnished under Division 23)
2. Temperature Controls.
3. Sprinkler tamper and flow switches and accessories.
4. Miscellaneous architectural items such as overhead doors, projection screens, kitchenette units, etc.
5. Elevator equipment, including power for machine and controls, trail cable, receptacle and telephone outlet(s) in equipment room, light and receptacle in pit(s).

D. Complete Utility connections as indicated or needed, extension to Project, metering as required, and connection to building systems. This work includes:

1. Apply for all services and pay for all fees, assessments, and charges of the Utility for each connection, all in a timely manner and according to the Project Schedule.
2. Provide and install all metering and accessories as required by Utility, make entire service in accordance with the Utility's requirements or other applicable regulation.
3. All necessary coordination with Utility to determine scope of work provided by Utility and part provided by Contractor so that a complete Utility connection is made.

E. Participate in coordination of Mechanical and Electrical installations. Provide additional coordination drawings, as directed by Architect, in areas of potential interferences.

- F. All work shall comply with applicable codes and regulations, including, but not limited to the following:
1. Connecticut Building, Fire Safety, and Health Codes, as amended, including all codes, standards and regulations referenced therein.
 2. Requirements of Local, State, and Federal authorities having jurisdiction over the Work.
 3. Current regulations of the Occupational Safety and Health Administration (OSHA).
 4. Requirements of affected Public Utility Companies.
 5. Special requirements set down by the Owner, the Owner's Insurance Carrier, or other concerned entities.
 6. NFPA 70-2017, National Electrical Code. Contractor shall conform to the latest State of Connecticut approved NFPA 70, codes. Supply, install and wire complete any devices or equipment required by code indicated or excluded.
 7. Contractor shall supply temporary power sufficient enough to carry the load of the building(s) to be renovated. Provide temporary lighting and power in conformance to OSHA regulations.

1.2 RELATED DOCUMENTS

- A. Instructions to Bidders, the General Provisions of the Contract, including General Conditions and General Requirements shall apply and be binding to the Contractor and/or Subcontractor who performs this work.
- B. Where items of the General Conditions or Special Conditions are repeated in this Section of the Specifications, it is intended to call particular attention to or to qualify them; it is not intended that any other parts of the General Conditions shall be assumed to be omitted if not repeated herein.

1.3 INTENT

- A. Intent of the specifications and drawings is to call for finished work, tested and ready for operation.
- B. Material, fixtures, and equipment mentioned in specifications or shown on drawings shall be furnished new, completely installed adjusted and left in a clean, safe and satisfactory condition ready for operation. All supplied appliances and connections of every sort necessary shall be furnished and installed to the satisfaction of Architect and Owner.
- C. Apparatus, appliances, material or work not shown on the plans but mentioned in specifications, or vice versa, or any incidental accessories such as electrical disconnect switches, circuit breakers, etc., necessary to make the work complete, serviceable and perfect in all respects and ready for operation, even though not particularly specified, shall be installed without additional expense to the Owner.
- D. Minor details not usually shown or specified, but necessary for proper installation and operation shall be included in the work as though herein specified or shown.
- E. Prior to submission of bids, give written notice to Architect of any materials or apparatus believed to be inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; or any necessary items or work omitted. In the absence of such written notice, it is mutually agreed that the cost of all required items has been included and that all systems will function satisfactorily without extra compensation.

1.4 DEFINITIONS

- A. "Architect" means Stephen Jager Associates LLC , 4 Grand View Drive, Enfield, CT 06082.
- B. "Engineer" means Acorn Consulting Engineers, Inc., West Simsbury, CT 06092
- C. "regulating authorities" or "authorities", means all Governmental, Utility, and Insuring Authorities having jurisdiction.
- D. "Subcontractor or Contractor", means specifically the Subcontractor working under his respective Section of Specifications.
- E. "furnish" or "provide" means to supply, erect, install and connect up complete in readiness for regular operation the particular work referred to, unless otherwise specified.
- F. "conduit" includes in addition to pipe, all fittings, connectors, hangers, and other accessories relating to such and the plant and labor necessary to install same.
- G. "concealed" means hidden from sight in chases, furred spaces, hung ceilings, embedded in construction, or buried underground.
- H. "exposed" means not "concealed" as defined above. Trenches, crawl spaces and tunnels shall be considered "Exposed"unless specifically noted otherwise.
- I. "wire" or "wire up" means to properly connect the related item to the appropriate source of power including all needed connectors, circuit breakers, switches and other items necessary for normal operation of the item.
- J. "temperature control" means, in addition to thermostats all heating, ventilating, air conditioning motorized dampers, solenoid valves, electrical air device actuators, relays and other electrical accessories related to HVAC and other mechanical systems.
- K. "concealed" means hidden from sight as in chases, furred spaces, shafts, or above ceilings.

1.5 DRAWINGS

- A. Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement. Deviations from the depicted arrangement shall be approved by the Architect.
- B. Location of all items shown on drawings or called for in specifications, not definitely fixed by dimension, are approximate only. Exact location necessary to secure best conditions and results shall be determined at the project and shall have the approval of the Architect.
- C. Follow the drawings in laying out work. Check drawings of other trades to verify spaces in which work will be installed to insure maximum headroom and space conditions. Where headroom or space conditions appear inadequate, the Architect shall be notified before proceeding with installation.
- D. Work shown on the drawings is intended to be approximately correct to the scale of the drawings. Figured dimensions and detailed drawings are in all cases to take precedence over them. Typical details shall apply to each and every item of the project where such items are incorporated. Drawings utilize symbols and schematic diagrams to indicate various items of work. These have no dimensional significance, nor do they delineate every item required for the intended installation. Work shall be installed in accordance with the diagrammatic intent of the Electrical drawings, and in conformity with the dimensions indicated on final Architectural and Structural working drawings and on equipment shop drawings.
- E. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for

complete work are excluded.

- F. Details appear on the drawings which are specific with the regard to the dimensioning and positioning of the work. These are intended for the purpose of establishing general feasibility. They do not obviate field coordination.
- G. If directed by the Architect or Owner, make reasonable modifications in the layout to prevent conflict with work of other trades or for proper execution of the work.
- H. Abide by and comply with the true intent of the drawings and specifications taken as a whole, to provide a complete job ready for operation. "Drawings and specifications taken as a whole" means all contract plans and specifications -- Architectural, Structural and all Subcontractors' drawings and specifications. Refer to drawings and specifications of other trades to check if equipment or items included under other Sections will require work in order to comply with the statement above "to provide a complete job ready for operation". This work shall be included in the Base Contract. It shall be understood that the indication and/or description of any item, on the drawings or specifications, or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated.
- I. No statement in the specifications or any omission in either plans or specifications should be misunderstood as relieving the contractor from providing a complete job ready for operation. All existing circuits and devices shall be energized and tested before the completion of the project, contractor shall supply all the required material, labor and equipment necessary for a complete installation. No exclusions from, or limitations in, the language used in drawings or specifications shall be interpreted as meaning that the items or accessories necessary to complete any required system or item of equipment are to be omitted.
- J. Information as to the general construction shall be derived from Structural and Architectural Drawings and Specifications only.
- K. The use of words in the singular shall not be considered as limiting where other indications indicate that more than one item is referred to.

1.6 VISITING THE SITE FOR SURVEYS AND MEASUREMENTS

- A. Before submitting a Bid, visit the site and become thoroughly familiar with all conditions under which the Work will be installed. Contractor will be held responsible for any assumptions, omissions or errors made as a result of failure to become familiar with the site and the Contract Documents.
- B. Base all measurements, both horizontal and vertical, from established benchmarks. Reference all Work from these established lines and levels. Verify all measurements at site and check the correctness of same as related to Work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the Drawings and Specifications, notify the Engineer and do not proceed with the Work until instructions have been received from the Engineer.

1.7 SUBSTITUTIONS

- A. Within sixty (60) days after award of contract, submit, through the General Contractor, to the Architect for review, a list of manufacturers of all materials and equipment proposed for use on the project. Indicate on submittal which items are substituted.
- B. A review, without exception, of this list does not constitute approval, nor does it guarantee acceptance of the shop drawings when submitted.
- C. The contractor's intent to purchase the exact make specified does not relieve him from the responsibility to submit this list. Failure to submit this list will require the contractor to supply the exact item specified as the basis for

design.

- D. Submittal of items which differ from those specified or indicated as the basis for design carries the implicit guarantee that the substituted item will provide the intended service and is compatible with other items or systems interfacing with it.
- E. When proposing a substitute item, the contractor is responsible for all costs of accommodating the substitution, including, but not limited to, space and accessibility, modifications required to other systems, structural adequacy and the like.
- F. If substitutions require the Architect or Engineer to prepare sketches or revised drawings in order to become acceptable, the cost of such sketches, drawings, or engineering shall be borne by the contractor.
- G. When substitutions require Engineer or Architect to spend an inordinate time for review or substitutions, the cost of review over four (4) hours will be charged to the contractor who made the submittal.

1.8 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the Work, except as otherwise specified, must be new and of first-class quality and be furnished, delivered, erected, connected and finished in every detail and so selected and arranged as to fit properly into the building spaces. Where no specific kind of quality of material is given, furnish a first-class standard article as accepted by the Engineer.
- B. Furnish the services of an experienced superintendent who is constantly in charge of the installation of the Work, and present on site at all times during the Work. Furnish all skilled Workmen, helpers and labor required to install, unload, transfer, erect, connect up, adjust, start, operate and test each system.
- C. Unless otherwise specifically indicated on the Drawings or in the Specifications, all equipment and materials must be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- D. Quality of Work must be consistent with good trade practice and installed in a neat Workmanlike manner. The Engineer reserved the right to reject any Work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. Replacement of said Work, in satisfactory manner, will be at no extra charge to the Owner.

1.9 SHOP DRAWINGS

- A. After acceptance of List of Manufacturers required under paragraph 1.07(A) of this Section, and prior to delivery of materials and equipment to the project site, submit eight (8) copies of shop drawings of each item for review by the Architect.
- B. Each submittal shall contain a complete list of all materials contained within. Include intended use for each item.
- C. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature and complete characteristics of equipment, including, but not limited to, dimensions, capacity, code compliance, motor and drive and testing, construction, electrical characteristics, support, all as required for this project.
- D. Architect may designate submittal of physical samples for review on items where actual color, texture or other characteristics might not be adequately described by a drawing or written material. Upon approval of a sample, each and every item of that sort must be identical to the approved sample.
- E. Samples, drawings, specifications, catalogs, etc., submitted for review shall be labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specification governing, Subcontractor's name and name of project.

- F. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the Subcontractor from his responsibility of furnishing material or performing work according to Contract Documents.
- G. Failure to submit shop drawings in ample time for checking shall not be cause for an extension of contract time, and no claim by reason of such default will be allowed.
- H. Submittals for all systems which require the interconnection of three or more devices shall include a system block diagram. The diagram shall be of the one line type and with sufficient detail to show interfaces and method of operation.
- I. Material or equipment installed prior to review shall be liable for removal and replacement at no extra charge to the Owner if the material or equipment does not meet the intent of Drawings and Specifications.

1.10 RECORD DRAWINGS

- A. Maintain a record set of Electrical Drawings at the job site on which any changes in location of equipment, devices, panels and major conduits are recorded.
- B. At the end of construction, provide the Owner with a complete set of As-Built Drawings, including all power and lighting plans (indicating as-built circuiting), power and special systems riser diagrams and panel schedules and fire alarm use. Prepare As-Built documentation utilizing the most recent version of AutoCAD. Provide the Owner with a "CD ROM" disk and one set of reproducible mylar documents.
- C. If electronic copies of the contract documents are made available to the Contractor for use in production of As-Built documentation, the Contractor assumes responsibility for completeness and accuracy of the As-Built documents. Translation or manipulation of electronic documents provided to the Contractor is the responsibility of the Contractor.
- D. Exact location of all conduits and utilities under floor slabs shall be indicated and dimensioned on these drawings, as well as the final arrangement of conduits and junction boxes in concealed chases, concealed in walls or above ceilings.

1.11 LAWS, ORDINANCES, CODES, PERMITS AND FEES

- A. Give all necessary notices, obtain all permits and pay all governmental taxes, fees and other costs in connection with the work. File all necessary plans, prepare all documents and obtain all necessary approvals of governmental departments having jurisdiction. Obtain all required Certificate of Inspection of the work and deliver to Architect prior to application for final payment.
- B. Materials furnished and work installed shall comply with the rules and recommendations of the National Board of Fire Underwriters, with all requirements of utility companies, with the Board of Health, with the recommendations of the fire insurance rating organization having jurisdiction, with the local and state building codes, and with the requirements of all governmental departments having jurisdiction. If contract requirements are in excess of applicable codes, rules or regulations, contract provisions shall be given precedence.
- C. Provide utility services as required and as indicated on Drawings and in 1.01(D), above.

1.12 ROYALTIES AND PATENTS

- A. Pay all royalties and defend all suits and claims for infringement of any patent rights and save the Owner harmless on account thereof.

- B. If it is observed that a process or article specified is an infringement of a patent, promptly notify the Architect in writing. If any work is performed knowing it is to be an infringement of a patent, all costs arising therefrom shall be borne by the Contractor.

1.13 STANDARD SPECIFICATIONS

- A. Certain standard and staple materials may be described by reference to standard specifications. The standards referred to are as follows:

ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
UL	Underwriters Laboratories, Inc.
NFPA	National Fire Protection Association
FM	Factory Mutual Insurance Company
IRI	Industrial Risk Insurers (Formerly FIA)
IES	Illuminating Engineering Society
IEEE	Institute of Electrical and Electronic Engineers

- B. The particular specification will be identified by appropriate prefix and number only, with the latest or legally defined revision being applicable.

1.14 INTERPRETATION OF PLANS AND SPECIFICATIONS

- A. Questions or disagreements arising as to the intent of the specifications or the drawings, or the kind and quality of work required thereby, shall be decided by the Architect whose interpretation thereof shall be final, conclusive and binding on all parties.

1.15 PROCEDURE OF WORK

- A. All work shall proceed in a manner approved by the Architect.
- B. Determination of the required job procedure will be made by the Architect in the best interests of the job and may be adjusted to meet job conditions.

1.16 CHANGES TO WORK

- A. During the progress of the work, the Architect may make any changes, alterations, additions or omissions to work drawn or specified after having agreed on an equitable allowance to be added to or deducted from the contract price. Claims for extra cost to cover extra work will not be allowed unless specifically authorized in writing by the Architect prior to the execution of such additional work.

1.17 COORDINATION OF TRADES

- A. Give full cooperation to other trades and furnish any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.

1.18 PROTECTION OF WORK AND PROPERTY

- A. Be responsible for the maintenance and protection of equipment, materials and tools stored or installed on the

job site, from loss or damage of all causes, until final acceptance by the Owner.

- B. Be responsible for the protection of finished work of other trades from damage or defacement and remedy any such injury at no additional cost to the Owner.

1.19 CUTTING, PATCHING AND PAINTINGS

- A. Cutting, patching and painting shall be done by the General Contractor unless otherwise noted on plans or specifications.
- B. Cooperate with the General Contractor in making sure that sleeves are set and chases provided for the installation of the work. If failure to do so makes it necessary to cut and patch any part of the completed structure, this shall be done at the expense of the subcontractor having jurisdiction over the work.

1.20 TEMPORARY OPENINGS

- A. Ascertain whether any special temporary openings in the building will be required for the admission of apparatus and notify the Contractor accordingly.
- B. Failure to give sufficient notice to the Contractor in time to arrange for these openings during construction, shall result in this subcontractor's assumption of all costs pertaining to making and repairing any such temporary openings.

1.21 MANUFACTURER'S IDENTIFICATION

- A. Manufacturer's nameplate, name or trademark shall be permanently affixed to all material and equipment furnished under this specification. The nameplate of a subcontractor or distributor will not be acceptable.

1.22 MANUFACTURERS IDENTIFICATION

- A. Identify each control and item of equipment with a permanently attached nameplate made of black surface, white core laminated plastic with incised letters, bearing the name of the equipment item and designation of the item taken from the drawings or schedules.
- B. Identify electrical feeders and risers where they enter or leave a junction box or cabinet with fiber tags having the cable designation stamped thereon and tied securely to each cable or by means of printed plastic self-adhering labels attached to the cable sheath.
- C. Subcontractor shall label all cabinet, panels, pull boxes, etc., in the electrical system using the designations shown on the plans and schedules such as -- "PANEL H1", "MDP-1", etc., using incised laminated plastic nameplates securely attached.
- D. Provide typewritten directory cards in all electric panels showing circuit numbers and area or load serviced.
- E. Refer to Section 260553.

1.23 INSTRUCTION BOOKS AND OPERATING INSTRUCTIONS

- A. Furnish three (3) sets of operating and maintenance manuals in hard cover covering all electrical systems in the project. Include manufacturer's approved submittal of each item. Submit for review of Architect.
- B. Manuals shall contain, as a minimum, the following:
 - 1. Description of the project and major subsystems.

2. Descriptive text covering the startup, adjustment, trouble-shooting, and safe shutdown for each system.
 3. Copies of each typewritten panel directory.
 4. Copies of lighting control wiring diagrams and description of operation.
 5. A schedule of maintenance based on the manufacturer's recommendations, showing what work is to be performed and at what intervals.
 6. Copies of the finally approved submittal for each item, together with the manufacturer's installation, operation, and maintenance instructions and parts lists.
 7. List of Firm names, addresses, telephone numbers to be contacted for regular or emergency service, or purchase of parts.
- C. Manuals shall be arranged in one or more three-ring binders, completely indexed as follows:
1. General information; Items 1, 2, 3, & 7 above.
 2. Control system information; Item 4.
 3. Approved submittal, maintenance, and parts information; Items 5 & 6.
 4. Each section shall be identified by a permanent index tab.
 5. Each item within a major section shall be separately indexed for quick reference.
- D. Provide adequate written and/or verbal instructions to the Owner's operating personnel and such others as the Owner may designate. As a minimum, contractor shall provide for three (3), eight hour working days of instructions. Individual equipment or system Specifications may require additional or different periods of instruction.

1.24 SLEEVES, INSERTS AND ANCHOR BOLTS

- A. Be responsible for the location and proper position of sleeves and anchor bolts. If failure to do so requires cutting and patching of finished work, it shall be done at the Subcontractor's expense.
- B. Conduits passing through concrete or masonry floors, walls or partitions shall be provided with sleeves having an internal diameter 1/2" larger than the outside of the conduit.
- C. Sleeves through concrete floors or interior masonry walls shall be Schedule 40 black steel pipe, set flush with wall, floor or ceiling surface. Sleeve through floors shall be packed with a fireproof, resilient material to maintain the fire rating integrity of the assembly and caulked with waterproof compound to the approval of the Architect.
- D. Sleeves through floors of wet areas such as equipment rooms, toilets, etc., shall extend 2" above finished floor surface and be sealed watertight.

1.25 ACCESSIBILITY

- A. Install work so that all parts are readily accessible for inspection, maintenance and repair.
- B. Be fully informed regarding peculiarities and limitations of space available for the installation of materials and apparatus.
- C. See that all equipment items are made easily accessible for adjustment and operation.

- D. Where such items must be located over non-access ceilings, in chases or other inaccessible places, access doors and/or panels of a type and size approved by the Architect shall be supplied and delivered to the General Contractor for installation.
- E. Items requiring access are to be grouped to keep size and quantity of access doors to a minimum.
- F. Access doors installed in walls, floors or ceilings shall have the same fire rating as the wall, floor or ceiling.

1.26 ELECTRICAL WORK

- A. Install and wire up complete all electrical switches, starters and unmounted motors and other electrical equipment supplied by other trades.
- B. Furnish separate disconnect switches for all motors controlled by magnetic starters.
- C. Each trade supplying electrically operated equipment for installation and wiring by this Subcontractor is to furnish sufficiently detailed instructions and wiring diagrams for their installation.
- D. Control devices that include mechanical elements such as float switches, alternators, temperature and pressure switches or controls, damper operators or the like, shall be installed by the trade furnishing them, ready for wiring by this Subcontractor, unless otherwise indicated.
- E. Equipment including a number of electrical items in a single enclosure or common base shall be supplied to the job site internally wired as a unit, to numbered terminals, ready for wiring connections.

1.27 ELECTRIC MOTORS

- A. Motors shall conform to all applicable regulations and be suitable for the load, duty, voltage, phase, frequency, service and location intended.

1.28 TEMPORARY POWER

- A. Furnish and install all required temporary electrical services, including lighting and ground-fault circuit-interrupter receptacles as required for construction purposes.
- B. In all of the above cases, furnish the appropriate trades, well in advance of their work schedule, with all information, dimensions, templates, wiring diagrams and devices necessary to coordinate the work.
- C. Be responsible for any additional costs incurred as a result of his failure to furnish information sufficiently in advance to allow for proper coordination.

1.29 TESTS

- A. Test systems and equipment as required by the various Sections of the Specifications.
- B. Tests to be witnessed by and to the satisfaction of the Architect or his representative and such others as may have legal jurisdiction.
- C. Work shall be tested, repaired and retested until an approved test is achieved.
- D. Damages resulting from tests shall be repaired or damaged work replaced to the satisfaction of Architect and Owner.
- E. Testing must be completed successfully prior to concealment of the work.

F. Completed systems shall be tested for proper operation, capacity and function. Insofar as possible, systems normally operated during certain seasons of the year shall be tested during the appropriate season.

G. Costs of all tests shall be borne by the appropriate Contractor.

1.30 QUIET OPERATION

A. All equipment shall be isolated from the building structure by approved means. Noises and hum of equipment shall be absorbed or attenuated so as not to be objectionable.

B. Where sound or vibration levels are considered objectionable by the Architect, they shall be corrected in a manner approved by the Architect, at no additional cost to the Owner.

1.31 USE OF INSTALLATION BY OWNER

A. Owner shall have the privilege of using any part of the work when sufficiently complete, but such use shall not be considered as an acceptance of the work in lieu of the written certificate from the Architect.

1.32 CLEANUP

A. Systems, enclosures, and equipment shall be thoroughly cleaned, inside and out, before being placed into operation.

B. Keep the site free from accumulation of waste materials or rubbish. At conclusion of the work, remove all surplus materials, tools, construction equipment and rubbish from the site and leave the premises in a clean condition.

1.33 GUARANTEE AND SERVICE

A. Guarantee that all work will be free from defects in workmanship and/or materials and that all apparatus will achieve the capacities and characteristics specified. If, during the period of one (1) year, or as otherwise indicated, from certificate of completion of the work, defects in material or workmanship appear, remedy such defects without cost to the Owner. In default thereof, the Owner may have such work done and charge the cost to the appropriate Contractor or Subcontractor. Also, indemnify the Owner for any property damage which might result from such a defect which made repairs necessary.

B. Certain equipment will require guarantee periods exceeding one year due to the need for seasonal operation. In such case, the guarantee will extend through at least one full, continuous season.

C. Any fault in a system shall be corrected, and any work damaged in the course of this correction shall be repaired, replaced and restored to its original condition at no additional cost to the Owner.

1.34 INSURANCE

A. Fully insure all employees, material and finished work as required by the General Conditions of the Contract.

1.35 SCAFFOLDING, RIGGING AND HOISTING

A. Unless otherwise indicated, the work of each Section includes all scaffolding, rigging, hoisting and services necessary for the delivery, erection and installation in place of all equipment and apparatus furnished and the removal of same when no longer required.

1.36 PROGRESS SCHEDULE

A. Keep informed of progress schedules of all other trades and work in accordance with the project schedule to

ensure timely completion of this work.

1.37 WORKMANSHIP

- A. All work shall be performed in a neat and workmanlike manner and shall conform to the best trade practices for such work.

END OF SECTION

SECTION 27 13 01 - TELEPHONE WIRING AND CONDUIT

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SCOPE OF WORK

- A. Provide all conduit, outlet boxes, terminal boards, sleeves, wiring etc., as indicated on drawings or as required. Provide raceway system as described on the drawings, or as specifically directed by the Telephone Company on the job site. Provide cat 5e cable from each phone outlet to main telephone board and tag both ends. Confirm cable type with telephone company.

1.3 RELATED WORK

- A. Section 270500 - Common Work Results for Communications.
- B. All other Sections of Division 26 & 27.

PART 2 - PRODUCTS

2.1 TERMINAL BOARDS

- A. Terminal boards shall be 3/4 inch plywood, 4 foot X 8 foot, unless indicated larger on drawings, or as directed otherwise by Telephone Company on job site. Provide quad receptacle on board for telephone electronic devices like signal booster/router.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Telephone service raceway shall be installed overhead into the building and shall be terminated where shown on Drawings. Coordinate with the Telephone Company to determine point of origin for the conduit.
- B. Paint Board light gray.
- C. All telephone system wiring shall be cable approved by Telephone Company.

END OF SECTION

SECTION 27 13 02 - TELEVISION WIRING AND CONDUIT

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Television distribution wiring and conduit.

1.3 RELATED WORK

- A. Section 270500 - Common Work Results for Communications.
- B. All other Sections of Division 26 & 27.

1.4 SYSTEM DESCRIPTION

- A. Provide complete television distribution system throughout building. Verify all requirements and equipment with local utility.
- B. System to provide an operating signal level of plus 10 dbmv plus or minus 2 db over frequency range of 40 to 300 MHz at each outlet location.
- C. Radiation: The following maximum radiation limits, as measured with reference dipole, not to be exceeded on any portion of system, including location of amplifier, coupling and mixing networks, distribution wiring and terminal service locations:

Frequency Range in MHz	Radiation Limit Microvolts/Meter	Test Distance
Up to 54	20	30 ft
54 - 108	20	10 ft
108 - 174	10	10 ft
174 - 216	20	10 ft
216 - 300	20	30 ft

1.5 REGULATORY REQUIREMENTS

- A. Installation subject to requirements of UL.
- B. Entire installation, to conform fully to the requirements of the appropriate authorities and local cable company.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Blonder-Tongue.
- B. Westinghouse Electric Co.

C. The Finney Company.

2.2 EQUIPMENT

- A. Wall Plates: Only "back matched" "flat Loss" 75 ohm directional coupler wall plates to be used in distribution system and these to meet following technical specifications.
1. Minimum frequency band pass capacity of 5 to 300 MHz with output flatness of plus or minus 0.5 db or better for each unit over entire frequency range.
 2. Maximum cascaded number of above noted units in any installation not to exceed ten (10).
 3. Each unit to have 20 db return loss or greater over entire frequency range.
 4. Each unit to have 32 db output to tap isolation or greater over entire frequency range.
 5. Each unit to have 20 db directivity or greater over entire frequency range.
- B. Cable: Cable used to be coaxial 75 ohm, plus or minus 2 db, 100 percent shielded including patch cords from wall plate to receiver. Structural return loss to be 26 db or greater in installed position.
- C. Cable selection to be on basis of maximum permissible tilt incurred when providing riser with maximum cascade of ten distribution terminal points with an operating signal level of plus 10 dbmv plus or minus 2 db over frequency range of 40 to 300 MHz at each outlet location. Distribution system to be set up for 2 db forward output tilt at input to each distribution riser between 40 and 300 MHz and cable type and lengths to be selected to comply with above.
- D. Verify cable with local utility before ordering or installation. Install per local utility specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Building shall be serviced overhead from existing poles.
- B. Wiring to be installed in cable, confirm cable type with cable co.
- C. Provide 6 ft long, 75 ohm connector cable from wall plate to set. Both sets of terminals to be screw type with 75 ohm connection at either end. Cable to be of matching type to that used in system.

END OF SECTION

SECTION 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The following drawings indicate the work required for this Division of Work:

All Drawings associated with this project.

All other contract drawings and specifications associated with the project.

B. Certain items of work pertaining to the work of this Division are provided under other Divisions of the Specification. These include, but are not limited to the following:

1. Excavating and backfilling for underground primary and secondary electric, telephone, television, and other building services provided under this Division.
2. Concrete work for equipment bases, transformer and switching pads, etc.
3. Installation of access doors in finished construction.
4. Installation of pipe sleeves in walls and floors.
5. Framing of openings in walls, floors, roof.
6. Chases, soffits, furred spaces required to conceal work of this Division.

C. Materials furnished under other Divisions and installed and/or wired by this Division include, but are not limited to:

1. Mechanical Equipment. (Motor Starters furnished under Division 23)
2. Temperature Controls.
3. Sprinkler tamper and flow switches and accessories.
4. Miscellaneous architectural items such as overhead doors, projection screens, kitchenette units, etc.
5. Elevator equipment, including power for machine and controls, trail cable, receptacle and telephone outlet(s) in equipment room, light and receptacle in pit(s).

D. Complete Utility connections as indicated or needed, extension to Project, metering as required, and connection to building systems. This work includes:

1. Apply for all services and pay for all fees, assessments, and charges of the Utility for each connection, all in a timely manner and according to the Project Schedule.
2. Provide and install all metering and accessories as required by Utility, make entire service in accordance with the Utility's requirements or other applicable regulation.
3. All necessary coordination with Utility to determine scope of work provided by Utility and part provided by Contractor so that a complete Utility connection is made.

E. Participate in coordination of Mechanical and Electrical installations. Provide additional coordination drawings, as directed by Architect, in areas of potential interferences.

- F. All work shall comply with applicable codes and regulations, including, but not limited to the following:
1. Connecticut Building, Fire Safety, and Health Codes, as amended, including all codes, standards and regulations referenced therein.
 2. Requirements of Local, State, and Federal authorities having jurisdiction over the Work.
 3. Current regulations of the Occupational Safety and Health Administration (OSHA).
 4. Requirements of affected Public Utility Companies.
 5. Special requirements set down by the Owner, the Owner's Insurance Carrier, or other concerned entities.
 6. NFPA 70- 2017, National Electrical Code. Contractor shall conform to the latest State of Connecticut approved NFPA 70, codes. Supply, install and wire complete any devices or equipment required by code indicated or excluded.
 7. Contractor shall supply temporary power sufficient enough to carry the load of the building(s) to be renovated. Provide temporary lighting and power in conformance to OSHA regulations.

1.2 RELATED DOCUMENTS

- A. Instructions to Bidders, the General Provisions of the Contract, including General Conditions and General Requirements shall apply and be binding to the Contractor and/or Subcontractor who performs this work.
- B. Where items of the General Conditions or Special Conditions are repeated in this Section of the Specifications, it is intended to call particular attention to or to qualify them; it is not intended that any other parts of the General Conditions shall be assumed to be omitted if not repeated herein.

1.3 INTENT

- A. Intent of the specifications and drawings is to call for finished work, tested and ready for operation.
- B. Material, fixtures, and equipment mentioned in specifications or shown on drawings shall be furnished new, completely installed adjusted and left in a clean, safe and satisfactory condition ready for operation. All supplied appliances and connections of every sort necessary shall be furnished and installed to the satisfaction of Architect and Owner.
- C. Apparatus, appliances, material or work not shown on the plans but mentioned in specifications, or vice versa, or any incidental accessories such as electrical disconnect switches, circuit breakers, etc., necessary to make the work complete, serviceable and perfect in all respects and ready for operation, even though not particularly specified, shall be installed without additional expense to the Owner.
- D. Minor details not usually shown or specified, but necessary for proper installation and operation shall be included in the work as though herein specified or shown.
- E. Prior to submission of bids, give written notice to Architect of any materials or apparatus believed to be inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; or any necessary items or work omitted. In the absence of such written notice, it is mutually agreed that the cost of all required items has been included and that all systems will function satisfactorily without extra compensation.

1.4 DEFINITIONS

- A. "Architect" means Stephen Jager Associates LLC , 4 Grand View Drive, Enfield, CT 06082.
- B. "Engineer" means Acorn Consulting Engineers, Inc., West Simsbury, CT 06092
- C. "regulating authorities" or "authorities", means all Governmental, Utility, and Insuring Authorities having jurisdiction.
- D. "Subcontractor or Contractor", means specifically the Subcontractor working under his respective Section of Specifications.
- E. "furnish" or "provide" means to supply, erect, install and connect up complete in readiness for regular operation the particular work referred to, unless otherwise specified.
- F. "conduit" includes in addition to pipe, all fittings, connectors, hangers, and other accessories relating to such and the plant and labor necessary to install same.
- G. "concealed" means hidden from sight in chases, furred spaces, hung ceilings, embedded in construction, or buried underground.
- H. "exposed" means not "concealed" as defined above. Trenches, crawl spaces and tunnels shall be considered "Exposed" unless specifically noted otherwise.
- I. "wire" or "wire up" means to properly connect the related item to the appropriate source of power including all needed connectors, circuit breakers, switches and other items necessary for normal operation of the item.
- J. "temperature control" means, in addition to thermostats all heating, ventilating, air conditioning motorized dampers, solenoid valves, electrical air device actuators, relays and other electrical accessories related to HVAC and other mechanical systems.
- K. "concealed" means hidden from sight as in chases, furred spaces, shafts, or above ceilings.

1.5 DRAWINGS

- A. Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement. Deviations from the depicted arrangement shall be approved by the Architect.
- B. Location of all items shown on drawings or called for in specifications, not definitely fixed by dimension, are approximate only. Exact location necessary to secure best conditions and results shall be determined at the project and shall have the approval of the Architect.
- C. Follow the drawings in laying out work. Check drawings of other trades to verify spaces in which work will be installed to insure maximum headroom and space conditions. Where headroom or space conditions appear inadequate, the Architect shall be notified before proceeding with installation.
- D. Work shown on the drawings is intended to be approximately correct to the scale of the drawings. Figured dimensions and detailed drawings are in all cases to take precedence over them. Typical details shall apply to each and every item of the project where such items are incorporated. Drawings utilize symbols and schematic diagrams to indicate various items of work. These have no dimensional significance, nor do they delineate every item required for the intended installation. Work shall be installed in accordance with the diagrammatic intent of the Electrical drawings, and in conformity with the dimensions indicated on final Architectural and Structural working drawings and on equipment shop drawings.
- E. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for

complete work are excluded.

- F. Details appear on the drawings which are specific with the regard to the dimensioning and positioning of the work. These are intended for the purpose of establishing general feasibility. They do not obviate field coordination.
- G. If directed by the Architect or Owner, make reasonable modifications in the layout to prevent conflict with work of other trades or for proper execution of the work.
- H. Abide by and comply with the true intent of the drawings and specifications taken as a whole, to provide a complete job ready for operation. "Drawings and specifications taken as a whole" means all contract plans and specifications -- Architectural, Structural and all Subcontractors' drawings and specifications. Refer to drawings and specifications of other trades to check if equipment or items included under other Sections will require work in order to comply with the statement above "to provide a complete job ready for operation". This work shall be included in the Base Contract. It shall be understood that the indication and/or description of any item, on the drawings or specifications, or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated.
- I. No statement in the specifications or any omission in either plans or specifications should be misunderstood as relieving the contractor from providing a complete job ready for operation. All existing circuits and devices shall be energized and tested before the completion of the project, contractor shall supply all the required material, labor and equipment necessary for a complete installation. No exclusions from, or limitations in, the language used in drawings or specifications shall be interpreted as meaning that the items or accessories necessary to complete any required system or item of equipment are to be omitted.
- J. Information as to the general construction shall be derived from Structural and Architectural Drawings and Specifications only.
- K. The use of words in the singular shall not be considered as limiting where other indications indicate that more than one item is referred to.

1.6 VISITING THE SITE FOR SURVEYS AND MEASUREMENTS

- A. Before submitting a Bid, visit the site and become thoroughly familiar with all conditions under which the Work will be installed. Contractor will be held responsible for any assumptions, omissions or errors made as a result of failure to become familiar with the site and the Contract Documents.
- B. Base all measurements, both horizontal and vertical, from established benchmarks. Reference all Work from these established lines and levels. Verify all measurements at site and check the correctness of same as related to Work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the Drawings and Specifications, notify the Engineer and do not proceed with the Work until instructions have been received from the Engineer.

1.7 SUBSTITUTIONS

- A. Within sixty (60) days after award of contract, submit, through the General Contractor, to the Architect for review, a list of manufacturers of all materials and equipment proposed for use on the project. Indicate on submittal which items are substituted.
- B. A review, without exception, of this list does not constitute approval, nor does it guarantee acceptance of the shop drawings when submitted.
- C. The contractor's intent to purchase the exact make specified does not relieve him from the responsibility to submit this list. Failure to submit this list will require the contractor to supply the exact item specified as the basis for

design.

- D. Submittal of items which differ from those specified or indicated as the basis for design carries the implicit guarantee that the substituted item will provide the intended service and is compatible with other items or systems interfacing with it.
- E. When proposing a substitute item, the contractor is responsible for all costs of accommodating the substitution, including, but not limited to, space and accessibility, modifications required to other systems, structural adequacy and the like.
- F. If substitutions require the Architect or Engineer to prepare sketches or revised drawings in order to become acceptable, the cost of such sketches, drawings, or engineering shall be borne by the contractor.
- G. When substitutions require Engineer or Architect to spend an inordinate time for review or substitutions, the cost of review over four (4) hours will be charged to the contractor who made the submittal.

1.8 MATERIALS AND WORKMANSHIP

- A. All materials and apparatus required for the Work, except as otherwise specified, must be new and of first-class quality and be furnished, delivered, erected, connected and finished in every detail and so selected and arranged as to fit properly into the building spaces. Where no specific kind of quality of material is given, furnish a first-class standard article as accepted by the Engineer.
- B. Furnish the services of an experienced superintendent who is constantly in charge of the installation of the Work, and present on site at all times during the Work. Furnish all skilled Workmen, helpers and labor required to install, unload, transfer, erect, connect up, adjust, start, operate and test each system.
- C. Unless otherwise specifically indicated on the Drawings or in the Specifications, all equipment and materials must be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- D. Quality of Work must be consistent with good trade practice and installed in a neat Workmanlike manner. The Engineer reserved the right to reject any Work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. Replacement of said Work, in satisfactory manner, will be at no extra charge to the Owner.

1.9 SHOP DRAWINGS

- A. After acceptance of List of Manufacturers required under paragraph 1.07(A) of this Section, and prior to delivery of materials and equipment to the project site, submit eight (8) copies of shop drawings of each item for review by the Architect.
- B. Each submittal shall contain a complete list of all materials contained within. Include intended use for each item.
- C. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature and complete characteristics of equipment, including, but not limited to, dimensions, capacity, code compliance, motor and drive and testing, construction, electrical characteristics, support, all as required for this project.
- D. Architect may designate submittal of physical samples for review on items where actual color, texture or other characteristics might not be adequately described by a drawing or written material. Upon approval of a sample, each and every item of that sort must be identical to the approved sample.
- E. Samples, drawings, specifications, catalogs, etc., submitted for review shall be labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specification governing, Subcontractor's name and name of project.

- F. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the Subcontractor from his responsibility of furnishing material or performing work according to Contract Documents.
- G. Failure to submit shop drawings in ample time for checking shall not be cause for an extension of contract time, and no claim by reason of such default will be allowed.
- H. Submittals for all systems which require the interconnection of three or more devices shall include a system block diagram. The diagram shall be of the one line type and with sufficient detail to show interfaces and method of operation.
- I. Material or equipment installed prior to review shall be liable for removal and replacement at no extra charge to the Owner if the material or equipment does not meet the intent of Drawings and Specifications.

1.10 RECORD DRAWINGS

- A. Maintain a record set of Electrical Drawings at the job site on which any changes in location of equipment, devices, panels and major conduits are recorded.
- B. At the end of construction, provide the Owner with a complete set of As-Built Drawings, including all power and lighting plans (indicating as-built circuiting), power and special systems riser diagrams and panel schedules and fire alarm use. Prepare As-Built documentation utilizing the most recent version of AutoCAD. Provide the Owner with a "CD ROM" disk and one set of reproducible mylar documents.
- C. If electronic copies of the contract documents are made available to the Contractor for use in production of As-Built documentation, the Contractor assumes responsibility for completeness and accuracy of the As-Built documents. Translation or manipulation of electronic documents provided to the Contractor is the responsibility of the Contractor.
- D. Exact location of all conduits and utilities under floor slabs shall be indicated and dimensioned on these drawings, as well as the final arrangement of conduits and junction boxes in concealed chases, concealed in walls or above ceilings.

1.11 LAWS, ORDINANCES, CODES, PERMITS AND FEES

- A. Give all necessary notices, obtain all permits and pay all governmental taxes, fees and other costs in connection with the work. File all necessary plans, prepare all documents and obtain all necessary approvals of governmental departments having jurisdiction. Obtain all required Certificate of Inspection of the work and deliver to Architect prior to application for final payment.
- B. Materials furnished and work installed shall comply with the rules and recommendations of the National Board of Fire Underwriters, with all requirements of utility companies, with the Board of Health, with the recommendations of the fire insurance rating organization having jurisdiction, with the local and state building codes, and with the requirements of all governmental departments having jurisdiction. If contract requirements are in excess of applicable codes, rules or regulations, contract provisions shall be given precedence.
- C. Provide utility services as required and as indicated on Drawings and in 1.01(D), above.

1.12 ROYALTIES AND PATENTS

- A. Pay all royalties and defend all suits and claims for infringement of any patent rights and save the Owner harmless on account thereof.

- B. If it is observed that a process or article specified is an infringement of a patent, promptly notify the Architect in writing. If any work is performed knowing it is to be an infringement of a patent, all costs arising therefrom shall be borne by the Contractor.

1.13 STANDARD SPECIFICATIONS

- A. Certain standard and staple materials may be described by reference to standard specifications. The standards referred to are as follows:

ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
UL	Underwriters Laboratories, Inc.
NFPA	National Fire Protection Association
FM	Factory Mutual Insurance Company
IRI	Industrial Risk Insurers (Formerly FIA)
IES	Illuminating Engineering Society
IEEE	Institute of Electrical and Electronic Engineers

- B. The particular specification will be identified by appropriate prefix and number only, with the latest or legally defined revision being applicable.

1.14 INTERPRETATION OF PLANS AND SPECIFICATIONS

- A. Questions or disagreements arising as to the intent of the specifications or the drawings, or the kind and quality of work required thereby, shall be decided by the Architect whose interpretation thereof shall be final, conclusive and binding on all parties.

1.15 PROCEDURE OF WORK

- A. All work shall proceed in a manner approved by the Architect.
- B. Determination of the required job procedure will be made by the Architect in the best interests of the job and may be adjusted to meet job conditions.

1.16 CHANGES TO WORK

- A. During the progress of the work, the Architect may make any changes, alterations, additions or omissions to work drawn or specified after having agreed on an equitable allowance to be added to or deducted from the contract price. Claims for extra cost to cover extra work will not be allowed unless specifically authorized in writing by the Architect prior to the execution of such additional work.

1.17 COORDINATION OF TRADES

- A. Give full cooperation to other trades and furnish any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.

1.18 PROTECTION OF WORK AND PROPERTY

- A. Be responsible for the maintenance and protection of equipment, materials and tools stored or installed on the

job site, from loss or damage of all causes, until final acceptance by the Owner.

- B. Be responsible for the protection of finished work of other trades from damage or defacement and remedy any such injury at no additional cost to the Owner.

1.19 CUTTING, PATCHING AND PAINTINGS

- A. Cutting, patching and painting shall be done by the General Contractor unless otherwise noted on plans or specifications.
- B. Cooperate with the General Contractor in making sure that sleeves are set and chases provided for the installation of the work. If failure to do so makes it necessary to cut and patch any part of the completed structure, this shall be done at the expense of the subcontractor having jurisdiction over the work.

1.20 TEMPORARY OPENINGS

- A. Ascertain whether any special temporary openings in the building will be required for the admission of apparatus and notify the Contractor accordingly.
- B. Failure to give sufficient notice to the Contractor in time to arrange for these openings during construction, shall result in this subcontractor's assumption of all costs pertaining to making and repairing any such temporary openings.

1.21 MANUFACTURER'S IDENTIFICATION

- A. Manufacturer's nameplate, name or trademark shall be permanently affixed to all material and equipment furnished under this specification. The nameplate of a subcontractor or distributor will not be acceptable.

1.22 MANUFACTURERS IDENTIFICATION

- A. Identify each control and item of equipment with a permanently attached nameplate made of black surface, white core laminated plastic with incised letters, bearing the name of the equipment item and designation of the item taken from the drawings or schedules.
- B. Identify electrical feeders and risers where they enter or leave a junction box or cabinet with fiber tags having the cable designation stamped thereon and tied securely to each cable or by means of printed plastic self-adhering labels attached to the cable sheath.
- C. Subcontractor shall label all cabinet, panels, pull boxes, etc., in the electrical system using the designations shown on the plans and schedules such as -- "PANEL H1", "MDP-1", etc., using incised laminated plastic nameplates securely attached.
- D. Provide typewritten directory cards in all electric panels showing circuit numbers and area or load serviced.
- E. Refer to Section 260553.

1.23 INSTRUCTION BOOKS AND OPERATING INSTRUCTIONS

- A. Furnish three (3) sets of operating and maintenance manuals in hard cover covering all electrical systems in the project. Include manufacturer's approved submittal of each item. Submit for review of Architect.
- B. Manuals shall contain, as a minimum, the following:
 - 1. Description of the project and major subsystems.

2. Descriptive text covering the startup, adjustment, trouble-shooting, and safe shutdown for each system.
 3. Copies of each typewritten panel directory.
 4. Copies of lighting control wiring diagrams and description of operation.
 5. A schedule of maintenance based on the manufacturer's recommendations, showing what work is to be performed and at what intervals.
 6. Copies of the finally approved submittal for each item, together with the manufacturer's installation, operation, and maintenance instructions and parts lists.
 7. List of Firm names, addresses, telephone numbers to be contacted for regular or emergency service, or purchase of parts.
- C. Manuals shall be arranged in one or more three-ring binders, completely indexed as follows:
1. General information; Items 1, 2, 3, & 7 above.
 2. Control system information; Item 4.
 3. Approved submittal, maintenance, and parts information; Items 5 & 6.
 4. Each section shall be identified by a permanent index tab.
 5. Each item within a major section shall be separately indexed for quick reference.
- D. Provide adequate written and/or verbal instructions to the Owner's operating personnel and such others as the Owner may designate. As a minimum, contractor shall provide for three (3), eight hour working days of instructions. Individual equipment or system Specifications may require additional or different periods of instruction.

1.24 SLEEVES, INSERTS AND ANCHOR BOLTS

- A. Be responsible for the location and proper position of sleeves and anchor bolts. If failure to do so requires cutting and patching of finished work, it shall be done at the Subcontractor's expense.
- B. Conduits passing through concrete or masonry floors, walls or partitions shall be provided with sleeves having an internal diameter 1/2" larger than the outside of the conduit.
- C. Sleeves through concrete floors or interior masonry walls shall be Schedule 40 black steel pipe, set flush with wall, floor or ceiling surface. Sleeve through floors shall be packed with a fireproof, resilient material to maintain the fire rating integrity of the assembly and caulked with waterproof compound to the approval of the Architect.
- D. Sleeves through floors of wet areas such as equipment rooms, toilets, etc., shall extend 2" above finished floor surface and be sealed watertight.

1.25 ACCESSIBILITY

- A. Install work so that all parts are readily accessible for inspection, maintenance and repair.
- B. Be fully informed regarding peculiarities and limitations of space available for the installation of materials and apparatus.
- C. See that all equipment items are made easily accessible for adjustment and operation.

- D. Where such items must be located over non-access ceilings, in chases or other inaccessible places, access doors and/or panels of a type and size approved by the Architect shall be supplied and delivered to the General Contractor for installation.
- E. Items requiring access are to be grouped to keep size and quantity of access doors to a minimum.
- F. Access doors installed in walls, floors or ceilings shall have the same fire rating as the wall, floor or ceiling.

1.26 ELECTRICAL WORK

- A. Install and wire up complete all electrical switches, starters and unmounted motors and other electrical equipment supplied by other trades.
- B. Furnish separate disconnect switches for all motors controlled by magnetic starters.
- C. Each trade supplying electrically operated equipment for installation and wiring by this Subcontractor is to furnish sufficiently detailed instructions and wiring diagrams for their installation.
- D. Control devices that include mechanical elements such as float switches, alternators, temperature and pressure switches or controls, damper operators or the like, shall be installed by the trade furnishing them, ready for wiring by this Subcontractor, unless otherwise indicated.
- E. Equipment including a number of electrical items in a single enclosure or common base shall be supplied to the job site internally wired as a unit, to numbered terminals, ready for wiring connections.

1.27 ELECTRIC MOTORS

- A. Motors shall conform to all applicable regulations and be suitable for the load, duty, voltage, phase, frequency, service and location intended.

1.28 TEMPORARY POWER

- A. Furnish and install all required temporary electrical services, including lighting and ground-fault circuit-interrupter receptacles as required for construction purposes.
- B. In all of the above cases, furnish the appropriate trades, well in advance of their work schedule, with all information, dimensions, templates, wiring diagrams and devices necessary to coordinate the work.
- C. Be responsible for any additional costs incurred as a result of his failure to furnish information sufficiently in advance to allow for proper coordination.

1.29 TESTS

- A. Test systems and equipment as required by the various Sections of the Specifications.
- B. Tests to be witnessed by and to the satisfaction of the Architect or his representative and such others as may have legal jurisdiction.
- C. Work shall be tested, repaired and retested until an approved test is achieved.
- D. Damages resulting from tests shall be repaired or damaged work replaced to the satisfaction of Architect and Owner.
- E. Testing must be completed successfully prior to concealment of the work.

F. Completed systems shall be tested for proper operation, capacity and function. Insofar as possible, systems normally operated during certain seasons of the year shall be tested during the appropriate season.

G. Costs of all tests shall be borne by the appropriate Contractor.

1.30 QUIET OPERATION

A. All equipment shall be isolated from the building structure by approved means. Noises and hum of equipment shall be absorbed or attenuated so as not to be objectionable.

B. Where sound or vibration levels are considered objectionable by the Architect, they shall be corrected in a manner approved by the Architect, at no additional cost to the Owner.

1.31 USE OF INSTALLATION BY OWNER

A. Owner shall have the privilege of using any part of the work when sufficiently complete, but such use shall not be considered as an acceptance of the work in lieu of the written certificate from the Architect.

1.32 CLEANUP

A. Systems, enclosures, and equipment shall be thoroughly cleaned, inside and out, before being placed into operation.

B. Keep the site free from accumulation of waste materials or rubbish. At conclusion of the work, remove all surplus materials, tools, construction equipment and rubbish from the site and leave the premises in a clean condition.

1.33 GUARANTEE AND SERVICE

A. Guarantee that all work will be free from defects in workmanship and/or materials and that all apparatus will achieve the capacities and characteristics specified. If, during the period of one (1) year, or as otherwise indicated, from certificate of completion of the work, defects in material or workmanship appear, remedy such defects without cost to the Owner. In default thereof, the Owner may have such work done and charge the cost to the appropriate Contractor or Subcontractor. Also, indemnify the Owner for any property damage which might result from such a defect which made repairs necessary.

B. Certain equipment will require guarantee periods exceeding one year due to the need for seasonal operation. In such case, the guarantee will extend through at least one full, continuous season.

C. Any fault in a system shall be corrected, and any work damaged in the course of this correction shall be repaired, replaced and restored to its original condition at no additional cost to the Owner.

1.34 INSURANCE

A. Fully insure all employees, material and finished work as required by the General Conditions of the Contract.

1.35 SCAFFOLDING, RIGGING AND HOISTING

A. Unless otherwise indicated, the work of each Section includes all scaffolding, rigging, hoisting and services necessary for the delivery, erection and installation in place of all equipment and apparatus furnished and the removal of same when no longer required.

1.36 PROGRESS SCHEDULE

A. Keep informed of progress schedules of all other trades and work in accordance with the project schedule to

ensure timely completion of this work.

1.37 WORKMANSHIP

- A. All work shall be performed in a neat and workmanlike manner and shall conform to the best trade practices for such work.

END OF SECTION

SECTION 28 31 02 - PROTECTED PREMISES FIRE ALARM/EMERGENCY COMMUNICATION SYSTEM

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.1 WORK INCLUDED

- A. Installation of a complete addressable fire alarm system.

1.2 RELATED WORK

- A. Section 280500 - General Provisions-Electrical.
- B. All other Sections of Division 26.

1.3 REFERENCES

- A. National Fire Protection Association (NFPA) - USA:

Refer to section 280500 Common Work Results for Electronic Safety and Security for code references.
- B. Underwriters Laboratories Inc. (UL) - USA:

No. 50	Cabinets and Boxes
No. 268	Smoke Detectors for Fire Protective Signaling Systems
No. 864	Control Units for Fire Protective Signaling Systems
No. 268A	Smoke Detectors for Duct Applications.
No. 521	Heat Detectors for Fire Protective
No. 464	Audible Signaling Appliances.
No. 38	Manually Actuated Signaling Boxes.
No. 346	Waterflow Indicators for Fire Protective Signaling Systems.
No. 1481	Power supplies for Fire Protective Signaling Systems.
No. 1076	Control Units for Burglar Alarm Proprietary Protective Signaling Systems.
No. 1971	Visual Notification Appliances.
- C. Local and State Building Codes.
- D. All requirements of the Authority Having Jurisdiction (AHJ).

1.4 SUBMITTALS

- a. General
 - 1. Submit product data under provisions of section 260505.
 - ii. All substitute equipment proposed as equal to the equipment specified herein, shall meet or exceed the following standards.

B. Shop Drawings:

1. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
2. Show main control panel module layout, configurations and terminations.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s) including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.
4. Approvals will be based on complete submissions of manuals together with shop drawings.

D. Software Modifications

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

E. Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.5 QUALITY ASSURANCE

- A. Each and all items of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriter's Laboratories, Inc. (UL) and shall bear the UL label. All control equipment shall be listed under UL category U0JZ as a single control unit. Partial listings shall not be acceptable. All equipment and the installation shall conform to all national, state, and local fire codes and shall conform to NFPA 72.
- B. All control equipment must have transient protection to comply with UL864 requirements.

1.6 SYSTEM DESCRIPTION

- A. This section of the specification includes the furnishing, installation, and connection of a microprocessor controlled, analog addressable, intelligent fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and

specified herein.

- B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.
- C. The system shall be an active/interrogative type system where each transponder and/or addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.
- D. The fire alarm system shall be manufactured by an ISO 9001 certified company.

1.7 SYSTEM OPERATION

- A. Activation of any manual fire alarm station, heat or system smoke detector, or waterflow switch shall cause all of the following to occur throughout the building. Non-handicapped apartments shall have a single station smoke detector.
 - 1. All system audible alarm devices including those within handicapped apartments sound continuously until the alarm condition has been manually acknowledged and reset. Non-handicapped apartments with single station smoke detectors shall only sound an alarm signal within the apartment.
 - 2. All system visual alarm devices to flash until the alarm condition has been acknowledged and reset.
 - 3. The appropriate zone alarm LED on the panel shall be lit steadily until the alarm condition has been acknowledged and reset.
 - 4. Transmit an alarm signal by a leased telephone to a central station.
 - 5. The appropriate zone alarm LED on the remotely located annunciator panel shall be lit steadily until the alarm condition has been acknowledged and reset.
 - 6. Return all elevators to the primary or alternate floor of egress.
 - 7. A smoke detector in any elevator lobby shall, in addition to the above functions, return all elevators to the primary or alternate floor of egress and activate audible/visual device inside elevator cab.
 - 8. Smoke detectors in the elevator machine room or top of hoistway shall return all elevators in to the primary or alternate floor. Smoke detectors or heat detectors installed to shut down elevator power shall do so in accordance with ANSI A17.1 requirements and be coordinated with the electrical contractor.
 - 9. Duct type smoke detectors shall, in addition to the above functions shut down the ventilation system or close associated control dampers as appropriate.
- B. The activation of any sprinkler supervisory tamper switch shall activate the system supervisory service audible signal and illuminate the LED at the control panel in the remote annunciator. Differentiation between valve tamper activation and opens and/or grounds on the initiation circuit shall be provided.
- C. Pressing the supervisory service acknowledge key shall silence the supervisory audible signal while maintaining the supervisory service LED "on" indicating the off normal condition.
- D. Restoring the valve to the normal position shall cause the supervisory service LED to extinguish, indicating restoration to normal.

- E. Any alarms shall be displayed on an 80 character LCD display. The top line of 40 characters shall be the point label and the second line shall be the device type identifier. The system alarm LED shall flash on the control panel and the remote annunciator until the alarm has been acknowledged. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another zone shall flash the system alarm LED on the control panel and the annunciator. The LCD display shall show the alarm information.

PART 2 - PRODUCTS

2.1 MAIN FIRE ALARM CONTROL PANEL

- A. The main FACP Central Console shall be equal to NOTIFIER Model NFS-640 and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, local and remote operator terminals, printers, annunciators, and other system controlled devices. Simplex Grinnell may substitute equal products on this project.

- 1. Function: The main FACP shall perform the following functions:

- a. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
- b. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to monitor and control modules.
- c. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed.
- d. Visually and audibly annunciate any trouble, supervisory, security or alarm condition on operator's terminals, panel display, and annunciators.

- B. System Capacity and General Operation

- 1. The control panel shall be capable of expansion by 198 analog/addressable devices for a maximum system capacity of 1980 points. The system shall be capable of 2048 annunciation points per system regardless of the number of addressable devices.
- 2. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 80 character liquid crystal display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
- 3. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.
- 4. The FACP shall be able to provide the following features:

- Block Acknowledge for Trouble Conditions
- Rate Charger Control
- Control-By-Time (Delay, Pulse, time of day, etc.)
- Automatic Day/Night Sensitivity Adjust (high/low)
- Device Blink Control (turn of detector LED strobe)
- Environmental Drift Compensation (selectable ON or OFF)
- Smoke Detector Pre-alarm Indication at Control Panel
- NFPA 72 Smoke Detector Sensitivity Test
- System Status Reports

Alarm Verification, by device, with tally
Multiple Printer Interface
Multiple CRT Display Interface
Non-Fire Alarm Module Reporting
Automatic NFPA 72 Detector Test
Programmable Trouble Reminder
Upload/Download System Database to PC Computer
One-Man Walk Test
Smoke Detector Maintenance Alert
Security Monitor Points
Alpha-numeric Pager Interface
On-line or Off-line programming

C. Central Processing Unit

1. The Central Processing Unit shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the Central Processing Unit.
2. The Central Processing Unit shall contain and execute all control-by-event (including ANDing, ORing, NOTing, CROSSZONEing) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.
3. The Central Processing Unit shall also provide a real-time clock for time annotation of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.
4. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
5. The CPU and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL864 standards.
6. Each peripheral device connected to the CPU shall be continuously scanned for proper operation. Data transmissions between the CPU and peripheral devices shall be reliable and error free. The transmission scheme used shall employ dual transmission or other equivalent error checking techniques.

D. Display

1. The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
2. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
3. The system display shall provide an 80-character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide five Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, DISPLAY TROUBLE, and SIGNAL SILENCE.
4. The system display shall provide a 25-key touch key-pad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be accessible through the display interface assembly to prevent unauthorized

system control or programming.

5. The system display shall include the following operator control switches: SIGNAL SILENCE, LAMP TEST, RESET, SYSTEM TEST, and ACKNOWLEDGE.

E. Signaling Line Circuit (SLC) Interface Board

1. The SLC board shall monitor and control a minimum of 198 intelligent addressable devices. This includes 99 intelligent detectors (Ionization, Photoelectric, or Thermal) and 99 monitor or control modules.
2. The SLC interface board shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.
3. The SLC interface board shall not require any jumper cuts or address switch settings to initialize operations.
4. The SLC interface board shall provide power and communicate with all intelligent addressable detectors and modules on a single pair of wires. This SLC Loop shall be capable of operating as a NFPA Style 7 (Class A) circuit.
5. The SLC interface board shall be able to drive an NFPA Style 4 twisted shielded circuit up to 12,500 feet in length. The SLC Interface shall also be capable of driving an NFPA Style 4, no twist, no shield circuit up to 3,000 feet in length. In addition, SLC wiring shall meet the listing requirements for it to exit the building or structure. "T"-tapping shall be allowed in either case.
6. The SLC interface board shall receive analog information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

F. Serial Interface Board (SIB)

1. The Serial Interface Board shall provide an EIA-232 interfaces between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.
2. The SIB shall allow the use of multiple printers, CRT monitors, and other peripherals connected to the EIA-232 ports.
3. The Serial Interface Board shall provide one EIA-485 port for the serial connection to annunciation and control subsystem components.
4. The SIB shall have LEDs that will show that it is in regular communication with annunciators or other EIA-485 connected peripheral devices.
5. EIA-232 serial output circuits shall be optically isolated to assure protection from earth ground.
6. The FACP will send packets of 80 ASCII characters followed by a carriage return (ODH) and a line feed (OAH). The external monitoring computer shall recognize certain combinations of characters in certain locations within the 80 character string in order to interpolate the status of the FACP.

G. Enclosures:

1. The control panels shall be housed in a UL listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be hinged on either the right or left side (field selectable).
4. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.

H. Power Supply:

1. The Main Power Supply shall operate on 120/208 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
2. It shall provide 3.0 amps of usable notification appliance power, using a switching 24 VDC regulator.
3. It shall be expandable, for additional notification appliance power, in 3.0 ampere increments.
4. It shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. It shall charge up to 55 Amp Hour batteries within a 48 hour period.
5. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
6. It shall be power-limited per 1995 UL864 requirements.
7. It shall provide meters to indicate battery voltage and charging current.
8. The power supply shall be capable of charging NICAD batteries up to 32 Amp Hours.

I. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.

1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.
2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.
3. The UDACT shall be completely field programmable from a built-in keypad and 4 character red, seven segment display.
4. The UDACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.
5. Communication shall include vital system status such as:

- Independent Zone (Alarm, trouble, non-alarm, supervisory)
 - Independent Addressable Device Status
 - AC (Mains) Power Loss
 - Low Battery and Earth Fault
 - System Off Normal
 - 12 and 24 Hour Test Signal
 - Abnormal Test Signal (per UL requirements)
 - EIA-485 Communications Failure
 - Phone Line Failure
6. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.
- J. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.
1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.
 2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
 3. The FCPS shall include an attractive surface mount backbox.
 4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per 1993 NFPA requirements.
 5. The FCPS include power limited circuitry, per 1995 UL standards.
- K. System Circuit Supervision:
1. The FACP shall supervise all circuits to intelligent devices, annunciators and conventional peripherals and annunciate loss of communications with these devices. The CPU shall continuously scan above devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate that device or devices are not responding and print the information in the history buffer and on a printer.
 2. Sprinkler system valves, PIV and main gate valves shall be supervised for off-normal position.
- L. Field Wiring Terminal Blocks:
- For ease of service all wiring terminal blocks shall be the plug-in/removable type and be capable of terminating up to 12 AWG wire. Terminal blocks that are permanently fixed to the PC board are not acceptable.
- M. Remote Transmissions:
1. Provide local energy or polarity reversal or trip circuits as required.
 2. The system shall be capable of operating a polarity reversal or local energy or fire alarm transmitter for automatically transmitting fire information to the fire department.
 3. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.

- N. System Expansion: Design the main FACP and transponders so that the system can be expanded in the future (to include the addition of twenty percent more circuits or zones) without disruption or replacement of the existing control panel. This shall include hardware capacity, software capacity and cabinet space.
- O. Field Programming
1. The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.
 2. It shall be possible to program through the standard FACP keyboard all system functions.
- P. It shall be the responsibility of the equipment supplier /installer to ensure that all equipment supplied will fit in locations designated on plans and in the specifications.
- Q. Specific System Operations
1. Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the system keypad or from the keyboard of the video terminal. Sensitivity range shall be within the allowed UL window.
 2. Alarm Verification: Each of the Intelligent Addressable Smoke Detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification function shall be programmable from 5 to 50 seconds and each detector shall be able to be selected for verification during the field programming of the system or anytime after system turn-on. Alarm verification shall not require any additional hardware to be added to the control panel. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
 3. System Point Operations:
 - a. Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or video terminal.
 - b. System output points shall be capable of being turned on or off from the system keypad or the video terminal.
 4. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:
 - a. Device Status.
 - b. Device Type.
 - c. Custom Device Label.
 - d. Software Zone Label.
 - e. Device Zone Assignments.
 - f. Analog Detector Sensitivity.
 - g. All Program Parameters.
 5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system statuses:
 6. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 400 system events. Each of these events will be stored, with time and

date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed, one event at a time, and the actual number of activations may also be displayed and or printed.

7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.

If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

8. The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

2.2 ADDRESSABLE DEVICES

A. GENERAL

1. Addressable devices shall provide an address-setting means using rotary decimal switches.
2. Addressable devices shall use simple to install and maintain decade (numbered 0 to 9) type address switches. Devices which use a binary address or special tools for setting the device address, such as a dip switch are not an allowable substitute.
3. Detectors shall be Analog and Addressable, and shall connect to the fire alarm control panel's Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual (2) status LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs can be programmed off via the fire control panel program.
5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity can be automatically adjusted by the panel on a time-of-day basis.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature.
8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

2.3 VISUAL AND COMBINATION AUDIO/VISUAL UNITS

- A. The combination horn and light shall be separate components mounted together as one unit. The combination unit shall be mountable on a standard four inch square box in semi-flush mount configurations. The visual unit shall contain a 24 VDC Xenon flasher providing a rate of 60 flashes per minute. The lens shall be clear, tamperproof plastic with the word "FIRE" stamped in red on the front. The unit shall be reversible to allow the visual unit to be placed above or below the audible device.
- B. The horn shall be a four inch, metal diaphragm-type horn, red, and shall operate at 24 VDC. The horn shall operate at a minimum of 93 db at ten feet.
- C. Strobe unit for bedroom shall be 110 candela flash rate and shall meet the specifications of the ADA. The units shall be located above bed as required under ADA. Strobe intensity shall be rated under UL 1971.
- D. Apartment mini horn/strobe units shall provide a sound pressure level of 90 dBA minimum at 24 VDC at a distance of 10 feet. Meet all provisions of items A and C above, candela rating to be 15/75 cd adjustable. Based on Notifier Series MIZ.

2.4 ADDRESSABLE PULL BOX (MANUAL STATION)

- A. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
- B. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
- C. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.

2.5 INTELLIGENT PHOTOELECTRIC SMOKE DETECTOR

- A. The detectors shall use the photoelectric (light-scattering) principle to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density. Detectors installed within handicapped apartments shall include an audible sounder.

2.6 INTELLIGENT THERMAL DETECTORS

- A. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

2.7 INTELLIGENT DUCT SMOKE DETECTOR

- A. The in-duct smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
- B. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

2.8 TWO WIRE DETECTOR MONITOR MODULE

- A. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).

- B. the two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.
- C. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

2.9 SPRINKLER AND STANDPIPE VALVE SUPERVISORY SWITCHES:

- A. Each sprinkler system water supply control valve riser or zone control valve, and each standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
- B. Each Post Indicator Valve (PIV) or main gate valve shall be equipped with a supervisory switch.
- C. Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
- D. The mechanism shall be contained in a weatherproof aluminum housing, that shall provide a 3/4 inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.
- E. Switch housing to be finished in red baked enamel.
- F. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
- G. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

2.10 BATTERIES AND EXTERNAL CHARGER:

- A. Battery:
 - 1. Shall be 24 volt, Gell-Cell type.
 - 2. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
 - 3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.
- B. External Battery Charger:
 - 1. Shall be completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions. Charger shall operate from a 120-volt 60 hertz source.
 - 2. Shall be rated for fully charging a completely discharged battery within 48 hours while simultaneously supplying any loads connected to the battery.
 - 3. Shall have protection to prevent discharge through the charger.
 - 4. Shall have protection for overloads and short circuits on both AC and DC sides.

PART 3 - EXECUTION

3.1 WIRING

A. Conduit - Refer to Section 260533.

B. Cable & Wire

1. All fire alarm system wiring must be new.
2. Wiring shall be in accordance with local, state and national codes (NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for initiating device circuits and signaling line circuits, and 14 AWG for notification appliance circuits.
3. All wire shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. All wiring for the fire alarm system and/or devices shall be within metal conduit (3/4" minimum).
5. The system shall permit the use of IDC and NAC wiring in the same conduit with the multiplex communication loop.
6. The Radio Box shall be located adjacent to the Fire Alarm Control Panel. Installation shall conform to the local Fire Marshal's requirements.
7. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.
8. The Fire Alarm Control panel shall be capable of T-Tapping Class B (NFPA Style 4) Signaling Line Circuits. Systems which do not allow, have restrictions to, for example, the amount of T-Taps, length of T-Taps etc., are not acceptable.

C. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

3.2 FINAL TEST

Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all flow switches.
4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open signaling line circuits and verify that the trouble signal actuates.

6. Open and short notification appliance circuits and verify that trouble signal actuates.
7. Ground initiating device circuits and verify response of trouble signals.
8. Ground signaling line circuits and verify response of trouble signals.
9. Ground notification appliance circuits and verify response of trouble signals.
10. Check presence and audibility of tone at all alarm notification devices.
11. Check installation, supervision, and operation of all intelligent smoke detectors during a walk test.
12. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
13. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 GUARANTEE

- A. Guarantee all equipment and wiring free from inherent mechanical and electrical defects for a period of one year from the date of final acceptance.

3.4 MAINTENANCE AGREEMENT

- A. Provide the manufacturer's yearly maintenance and testing agreement effective from the date of final acceptance by the local authority having jurisdiction or from the date of final commencement of beneficial use, whichever comes first. The agreement shall include two inspections during the contract year. Provide one (1) additional year of maintenance with two inspections during the second year.

3.5 COORDINATION

- A. Contractor shall coordinate the installation/wiring of all multiplex devices to ensure wiring does not violate maximum lengths allowed by circuitry.

END OF SECTION