



Dannel P. Malloy
Governor

STATE OF CONNECTICUT
DEPARTMENT OF HOUSING



Evonne M. Klein
Commissioner

**Community Development Block Grant Disaster Recovery
Program (CDBG-DR)**

**Owner Occupied Rehabilitation and Rebuilding Program
(OORR)**

BID PACKAGE

For

Rehabilitation/Reconstruction work for:

Matthew Heissan

12 Jacob Street

Norwalk, CT 06853

Prepared By:

Martinez Couch & Associates, LLC

1084 Cromwell Avenue Suite A-2

Rocky Hill, CT 06067

860-436-4364

Project #: 1247 – 12 Jacob Street



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Section 1

ADVERTISEMENT FOR BIDS

Project # 1247 – 12 Jacob Street

DOH: _____

The State of Connecticut Department of Housing (DOH) is seeking proposals through a Request for Proposal (RFP) process for the rehabilitation, reconstruction and/or mitigation of residential structures damaged by Superstorm Sandy in compliance with all applicable local, federal, and state statutory requirements with special attention paid to requirements for Community Development Block Grants under the United States Department of Housing and Urban Development (“HUD”) Disaster Recovery grant program.

Separated sealed bids for 1247 – 12 Jacob Street will be received by Martinez, Couch & Associates LLC until 4:00 O’clock PM on Friday, March 8th, 2019, and then at said office publicly opened and read aloud.

The Information to Bidders, Form of Bid, Form of Contract, Plans, Specifications, and Form of Bid Bond, Performance and Payment Bond, and other contract documents may be examined on the Department of Housing Hurricane Sandy Recover website at www.ct.gov/doh/ and click on the “Hurricane Sandy” link.

Copies of plans may be downloaded directly from the Department of Housing website under bid notices or obtained at the office of Martinez, Couch and Associates LLC located at 1084 Cromwell Avenue Suite A-2, Rocky Hill, CT 06067 upon payment of \$50 for each set. Requests for copies of plans shall provide 2 business days notice to Martinez, Couch and Associates, LLC.

DOH reserves the right to waive any informalities or to reject any or all bids.

Each bidder must deposit with his bid, security in the amount, form and subject to the conditions provided in the Information to Bidders.

Attention to bidders is particularly called to the requirements as to conditions of employment to be observed and minimum wages rates to be paid under the contract (if applicable), Section 3, Segregated Facilities, Section 109 and E. O. 11246.

No bidder may withdraw his bid within 30 calendar days after the actual date of the bid opening thereof. Submitted bid values are allowed three percent (3) per annum increase for award by the DOH made beyond ninety calendar (90) days. Cost increases for such periods shall be prorated monthly and calculated by the DOH.

INFORMATION FOR BIDDERS

Receipt and Opening of Bids:

The State of Connecticut Department of Housing (herein called the "DOH"), invites bids on the form attached hereto, all blanks of which must be appropriately filled. Bids will be received by DOH at the office of Martinez, Couch & Associates, LLC until 4:00 O'clock PM on Friday, March 8th, 2019, and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to Mr. Richard Couch, P.E. at Martinez, Couch and Associates, LLC and designated as bid for Project 1247 – 12 Jacob Street, Norwalk, CT.

DOH may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement there considered. NO bidder may withdraw a bid within 30 days after the actual date of the opening thereof. Submitted bid values are allowed three percent (3) per annum increase for award by the DOH made beyond ninety calendar (90) days. Cost increases for such periods shall be prorated monthly and calculated by the DOH.

Mandatory Walk Through: All bidders must attend a mandatory walk through of the property designated above. The date and time of the walk through is set for 10:00AM on Friday, February 22nd, 2019.

Preparation of Bids:

Each bid must be submitted on the prescribed form and accompanied by Certification by Bidder Regarding Equal Employment Opportunity, Form HUD-950.1, and Certification of Bidder Regarding Section 3 and Segregated Facilities. All blank spaces for bid process must be filled in, in ink or typewritten, in both words and figures, and the foregoing Certifications must be fully completed and executed when submitted.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his/her address, and the name of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in the bid form.

Subcontracts: The bidder is specifically advised that any person, for, or other party to whom it is proposed to award a subcontract under this contract:

1. Must be acceptable to the DOH after verification by the State of the current eligibility status; and,
2. Must submit Form HUD-950.2, Certification by Proposed Subcontractor Regarding Equal Employment Opportunity and Certification of Proposed Subcontractor Regarding Section 3 and Segregated Facilities. Approval of the proposed subcontractor award cannot be given by the DOH unless and until the proposed subcontractor has submitted the Certifications and/or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject. Although the bidder is not required to attach such Certifications by proposed subcontractors to his/her bid, the bidder is here advised of this requirement so that appropriate action can be taken to prevent subsequent delay in subcontract awards.

Method of Bidding: DOH invites the following bid(s):

Qualifications of Bidder: The DOH may make such investigations as he/she deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the DOH all such information and data for this purpose as the DOH may request. The DOH reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the DOH that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted. The State's set Contractor Prequalifications are listed in Exhibit G and also are available at the Department of Housing's Hurricane Sandy Recovers website www.ct.gov/doh/ and click on the "Hurricane Sandy" link.

Bid Security: Each bid must be accompanied by an irrevocable letter of credit from the bank, certified check, or bank cashier's check in the amount not less than five percent (5%) of the bid. Bid bonds may be accepted as bid security. Such checks will be returned to all except the three lowest bidders within three days after the opening of bids, and the remaining cash, or checks will be returned promptly after DOH and the accepted bidder have executed the contract, or opening of bids, upon demand or the bidder at any time thereafter, so long as he/she has been notified of the acceptance of his/her bid.

Conditions of Work: Each bidder must inform him/herself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his/her obligation to furnish all material and labor necessary to carry out the provision of his/her contract. Insofar as possible the contractor, in carrying out the work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

Addenda and Interpretations: No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Every request for such interpretation should be in writing addressed to: Mr. Richard Couch, P.E. at Martinez, Couch and Associates, LLC and to be given consideration must be received at least seven days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instruction will be in the form of written addenda to the specifications which, if issued, will be forwarded by electronic mail and posted on DOH's Hurricane Sandy website to all prospective bidders (at the respective email addresses furnished for such purposes), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the contract documents.

Security for Faithful Performance: Simultaneously with his/her delivery of the executed contract, the Contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the DOH.

Performance and Payment Bonds: A performance and payment bond will be required of the successful bidder (contractor) for 100 percent of the contract price on contracts over \$100,000.

Contract Progress Schedule: Each bid shall be accompanied by a Contract Progress Schedule. Such Schedule shall list the bidder's timetable for completion of the contract.

Power of Attorney: Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

Notice of Special Conditions: Attention is particularly called to those parts of the contract documents and specifications which deal with the following:

1. Inspection and testing of materials
2. Insurance requirements
3. Wage rates (if applicable)
4. State allowances

Laws and Regulations: The bidder's attention is directed to the fact that all applicable 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.

Method of Award-Lowest Qualified Bidder: If at the time this contract is to be awarded, the lowest base bid submitted by a responsible bidder does not exceed the amount of funds then estimated by the DOH as available to finance the contract; the contract will be awarded on the base bid only. If such bid exceeds such amount, the DOH may reject all bids or may award the contract on the base bid combined with such deductible alternatives applied in numerical order in which they are listed in the Form of Bids, as produces a net amount which is within the available funds.

Submitted bid values are allowed three percent (3) per annum increase for award by the DOH made beyond ninety calendar (90) days. Cost increases for such periods shall be prorated monthly and calculated by the DOH.

If the homeowner wishes to select a prequalified bidding contractor other than the lowest and most responsible bidder, said owner is responsible for paying the difference between the lowest bidder and their chosen bidder from their own financing.

Obligation of Bidder: At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect to his/her bid.

Safety Standards and Accident Prevention: With respect to all work performed under this contract, the contractor shall:

1. Comply with the safety standards provision of applicable laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), and the requirements of Title 29 of the Code of Federal Regulations, Section 1518 as published in the "Federal Register," Volume 36, No 75, Saturday, April 17, 1971.
2. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) who may be injured on the job site before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.

BID FORM

The undersigned, being familiarized with the local conditions affecting the cost of the work and with the Drawings, Specifications, Invitation to Bidders, Instructions to Bidders, General Conditions, Bid Form, Form of Contract and Form of Bonds for Project No. 1247 – 12 Jacob Street, Norwalk, CT and Addenda No. _____ and _____ thereto, as prepared by Martinez, Couch & Associates, LLC, Connecticut, and on file in the office of DOH, hereby proposes to furnish all permits, labor, materials, tools, equipment, and related items required for the rehabilitation and reconstruction for said Project No. 1247 – 12 Jacob Street, Norwalk, CT located at 12 Jacob Street in Norwalk, State of Connecticut, all in accordance with the Drawings and Specifications, for the sum of:

BASE BID:		Lump Sum Price (\$)
	Full Time Work Superintendent	
Div. 01	General Requirements & Temporary Facilities	
02 41 19	Existing House Demolition	
03 30 00	Cast in Place Concrete	
04 20 00	Unit Masonry	
05 12 00	Structural Steel	
06 10 00	Rough Carpentry	
06 10 63	Exterior Rough Carpentry	
06 15 33	Wood Decking	
06 18 00	Glue Laminated Construction	
06 20 13	Exterior Finish Carpentry	
07 21 00/ 07 21 19	Building Insulation/ Foamed in Place Insulation	
07 46 23	Weather Barriers/Wood Siding	
07 71 23	Gutters Downspouts and Accessories	
Div. 08	Doors and Openings	
09 29 00	Gypsum Board Assemblies	
09 90 00/ 09 93 00	Paintings and Coatings/ Staining and Transparent Finishing	
Div. 22	Plumbing	
Div. 23	H.V.A.C	
Div. 26	Electrical	
31 10 00/ 31 20 00	Site Clearing /Earth Moving	
31 23 19/ 31 25 13	Dewatering/ Erosion Controls	
31 50 00	Excavation Support and Protection	
31 62 19	Micropiles (Mobilization and Demobilization)	
31 62 19	Micropiles	
32 31 13	Temporary Construction Fencing	
Division 33	Utilities	
	Allowance No. 1	\$ 5,000
	Allowance No. 2	\$ 10,000

Total Lump Sum _____

_____ Dollars (\$))

ALTERNATES:

ALTERNATES: See definitions in Section 01 23 00 – Alternates.	Dollars (\$)
<u>Alternate 1:</u> Add ___ Deduct ___ from Base Bid _____(Dollars)	
<u>Alternate 2:</u> Add ___ Deduct ___ from Base Bid _____(Dollars)	
<u>Alternate 3:</u> Add ___ Deduct ___ from Base Bid _____(Dollars)	
<u>Alternate 4:</u> Add ___ Deduct ___ from Base Bid _____(Dollars)	

UNIT PRICES:

Unit Prices: See Definitions in Section 01 22 00 – Unit Prices	Dollars (\$)	Unit
Unit Price 1: _____(Dollars)		Cubic Yard
Unit Price 2: _____(Dollars)		Cubic Yard
Unit Price 3: _____(Dollars)		Linear Foot

The undersigned agrees to commence the work on a date to be specified in the contract and to complete such work within **180** consecutive calendar days.

The undersigned agrees that if within the period of thirty (30) calendar days after the opening of bids, or when extended to the next work day immediately following said period, notice of the acceptance of this bid shall be mailed, or delivered to him/her at the business address given below, or at any time thereafter before this bid is withdrawn, _____, will within fifteen (15) calendar days thereafter deliver to DOH, where directed, a contract properly executed in such number of counterparts as may be required by said DOH, on the forms annexed, with such changes therein as shall have been made by the DOH, prior to the time named for delivery of this proposal, together with a 100% Performance Bond of a

Surety Company, which Surety must be authorized to transact business in the State of Connecticut, and duly qualified therefore, and in the form constituting part of the Specification and a letter indicating those Small/Minority Business Enterprises that will perform work and/or provide materials, equipment or services as part of the contract.

In submitting this bid, it is understood that the right is reserved by the abovementioned DOH to reject any and all bids; and it is agreed that this bid may not be withdrawn for a period of thirty calendar (30) days from the date of bid opening or until the next work day immediately following said period if such period ends on weekend or a State holiday.

Submitted bid values are allowed three percent (3) per annum increase for award by the DOH made beyond ninety calendar (90) days. Cost increases for such periods shall be prorated monthly and calculated by the DOH.

Security in the sum of _____ Dollars (\$ _____)
in the form of _____ is submitted herewith in accordance with the Specifications.

The undersigned bidder agrees to comply with the Section 3 plan included herein and all Federal requirements pertaining to conditions of employment to be observed and minimum wage rates to be paid under the contract, Segregated Facilities, Section 109 and Executive Order 11246.

Attached hereto is an affidavit, in proof that the undersigned has not entered into any collusion with any person in respect to this proposal, or any other proposal, or the submitting of proposals for the above Project. Also attached is a statement of contractor's qualifications, Certification of Bidder Regarding Equal Employment Opportunity, Certification of Bidder Regarding Section 3 and Segregated Facilities.

Date

Firm Name

Address

By: _____

Title: _____

(Bank Letterhead)

BID SECURITY

IRREVOCABLE LETTER OF CREDIT

Dear _____:

We hereby authorize you to draw on us to the aggregate amount of \$ _____
(five percent of the amount of the bid) in the event _____ withdraws
its bid within the bid holding period, or upon being awarded a contract, fails to provide adequate
performance and payment security as required by the Contract documents.

Such drafts must be accompanied by the following document:

A written certification by you that the proceeds of any draft drawn on this Letter of Credit will be used
solely to indemnify the DOH against loss or damage suffered by it resulting from any act or omission
described in the above paragraph.

We warrant to you that all drafts drawn in compliance with the terms of this Letter of Credit will be
unconditionally and duly honored upon delivery of the documentation specified and presented to this
office.

This Letter of Credit is irrevocable and shall be in full force and effect until notification in writing is
received from you that a contract for Project 1247 – 12 Jacob Street, Norwalk, CT has been awarded and
executed, whereupon this Letter of Credit shall automatically be canceled.

This Letter of Credit shall not be modified or amended except upon the written agreement of this Bank
and the DOH.

Sincerely yours,

President

FORM OF NON-COLLUSIVE AFFIDAVIT

AFFIDAVIT

State of _____)

County of _____)

_____, being first duly sworn, deposes and says:

That he/she is, _____ the party making the foregoing proposal for bid, that such proposal or bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived or agreed, directly or indirectly, with any bidder or person, to put in a sham bid or to refrain from bidding, and has not, in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of affiant or of any other bidder, or to fix any overhead, profit or cost element of said bid price, or of that of any other bidder, or to secure any advantage against DOH or any person interested in the proposed contract, and that all statements in said proposal for bid are true.

Project No. 1247 – 12 Jacob Street, Norwalk, CT

Location 12 Jacob Street, Norwalk, CT

Signature

Name and Title

Date

(Signature should be notarized.)

BIDDER'S CERTIFICATION OF ELIGIBILITY

By the submission of this bid, the bidder certifies that to the best of its knowledge and belief, neither it, nor any person or firm which has an interest in the bidder's firm, nor any of the bidder's subcontractors, is ineligible to:

- (1) Be awarded contracts by any agency of the United States Government or HUD; or,
- (2) Participate in HUD programs pursuant to 24 CFR part 24.

(Name of Bidder)

(Address)

BY: _____

Title: _____

NOTE: This certification is a material representation of fact upon which reliance is placed when making award. If it is later determined that the bidder knowingly rendered an erroneous certification, the contract may be terminated for default, and the bidder may be debarred or suspended from participation in HUD programs and other Federal programs.

CERTIFICATION OF GENERAL BIDDERS ON CDBG-DR CONSTRUCTION PROJECTS

I. CERTIFICATION REGARDING HEALTH AND SAFETY

The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least ten hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

II. CERTIFICATION REGARDING NON-COLLUSION AND DEBARMENT

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies that neither he/she nor any firm, corporation, partnership or association in which he/she has a substantial interest is designated as an ineligible contractor by the Comptroller General of the United States pursuant to Section 5.6 (b) of the Regulations of the Secretary of Labor, Part 5 (29 CFR, Part 5), or pursuant to Section 3 (a) of the Davis-Bacon Act, as amended (40 USC 276a). The undersigned further certifies that said undersigned is not presently debarred from doing public construction work in the State of Connecticut.

Date: _____

Name of General Bidder

By _____

Signature

Print name and Title

Business Address

Street, Address City and State

OSHA-10 OSHA-10

CERTIFICATION OF SUB- BIDDERS (IF ANY) ON CDBG-DR CONSTRUCTION PROJECTS

I. CERTIFICATION REGARDING HEALTH AND SAFETY

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupation Safety and Health Administration that is at least ten hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44F.

II. CERTIFICATION REGARDING NON-COLLUSION AND DEBARMENT

The undersigned further certifies under penalties of perjury that this subbid is in all responses bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the “person” shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies that neither he/she nor any firm, corporation, partnership or association in which he/she has a substantial interest is designated as an ineligible contractor by the Comptroller General of the United States pursuant to Section 5.6 (b) of the Regulations of the Secretary of Labor, Part 5 (29 CFR, Part 5), or pursuant to Section 3 (a) of the Davis-Bacon Act, as amended (40 USC 276a). The undersigned further certifies that said undersigned is not presently debarred from doing public construction work in the State of Connecticut.

Date _____

Name of Sub-bidder

By _____

Signature

Print Name and Title

Business Name

Street Address, City and State

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ as Principal,
and _____ Surety, are hereby held and firmly bound unto
_____ as DOH in the penal sum of
_____, for the payment of which, well and truly be made,
we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and
assigns. Signed this _____ day of _____, 2019.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted to
_____ a certain Bid, attached hereto and hereby
made a part hereof to enter into a contract in writing, for the _____

NOW, THEREFORE,

1. If said Bid shall be rejected, or in the alternate,
2. If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with the Bid) and shall furnish a bond for this faithful performance of said contract, and for the payment of all person performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid,

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any or all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time which the DOH may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal

Surety

SEAL

By: _____

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: THAT we,

_____, as

PRINCIPAL, and _____, as SURETY,

are held firmly bound unto _____

_____ hereinafter called the DOH, in the penal
sum of _____

_____ (\$ _____), for the payment

of which sum we bind ourselves, our heirs, executors, administrators, and successors, jointly and
severally.

WHEREAS, Principal has entered into a certain Contract with DOH, dated _____, a copy of
which is hereto attached and made a part hereof.

NOW, THEREFORE, the condition of this obligation is such that if the Principal shall in all respects fully
perform the Contract and all duly authorized modifications thereof, during its original term and any
extensions thereof that may be granted and during any guaranty period for which the Contract provides,
and if the Principal shall fully satisfy all claims arising out of the prosecution of the work under the
Contract and shall fully indemnify DOH for all expenses which it may incur by reason of such claims,
including its attorney's fees and court costs, and if the Principal shall make full payment to all persons
supplying labor, services, materials, or equipment in the prosecution of the work under the Contract, in
default of which such persons shall have a direct right of action hereupon; and if the Principal shall pay or
cause to be paid all sales and use taxes payable as a result of the performance of the Contract as well as
payment of gasoline and special motor fuel taxes in the performance of the Contract and all motor vehicle
fees required for commercial motor vehicles used in connection with the performance of the Contract,
then this obligation shall be void; otherwise, it shall remain in full force and effect. No modification of the
Contract or extension of the term thereof, nor any forbearance on the part of DOH shall in any way
release the Principal or the Surety from liability hereunder. Notice to the Surety of any such modification,
extension, or forbearance is hereby waived.

IN WITNESS WHEREOF, the aforesaid Principal and Surety have executed this instrument and affixed
their seals hereto, this _____ day of _____.

Principal

Surety

Name and Title

(Signatures must be notarized.)

(Power-of-Attorney for person signing for Surety Company must be attached to bond.)

The rate of premium on this bond is \$_____ per thousand.

The total amount of premium charge is \$_____.

(The above is to be filled in by Surety Company.)

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the

_____ Secretary of the corporation

named as Principal in the foregoing bond; that _____, who

signed the bond on behalf of the Principal, was then _____ of said

corporation; that I know his/her signature thereto is genuine; and that said bond was fully signed, sealed,

and attested for and in behalf of said corporation by authority of its governing body.

SUBCONTRACTOR IDENTIFICATION

(Provide additional forms for more subcontractors, as needed prior to execution.)

This form is a part of your bid package and must be submitted along with the itemized and formal bid forms at the time of the bid opening. Failure to submit a completed document could result in the disqualification of your bid.

Name of Subcontractor: _____

Address: _____

Trade: _____

Hourly Wage: \$_____ Full Contract Price: \$_____

Federal Tax# or SSN #: _____

Male Owned Business _____ Female Owned Business _____

Is he/she of Hispanic or Latino ethnicity? Yes _____ No _____

Race: (Please check one)

 White American Indian/Alaskan Native

 Black/African American Hasidic Jew

 Asian/Pacific American

Name of Subcontractor: _____

Address: _____

Trade: _____

Hourly Wage: \$_____ Full Contract Price: \$_____

Federal Tax# or SSN #: _____

Male Owned Business _____ Female Owned Business _____

Is he/she of Hispanic or Latino ethnicity? Yes _____ No _____

Race: (Please check one)

 White American Indian/Alaskan Native

 Black/African American Hasidic Jew

 Asian/Pacific American

Name of Subcontractor: _____

Address: _____

Trade: _____

Hourly Wage: \$_____ Full Contract Price: \$_____

Federal Tax# or SSN #: _____

Male Owned Business _____ Female Owned Business _____

Is he/she of Hispanic or Latino ethnicity? Yes _____ No _____

Race: (Please check one)

 White American Indian/Alaskan Native

 Black/African American Hasidic Jew

 Asian/Pacific American

Contractor's Signature

Date

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT
OPPORTUNITY

INSTRUCTIONS

This certification is required pursuant to Executive Order 11246 (30 F R 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed subcontractors shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven calendar days after bid opening. No contract shall be awarded unless such report is submitted.

CERTIFICATION OF BIDDER

Name and address of Bidder (include zip code)

-
1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause.
☐ YES ☐ NO
 2. Compliance reports were required to be filed in connection with such contract or subcontract.
☐ YES ☐ NO
 3. Bidder has filed all compliance reports due under applicable instructions, including SF.100.
☐ YES ☐ NO ☐ NOT REQUIRED
 4. Have you ever seen or are you being considered for sanction due to violation of Executive Order 11246, as amended?
☐ YES ☐ NO

NAME AND TITLE OF SIGNER (Please type.)

SIGNATURE

DATE

CERTIFICATION OF BIDDERS REGARDING SECTION 3 AND SEGREGATED FACILITIES

Project Name:

Project No:

Name of Prime Contractor:

The undersigned hereby certifies that:

1. Section 3 provisions are included in the Contract
2. A written Section 3 plan was prepared and submitted as part of the bid proceedings (if bid equals or exceeds \$100,000.00)
3. No segregated facilities will be maintained.

Name and Title of Signer (Print or Type)

Signature

Date

CONTRACTOR

Section 3 Plan Format

_____ agrees to implement the following specific affirmative action steps directed at increasing the utilization of lower income residents and business within the _____.

- A. To ascertain from the DOH the exact boundaries of the Section 3 covered project area and where advantageous, seek the assistance of local officials in preparing and implementing the affirmative action plans.
- B. To attempt to recruit from within the city the necessary number of lower income residents through: local advertising media, signs placed at the proposed site for the project, and community organizations and public or private institutions operating within or serving the project area such as Service Employment and Redevelopment (SER), Opportunities Industrialization Center (OIC), Urban League, Concentrated Employment Program, Hometown Plan, or the U. S. Employment Service.
- C. To maintain a list of all lower income residents who have applied either on their own or on referral from any source, and to employ such persons, if otherwise eligible and if a vacancy exists.
- D. To insert this Section 3 plan in all bid documents, and to require all bidders on subcontracts to submit a Section 3 Affirmative Action Plan including utilization goals and the specific steps planned to accomplish these goals.
- E. To insure that contracts which are typically let on a negotiated rather than a bid basis in areas other than Section 3 covered project areas, are also let on a negotiated basis, wherever feasible, when let in a Section 3 covered project area.
- F. To formally contact unions, subcontractors and trade associations to secure their cooperation for this program.
- G. To insure that all appropriated project area business concerns are notified or pending subcontractural opportunities
- H. To maintain records, including copies of correspondence, memoranda, etc., that document all above affirmative action steps have been taken.
- I. To appoint or recruit an executive official of the company or agency as Equal Opportunity Officer to coordinate the implementation of the Section 3 plan.
- J. To list on Table A, information related to subcontracts to be awarded.
- K. To list on Table B, all projected workforce needs for all phases of this project by occupation, trade, skill level and number of positions.

As officers and representatives of _____

We, the undersigned, have read and fully agree to this Affirmative Action Plan, and become a party to the full implementation of this program.

Signature

Title

Date

Loans, grants, contracts and subsidies for less than \$100,000.00 will be exempt.

Table A

Proposed Subcontracts Breakdown

For Period Covering _____, 20____ Through _____, 20____
(Duration of CDBG-DR OORR Assisted Project)

<i>Column 1</i>	<i>Column 2</i>	<i>Column3</i>	<i>Column 4</i>	<i>Column 5</i>
Type of Contract (Business of Profession)	Total Number of Contracts	Total Approximate Dollar Amount	Estimated Number of Contracts to Project Area Businesses*	Estimated Dollar Amount to Project Area Businesses*

*The Project Area is defined as the Town/City boundaries in which the assisted project resides.

Company

Project Name/Residence

Project Number

EEO Officer or Designee's Signature

Date

Table B**Estimated Project Workforce Breakdown**

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>
Job Category	Total Estimated Population	No. Positions Currently Occupied by Permanent Employees	No. Positions Not Currently Occupied	No. Positions to be filled with LIPAR*
Officers/Supervisors				
Professionals				
Technicians				
Housing Sales/Rental Management				
Office Clerical				
Service Workers				
Others				
TRADE:				
Journeyman				
Helpers				
Apprentices				
Maximum No. of Trainees				
Others				
TRADE:				
Journeyman				
Helpers				
Apprentices				
Maximum No. of Trainees				
Others				
TRADE:				
Journeyman				
Helpers				
Apprentices				
Maximum No. of Trainees				
Others				
Total				

**Lower Income Project Area Residents. Individuals residing within the project area whose family income does not exceed 80% of the area median income in the SMSA.*

Company

Green Building Standards Checklist

HUD CPD Green Building Retrofit Checklist

The CPD Green Retrofit Checklist promotes energy efficiency and green building practices for residential retrofit projects. Grantees must follow the checklist in its entirety and apply all measures within the Checklist to the extent applicable to the particular building type being retrofitted. The phrase “when replacing” in the Checklist refers to the mandatory replacement with specified green improvements, products, and fixtures only when replacing those systems during the normal course of the retrofit.

WATER AND ENERGY CONSERVATION MEASURES

N/A

Water-Conserving Fixtures

Install or retrofit water conserving fixtures in any unit and common facility, use the following specifications: Toilets-- 1.28 gpf; Urinals-- 0.5 gpf; Showerheads-- 2.0 gpm; Kitchen faucets-- 2.0 gpm; and Bathroom faucets-- 1.5gpm. [gpf = gallons per flush; gpm = gallons per minute]

N/A

ENERGY STAR Appliances

Install ENERGY STAR-labeled clothes washers, dishwashers, and refrigerators, if these appliance categories are provided in units or common areas.

N/A

Air Sealing: Building Envelope

Seal all accessible gaps and penetrations in the building envelope. If applicable, use low VOC caulk or foam.

N/A

Insulation: Attic (if applicable to building type)

For attics with closed floor cavities directly above the conditioned space, blow in insulation per manufacturer's specifications to a minimum density of 3.5 Lbs. per cubic foot (CF). For attics with open floor cavities directly above the conditioned space, install insulation to meet or exceed IECC levels.

N/A

Insulation: Flooring (if applicable to building type)

Install $\geq$ R-19 insulation in contact with the subfloor in buildings with floor systems over vented crawl spaces. Install a 6-mil vapor barrier in contact with 100% of the floor of the crawl space (the ground), overlapping seams and piers at least 6 inches.

N/A

Duct Sealing (if applicable to building type)

In buildings with ducted forced-air heating and cooling systems, seal all penetrations of the air distribution system to reduce leakage in order to meet or exceed ENERGY STAR for Homes' duct leakage standard.

N/A

Air Barrier System

Ensure continuous unbroken air barrier surrounding all conditioned space and dwelling units. Align insulation completely and continuously with the air barrier.

N/A

Radiant Barriers: Roofing

When replacing or making a substantial repair to the roof, use radiant barrier sheathing or other radiant barrier material; if economically feasible, also use cool roofing materials.

N/A

Windows

When replacing windows, install geographically appropriate ENERGY STAR rated windows.

N/A

Sizing of Heating and Cooling Equipment

When replacing, size heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manuals, Parts J and S, or 2012 ASHRAE Handbook--HVAC Systems and Equipment or most recent edition.

N/A

Domestic Hot Water Systems

When replacing domestic water heating system(s), ensure the system(s) meet or exceed the efficiency requirements of ENERGY STAR for Homes' Reference Design. Insulate pipes by at least R-4.

N/A

Efficient Lighting: Interior Units

Follow the guidance appropriate for the project type: install the ENERGY STAR Advanced Lighting Package (ALP); **OR** follow the ENERGY STAR MFHR program guidelines, which require that 80% of installed lighting fixtures within units must be ENERGY STAR-qualified or have ENERGY STAR-qualified lamps installed; **OR** when replacing, new fixtures and ceiling fans must meet or exceed ENERGY STAR efficiency levels.

N/A

Efficient Lighting: Common Areas and Emergency Lighting (if applicable to building type)

Follow the guidance appropriate for the project type: use ENERGY STAR-labeled fixtures or any equivalent high-performance lighting fixtures and bulbs in all common areas; **OR** when replacing, new common space and emergency lighting fixtures must meet or exceed ENERGY STAR efficiency levels. For emergency lighting, if installing new or replacing, all exist signs shall meet or exceed LED efficiency levels and conform to local building codes.

N/A

Efficient Lighting: Exterior

Follow the guidance appropriate for the project type: install ENERGY STAR-qualified fixtures or LEDs with a minimum efficacy of 45 lumens/watt; **OR** follow the ENERGY STAR MFHR program guidelines, which require that 80% of outdoor lighting fixtures must be ENERGY STAR-qualified or have ENERGY STAR-qualified lamps installed; **OR** when replacing, install ENERGY STAR compact fluorescents or LEDs with a minimum efficacy of 45 lumens/watt.

INDOOR AIR QUALITY

N/A

Air Ventilation: Single Family and Multifamily (three stories or fewer)

Install an in-unit ventilation system capable of providing adequate fresh air per ASHRAE 62.2 requirements.

N/A

Air Ventilation: Multifamily (four stories or more)

Install apartment ventilation systems that satisfy ASHRAE 62.2 for all dwelling units and common area ventilation systems that satisfy ASHRAE 62.1 requirements. If economically feasible, consider heat/energy recovery for 100% of corridor air supply.

N/A

Composite Wood Products that Emit Low/No Formaldehyde

Composite wood products must be certified compliant with California 93120. If using a composite wood product that does not comply with California 93120, all exposed edges and sides must be sealed with low-VOC sealants.

N/A

Environmentally Preferable Flooring

When replacing flooring, use environmentally preferable flooring, including the FloorScore certification. Any carpet products used must meet the Carpet and Rug Institute's Green Label or Green Label Plus certification for carpet, pad, and carpet adhesives.

X

Low/No VOC Paints and Primers

All interior paints and primers must be less than or equal to the following VOC levels: Flats--50 g/L; Non-flats--50 g/L; Floor--100 g/L. [g/L = grams per liter; levels are based on a combination of the Master Painters Institute (MPI) and GreenSeal standards.]

X

Low/No VOC Adhesives and Sealants

All adhesives must comply with Rule 1168 of the South Coast Air Quality Management District. All caulks and sealants must comply with regulation 8, rule 51, of the Bay Area Air Quality Management District.

N/A

Clothes Dryer Exhaust

Vent clothes dryers directly to the outdoors using rigid-type duct work.

X

Mold Inspection and Remediation

Inspect the interior and exterior of the building for evidence of moisture problems. Document the extent and location of the problems, and implement the proposed repairs according to the Moisture section of the EPA Healthy Indoor Environment Protocols for Home Energy Upgrades.

X

Combustion Equipment

When installing new space and water-heating equipment, specify power-vented or direct vent combustion equipment.

N/A

Mold Prevention: Water Heaters

Provide adequate drainage for water heaters that includes drains or catch pans with drains piped to the exterior of the dwelling.

X

Mold Prevention: Surfaces

When replacing or repairing bathrooms, kitchens, and laundry rooms, use materials that have durable, cleanable surfaces.

N/A

Mold Prevention: Tub and Shower Enclosures

When replacing or repairing tub and/or shower enclosures, use non-paper-faced backing materials such as cement board, fiber cement board, or equivalent in bathrooms.

N/A

Integrated Pest Management

Seal all wall, floor, and joint penetrations with low-VOC caulking or other appropriate sealing methods to prevent pest entry. [If applicable, provide training to multifamily buildings staff.]

X

Lead-Safe Work Practices

For properties built before 1978, if the project will involve disturbing painted surfaces or cleaning up lead contaminated dust or soil, use certified renovation or lead abatement contractors and workers using lead-safe work practices and clearance examinations consistent with the more stringent of EPA's Renovation, Repair, and Painting Rule and HUD's Lead Safe Housing Rule.

N/A

Radon Testing and Mitigation (if applicable based on building location)

For buildings in EPA Radon Zone 1 or 2, test for radon using the current edition of American Association of Radon Scientists and Technologists (AARST)'s Protocols for Radon Measurement in Homes Standard for Single-Family Housing or Duplexes, or AARST's Protocol for Conducting Radon and Radon Decay Product Measurements in Multifamily Buildings. To install radon mitigation systems in buildings with radon level of 4 pCi/L or more, use ASTM E 2121 for single-family housing or duplexes, or AARST's Radon Mitigation Standards for Multifamily Buildings. For new construction, use AARST's Reducing Radon in New Construction of 1 & 2 Family Dwellings and Townhouses, or ASTM E 1465.

Section 2: General Conditions for Construction Contracts

Based on HUD form 5370

Applicability. This form is applicable to any construction/development contract greater than \$100,000.

This form includes those clauses required by OMB's common rule on grantee procurement, implemented at HUD in 24 CFR 85.36, and those requirements set forth in Section 3 of the Housing and Urban Development Act of 1968 and its amendment by the Housing and Community Development Act of 1992, implemented by HUD at 24 CFR Part 135.

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1. Definitions

- (a) "Architect" means the person or other entity engaged by DOH to perform architectural, engineering, design, and other services related to the work as provided for in the contract. When DOH uses an engineer to act in this capacity, the terms "architect" and "engineer" shall be synonymous. The Architect shall serve as a technical representative of the Contracting Officer. The Architect's authority is as set forth elsewhere in this contract.
- (b) "Contract" means the contract entered into between DOH and the Contractor. It includes the forms of Bid, the Bid Bond, the Performance and Payment Bond or Bonds or other assurance of completion, the Certifications, Representations, and Other Statements of Bidders (form HUD-5370), these General Conditions of the Contract for Construction (form HUD-5370), the applicable wage rate determinations from the U.S. Department of Labor (when applicable), any special conditions included elsewhere in the contract, the specifications, and drawings. It includes all formal changes to any of those documents by addendum, change order, or other modification.
- (c) "Contracting Officer" means the person delegated the authority by DOH to enter into, administer, and/or terminate this contract and designated as such in writing to the Contractor. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer also designated in writing. The Contracting Officer shall be deemed the authorized agent of DOH in all dealings with the Contractor.
- (d) "Contractor" means the person or other entity entering into the contract with DOH to perform all of the work required under the contract.
- (e) "Drawings" means the drawings enumerated in the schedule of drawings contained in the Specifications and as described in the contract clause entitled Specifications and Drawings for Construction herein.
- (f) "DOH" means the State Department of Housing including the Commissioner, or any other person designated to act on its behalf.
- (g) "HUD" means the United States of America acting through the Department of Housing and Urban Development including the Secretary, or any other person designated to act on its behalf. HUD has agreed, subject to the provisions of an Annual Contributions Contract (ACC), to provide financial assistance to DOH, which includes assistance in financing the work to be performed under this contract. As defined elsewhere in these General Conditions or the contract documents, the determination of HUD may be required to authorize changes in the work or for release of funds to DOH for payment to the Contractor. Notwithstanding HUD's role, nothing in this contract shall be construed to create any contractual relationship between the Contractor and HUD.
- (h) "Grantee" means the State of Connecticut Department of Housing (DOH).
- (i) "Homeowner" means the owner(s) of the real property for which project is taking place and is a party to the contract.
- (j) "Project" means the entire project, whether construction or rehabilitation, the work for which is provided for in whole or in part under this contract.
- (k) "Specifications" means the written description of the technical requirements for construction and includes the criteria and tests for determining whether the requirements are met.
- (l) "Work" means materials, workmanship, and manufacture and fabrication of components.

2. Contractor's Responsibility for Work

- (a) The Contractor shall furnish all necessary labor, materials, tools, equipment, and transportation necessary for performance of the work. The Contractor shall also furnish all necessary water, heat, light, and power not made available to the Contractor by the Homeowner pursuant to the clause entitled Access to the Premises Section 5.3 of Homeowner Rehabilitation Agreement herein.
- (b) The Contractor shall perform on the site, and with its own organization, work equivalent to at least 15 percent of the total amount of work to be performed under the order. This percentage may be reduced by a supplemental agreement to this order if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of DOH.
- (c) At all times during performance of this contract and until the work is completed and accepted, the

Contractor shall directly superintend the work or assign and have on the work site a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

- (d) The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall hold and save DOH, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.
- (e) The Contractor shall lay out the work from base lines and bench marks indicated on the drawings and be responsible for all lines, levels, and measurements of all work executed under the contract. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from its failure to do so.
- (f) The Contractor shall confine all operations (including storage of materials) on Homeowner premises to areas authorized or approved by the Contracting Officer.
- (g) The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. After completing the work and before final inspection, the Contractor shall (1) remove from the premises all scaffolding, equipment, tools, and materials (including rejected materials) that are not the property of the Homeowner and all rubbish caused by its work; (2) leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer; (3) perform all specified tests; and, (4) deliver the installation in complete and operating condition.
- (h) The Contractor's responsibility will terminate when all work has been completed, the final inspection made, and the work accepted by the Contracting Officer. The Contractor will then be released from further obligation except as required by the warranties specified elsewhere in the contract.

3. Architect's Duties, Responsibilities, and Authority

- (a) The Architect for this contract, and any successor, shall be designated in writing by the Contracting Officer.
- (b) The Architect shall serve as the Contracting Officer's technical representative with respect to architectural, engineering, and design matters related to the work performed under the contract. The Architect may provide direction on contract performance. Such direction shall be within the scope of the contract and may not be of a nature which: (1) institutes additional work outside the scope of the contract; (2) constitutes a change as defined in the Changes clause herein; (3) causes an increase or decrease in the cost of the contract; (4) alters the Construction Progress Schedule; or (5) changes any of the other express terms or conditions of the contract.
- (c) The Architect's duties and responsibilities may include but shall not be limited to:
 - (1) Making periodic visits to the work site, and on the basis of his/her on-site inspections, issuing written reports to DOH which shall include all observed deficiencies. The Architect shall file a copy of the report with the Contractor's designated representative at the site;
 - (2) Making modifications in drawings and technical specifications and assisting the Contracting Officer in the preparation of change orders and other contract modifications for issuance by the Contracting Officer;
 - (3) Reviewing and making recommendations with respect to - (i) the Contractor's construction progress schedules; (ii) the Contractor's shop and detailed drawings; (iii) the machinery, mechanical and other equipment and materials or other articles proposed for use by the Contractor; and, (iv) the Contractor's price breakdown and progress payment estimates; and,
 - (4) Assisting in inspections, signing Certificates of Completion, and making recommendations with respect to acceptance of work completed under the contract.

4. Other Contracts

DOH may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with DOH employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by DOH employees

5. Pre-construction Conference and Notice to Proceed

- (a) Upon scheduling of the contract execution, and prior to the commencement of work, the Contractor shall attend a preconstruction conference with representatives of DOH, its Architect, and other interested parties convened by DOH. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract. DOH or its Architect will provide the Contractor with the date, time, and place of the conference.
- (b) The contractor shall begin work upon receipt of a written Notice to Proceed from the Contracting Officer or designee. The Contractor shall not begin work prior to receiving such notice. Such notice shall not be prior to the homeowners three (3) day Notice of Cancellation period.

6. Site Investigation and Conditions Affecting the Work

- (a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to, (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by DOH, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to DOH.
- (b) DOH assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by DOH. Nor does DOH assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in the contract.

7. Differing Site Conditions

- (a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site(s), of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.
- (b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. Work shall not proceed at the affected site, except at the Contractor's risk, until the Contracting Officer has provided written instructions to the Contractor. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the

work under this contract, whether or not changed as a result of the conditions, the Contractor shall file a claim in writing to DOH within ten days after receipt of such instructions and, in any event, before proceeding with the work. An equitable adjustment in the contract price, the delivery schedule, or both shall be made under this clause and the contract modified in writing accordingly.

- (c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.
- (d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

8. Specifications and Drawings for Construction

- (a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.
- (b) Wherever in the specifications or upon the drawings the words “directed”, “required”, “ordered”, “designated”, “prescribed”, or words of like import are used, it shall be understood that the “direction”, “requirement”, “order”, “designation”, or “prescription”, of the Contracting Officer is intended and similarly the words “approved”, “acceptable”, “satisfactory”, or words of like import shall mean “approved by”, or “acceptable to”, or “satisfactory to” the Contracting Officer, unless otherwise expressly stated.
- (c) Where “as shown”, “as indicated”, “as detailed”, or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word “provided” as used herein shall be understood to mean “provide complete in place” that is “furnished and installed”.
- (d) “Shop drawings” means drawings, submitted to DOH by the Contractor, subcontractor, or any lower tier subcontractor, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. DOH may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.
- (e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with other contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor’s approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate DOH’s reasons therefore. Any work done before such approval shall be at the Contractor’s risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.
- (f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect approves any such variation and the Contracting Officer concurs, the Contracting Officer shall issue an appropriate modification to the contract, except that, if the variation is minor or does not involve a

change in price or in time of performance, a modification need not be issued.

- (g) It shall be the responsibility of the Contractor to make timely requests of DOH for such large scale and full size drawings, color schemes, and other additional information, not already in his possession, which shall be required in the planning and production of the work. Such requests may be submitted as the need arises, but each such request shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.
- (h) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by DOH and one set will be returned to the Contractor. As required by the Contracting Officer, the Contractor, upon completing the work under this contract, shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the work is completed and accepted.
- (i) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all shop drawings prepared by subcontractors are submitted to the Contracting Officer.

9. Material and Workmanship

- (a) All equipment, material, and articles furnished under this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the contract to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of, and as approved by the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.
- (b) Approval of equipment and materials.
 - (1) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.
 - (2) When required by the specifications or the Contracting Officer, the Contractor shall submit appropriately marked samples (and certificates related to them) for approval at the Contractor's expense, with all shipping charges prepaid. The Contractor shall label, or otherwise properly mark on the container, the material or product represented, its place of origin, the name of the producer, the Contractor's name, and the identification of the construction project for which the material or product is intended to be used.
 - (3) Certificates shall be submitted in triplicate, describing each sample submitted for approval and certifying that the material, equipment or accessory complies with contract requirements. The certificates shall include the name and brand of the product, name of manufacturer, and the location where produced.
 - (4) Approval of a sample shall not constitute a waiver of DOH right to demand full compliance with contract requirements. Materials, equipment and accessories may be rejected for cause even though samples have been approved.
 - (5) Wherever materials are required to comply with recognized standards or specifications, such specifications shall be accepted as establishing the technical qualities and testing methods, but

shall not govern the number of tests required to be made nor modify other contract requirements. The Contracting Officer may require laboratory test reports on items submitted for approval or may approve materials on the basis of data submitted in certificates with samples. Check tests will be made on materials delivered for use only as frequently as the Contracting Officer determines necessary to insure compliance of materials with the specifications. The Contractor will assume all costs of retesting materials which fail to meet contract requirements and/or testing materials offered in substitution for those found deficient.

- (6) After approval, samples will be kept in the Project office until completion of work. They may be built into the work after a substantial quantity of the materials they represent has been built in and accepted.
- (c) Requirements concerning lead-based paint. The Contractor shall comply with the requirements concerning lead-based paint contained in the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846) as implemented by 24 CFR Part 35, HUD's Lead Safe Housing Rule and EPA's Repair Renovation, and Painting Rule at 40 CFR.80 Subpart E.

10. Permits and Codes

The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. Notwithstanding the requirement of the Contractor to comply with the drawings and specifications in the contract, all work installed shall comply with all applicable codes and regulations as amended by any waivers. Before installing the work, the Contractor shall examine the drawings and the specifications for compliance with applicable codes and regulations bearing on the work and shall immediately report any discrepancy it may discover to the Contracting Officer. Where the requirements of the drawings and specifications fail to comply with the applicable code or regulation, the Contracting Officer shall modify the contract by change order pursuant to the clause entitled Changes herein to conform to the code or regulation.

- (a) The Contractor shall secure and pay for all permits, fees, and licenses necessary for the proper execution and completion of the work. Where DOH can arrange for the issuance of all or part of these permits, fees and licenses, without cost to the Contractor, the contract amount shall be reduced accordingly.

11. Health, Safety, and Accident Prevention

- (a) In performing this contract, the Contractor shall:
 - (1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;
 - (2) Protect the lives, health, and safety of other persons;
 - (3) Prevent damage to property, materials, supplies, and equipment; and,
 - (4) Avoid work interruptions.
- (b) For these purposes, the Contractor shall:
 - (1) Comply with regulations and standards issued by the Secretary of Labor at 29 CFR Part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96), 40 U.S.C. 3701 et seq.; and
 - (2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.
- (c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29

CFR Part 1904.

- (d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.
- (e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as DOH, the Secretary of Housing and Urban Development, or the Secretary of Labor shall direct as a means of enforcing such provisions.

12. Temporary Heating

The Contractor shall provide and pay for temporary heating, covering, and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work, and to facilitate the completion of the work. Any permanent heating equipment used shall be turned over to the Homeowner in the condition and at the time required by the specifications.

13. Availability and Use of Utility Services

- (a) The Homeowner shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The Contractor shall carefully conserve any utilities furnished without charge.
- (b) The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines. Before final acceptance of the work by DOH, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

14. Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements

- (a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed under this contract, and which do not unreasonably interfere with the work required under this contract.
- (b) The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during performance of this contract, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- (c) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. Prior to disturbing the ground at the construction site, the Contractor shall ensure that all underground utility lines are clearly marked.
- (d) The Contractor shall shore up, brace, underpin, secure, and protect as necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be affected by the excavations or other operations connected with the construction of the project.

- (e) Any equipment temporarily removed as a result of work under this contract shall be protected, cleaned, and replaced in the same condition as at the time of award of this contract.
- (f) New work which connects to existing work shall correspond in all respects with that to which it connects and/or be similar to existing work unless otherwise required by the specifications.
- (g) No structural members shall be altered or in any way weakened without the written authorization of the Contracting Officer, unless such work is clearly specified in the plans or specifications.
- (h) If the removal of the existing work exposes discolored or unfinished surfaces, or work out of alignment, such surfaces shall be refinished, or the material replaced as necessary to make the continuous work uniform and harmonious. This, however, shall not be construed to require the refinishing or reconstruction of dissimilar finishes previously exposed, or finished surfaces in good condition, but in different planes or on different levels when brought together by the removal of intervening work, unless such refinishing or reconstruction is specified in the plans or specifications.
- (i) The Contractor shall give all required notices to any adjoining or adjacent property owner or other party before the commencement of any work.
- (j) The Contractor shall indemnify and save harmless DOH from any damages on account of settlement or the loss of lateral support of adjoining property, any damages from changes in topography affecting drainage, and from all loss or expense and all damages for which DOH may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.
- (k) The Contractor shall repair any damage to vegetation, structures, equipment, utilities, or improvements, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

15. Temporary Buildings and Transportation of Materials

- (a) Temporary buildings (e.g., storage sheds, shops, offices, sanitary facilities) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to DOH. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- (b) The Contractor shall, as directed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

16. Clean Air and Water

The contractor shall comply with the Clean Air Act, as amended, 42 USC 7401 et seq., the Federal Water Pollution Control Water Act, as amended, 33 U.S.C. 1251 et seq., and standards issued pursuant thereto in the facilities in which this contract is to be performed.

17. Energy Efficiency

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub.L. 94-163) for the State in which the work under the contract is performed.

18. Green Building Standards

DOH will require that all replacement of residential properties, including reconstruction and new construction of substantially damaged properties meet the Enterprise Green Communities Standard.

For those buildings that are non-substantially damaged, DOH will require that they be rehabilitated following the HUD CPD Green Buildings Retrofit Checklist. The requirement for rehabilitation is that to the extent possible strive to meet the checklist standard where there are Energy Star, Water Sense and Federal Management Program-designed products available.

DOH strongly encourages the use of green infrastructure techniques to mitigate against storm water run-off and flooding and incorporate EPA's Green Infrastructure resources to the extent feasible.

19. Inspection and Acceptance of Construction

- (a) Definitions. As used in this clause -
 - (1) "Acceptance" means the act of an authorized representative of DOH by which DOH approves of the work performed under this contract. Acceptance may be partial or complete.
 - (2) "Inspection" means examining and testing the work performed under the contract (including, when appropriate, raw materials, equipment, components, and intermediate assemblies) to determine whether it conforms to contract requirements.
 - (3) "Testing" mean that element of inspection that determines the properties or elements, including functional operation of materials, equipment, or their components, by the application of established scientific principles and procedures.
- (b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. All work is subject to DOH inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.
- (c) DOH inspections and tests are for the sole benefit of DOH and do not: (1) relieve the Contractor of responsibility for providing adequate quality control measures; (2) relieve the Contractor of responsibility for loss or damage of the material before acceptance; (3) constitute or imply acceptance; or, (4) affect the continuing rights of DOH after acceptance of the completed work under paragraph (j) below.
- (d) The presence or absence of DOH inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specifications without the Contracting Officer's written authorization. All instructions and approvals with respect to the work shall be given to the Contractor by the Contracting Officer.
- (e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. DOH may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. DOH shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.
- (f) DOH may conduct routine inspections of the construction site on a daily basis.
- (g) The Contractor shall, without charge, replace or correct work found by DOH not to conform to contract requirements, unless DOH decides that it is in its interest to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected

material from the premises.

- (h) If the Contractor does not promptly replace or correct rejected work, DOH may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed.
- (i) If any work requiring inspection is covered up without approval of DOH, it must, if requested by the Contracting Officer, be uncovered at the expense of the Contractor. If at any time before final acceptance of the entire work, DOH considers it necessary or advisable, to examine work already completed by removing or tearing it out, the Contractor, shall on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray all the expenses of the examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the Contracting Officer shall make an equitable adjustment to cover the cost of the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.
- (j) The Contractor shall notify the Contracting Officer, in writing, as to the date when in its opinion all or a designated portion of the work will be substantially completed and ready for inspection. If the Architect determines that the state of preparedness is as represented, DOH will promptly arrange for the inspection. Unless otherwise specified in the contract, DOH shall accept, as soon as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines and designates can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or DOH's right under any warranty or guarantee.

20. Use and Possession Prior to Completion

- (a) If applicable, the Homeowner may have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Homeowner intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Homeowner's possession or use shall not be deemed an acceptance of any work under the contract.
- (b) While the Homeowner has such possession or use, the Contractor shall be relieved of the responsibility for (1) the loss of or damage to the work resulting from the Homeowner's possession or use, notwithstanding the terms of the clause entitled Permits and Codes herein; (2) all maintenance costs on the areas occupied; and, (3) furnishing heat, light, power, and water used in the areas occupied without proper remuneration therefore. If prior possession or use by the Homeowner delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

21. Warranty of Title

The Contractor warrants good title to all materials, supplies, and equipment incorporated in the work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

22. Warranty of Construction

- (a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. This warranty shall continue for a period of **one year** from the date of final acceptance of the work. If the Homeowner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of (one year unless otherwise indicated) from the date that the Homeowner takes possession.
- (b) The Contractor shall remedy, at the Contractor's expense, any failure to conform, or any defect. In addition, the Contractor shall remedy, at the Contractor's expense, any damage to Homeowner-owned or controlled real or personal property when the damage is the result of—
 - (1) The Contractor's failure to conform to contract requirements; or
 - (2) Any defects of equipment, material, workmanship or design furnished by the Contractor.
- (c) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for (one year unless otherwise indicated) from the date of repair or replacement.
- (d) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect or damage.
- (e) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, DOH shall have the right to replace, repair or otherwise remedy the failure, defect, or damage at the Contractor's expense.
- (f) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:
 - (1) Obtain all warranties that would be given in normal commercial practice;
 - (2) Require all warranties to be executed in writing, for the benefit of the homeowner; and,
 - (3) Enforce all warranties for the benefit of the homeowner.
- (g) In the event the Contractor's warranty under paragraph(a) of this clause has expired, the homeowner may bring suit at its own expense to enforce a subcontractor's, manufacturer's or supplier's warranty.
- (h) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defect of material or design furnished by the homeowner nor for the repair of any damage that results from any defect in DOH furnished material or design.
- (i) Notwithstanding any provisions herein to the contrary, the establishment of the time periods in paragraphs (a) and (c) above relate only to the specific obligation of the Contractor to correct the work, and have no relationship to the time within which its obligation to comply with the contract may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligation other than specifically to correct the work.
- (j) This warranty shall not limit DOH's/Homeowner's rights under the Inspection and Acceptance of Construction clause of this contract with respect to latent defects, gross mistakes or fraud.

23. Contract Period

The Contractor shall complete all work required under this contract within 180 calendar days of the effective date of the contract, or within the time schedule established in the notice to proceed issued by the Contracting Officer.

24. Order of Provisions

In the event of a conflict between these General Conditions and the Specifications, the General Conditions shall prevail. In the event of a conflict between the contract and any applicable state or local law or regulation, the state or local law or regulation shall prevail; provided that such state or local law or regulation does not conflict with, or is less restrictive than applicable federal law, regulation, or Executive Order. In the event of such a conflict, applicable federal law, regulation, and Executive Order shall prevail.

25. Payments

- (a) DOH/Homeowner shall pay the Contractor the price as provided in this contract.
- (b) DOH shall make progress payments approximately every 30 days as the work proceeds, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer. DOH may, subject to written determination and approval of the Contracting Officer, make more frequent payments to contractors which are qualified small businesses.
- (c) Before the first progress payment under this contract, the Contractor shall furnish, in such detail as requested by the Contracting Officer, a breakdown of the total contract price showing the amount included therein for each principal category of the work, which shall substantiate the payment amount requested in order to provide a basis for determining progress payments. The breakdown shall be approved by the Contracting Officer and must be acceptable to DOH. The values and quantities employed in making up this breakdown are for determining the amount of progress payments and shall not be construed as a basis for additions to or deductions from the contract price. The Contractor shall prorate its overhead and profit over the construction period of the contract.
- (d) The Contractor shall submit, on AIA forms provided by DOH, periodic estimates showing the value of the work performed during each period based upon the approved breakdown of the contract price. Such estimates shall be submitted not later than 14 days in advance of the date set for payment and are subject to correction and revision as required. The estimates must be approved by the Contracting Officer with the concurrence of the Architect prior to payment. If the contract covers more than one project, the Contractor shall furnish a separate progress payment estimate for each.
- (e) Along with each request for progress payments and the required estimates, the Contractor shall furnish lien waivers and labor releases as good and sufficient evidence that the premises are free from all liens, damages, and anything chargeable to said contractor.
- (f) Except as otherwise provided in State law, DOH shall retain five (5) percent of the amount of progress payments until completion and acceptance of all work under the contract; except, that if upon completion of 50 percent of the work, the Contracting Officer, after consulting with the Architect, determines that the Contractor's performance and progress are satisfactory, DOH may make the remaining payments in full for the work subsequently completed. If the Contracting Officer subsequently determines that the Contractor's performance and progress are unsatisfactory, DOH shall reinstate the five (5) percent retainage until such time as the Contracting Officer determines that performance and progress are satisfactory. Retainage will be released 90 days after project completion.
- (g) The Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration when computing progress payments. Material delivered to the Contractor at locations other than the site may also be taken into consideration if the Contractor furnishes satisfactory evidence that (1) it has acquired title to such material; (2) the material is properly stored in a bonded warehouse, storage yard, or similar suitable place as may be approved by the Contracting Officer; (3) the material is insured to cover its full value; and (4) the material will be used to perform this contract. Before any progress payment which includes delivered material is made, the Contractor shall furnish such documentation as the Contracting Officer may require to assure the protection of DOH's/Homeowner's interest in such materials. The Contractor shall remain responsible for such stored material notwithstanding the transfer of title to the Homeowner.

- (h) All material and work covered by progress payments made shall, at the time of payment become the sole property of the Homeowner, but this shall not be construed as (1) relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or, (2) waiving the right of DOH/Homeowner to require the fulfillment of all of the terms of the contract. In the event the work of the Contractor has been damaged by other contractors or persons other than employees of DOH in the course of their employment, the Contractor shall restore such damaged work without cost to DOH/Homeowner and to seek redress for its damage only from those who directly caused it.
- (i) DOH shall make the final payment due the Contractor under this contract after (1) completion and final acceptance of all work; and (2) presentation of release of all claims against DOH/Homeowner arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. Each such exception shall embrace no more than one claim, the basis and scope of which shall be clearly defined. The amounts for such excepted claims shall not be included in the request for final payment. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned.
- (j) Prior to making any payment, the Contracting Officer may require the Contractor to furnish receipts or other evidence of payment from all persons performing work and supplying material to the Contractor, if the Contracting Officer determines such evidence is necessary to substantiate claimed costs.
- (k) DOH shall not; (1) determine or adjust any claims for payment or disputes arising there under between the Contractor and its subcontractors or material suppliers; or, (2) withhold any moneys for the protection of the subcontractors or material suppliers. The failure or refusal of DOH to withhold moneys from the Contractor shall in nowise impair the obligations of any surety or sureties under any bonds furnished under this contract.

26. Contract Modifications

- (a) Only the Contracting Officer has authority to modify any term or condition of this contract. Any contract modification shall be authorized in writing.
- (b) The Contracting Officer may modify the contract unilaterally (1) pursuant to a specific authorization stated in a contract clause (e.g., Changes); or (2) for administrative matters which do not change the rights or responsibilities of the parties (e.g., change in DOH/homeowner's address). All other contract modifications shall be in the form of supplemental agreements signed by the Contractor and the Contracting Officer.
- (c) When a proposed modification requires the approval of DOH prior to its issuance (e.g., a change order that exceeds DOH's approved threshold), such modification shall not be effective until the required approval is received by DOH.

27. Changes

- (a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract including changes:
 - (1) In the specifications (including drawings and designs);
 - (2) In the method or manner of performance of the work;
 - (3) Directing the acceleration in the performance of the work.
- (b) Any other written order or oral order (which, as used in this paragraph (b), includes direction,

instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances and source of the order and (2) that the Contractor regards the order as a change order.

- (c) Except as provided in this clause, no order, statement or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.
- (d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for a adjustment based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days (5 days for oral orders) before the Contractor gives written notice as required. In the case of defective specifications for which DOH is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.
- (e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause, or (2) the furnishing of a written notice under paragraph(b) of this clause, by submitting a written statement describing the general nature and the amount of the proposal. If the facts justify it, the Contracting Officer may extend the period for submission. The proposal may be included in the notice required under paragraph (b) above. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.
- (f) The Contractor's written proposal for equitable adjustment shall be submitted in the form of a lump sum proposal supported with an itemized breakdown of all increases and decreases in the contract in at least the following details:
 - (1) Direct Costs. Materials (list individual items, the quantity and unit cost of each, and the aggregate cost); Transportation and delivery costs associated with materials; Labor breakdowns by hours or unit costs (identified with specific work to be performed); Construction equipment exclusively necessary for the change; Costs of preparation and/ or revision to shop drawings resulting from the change; Worker's Compensation and Public Liability Insurance; Employment taxes under FICA and FUTA; and, Bond Costs when size of change warrants revision.
 - (2) Indirect Costs. Indirect costs may include overhead, general and administrative expenses, and fringe benefits not normally treated as direct costs.
 - a. Overhead on work performed by General Contractor for the General Contractor – 10 percent above Direct Costs.
 - b. Overhead on work performed by Subcontractor for the Subcontractor – 10 percent above Direct Costs.
 - c. Overhead on work performed by Subcontractor for General Contractor – 5 percent above Direct Costs
 - (3) Profit. The amount of profit shall be negotiated and may vary according to the nature, extent, and complexity of the work required by the change. Generally
 - a. Profit on Work Performed by General Contractor for General Contractor – 5 percent profit above Direct Costs
 - b. Profit on Work Performed by Subcontractor for Subcontractor – 5 percent profit above Direct Costs
 - c. Profit on Work Performed by Subcontractor for General Contractor – 2.5 percent above Direct Costs

The allowability of the direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR 1-31), as implemented by HUD Handbook 2210.18, in effect on the date of this contract. Equitable adjustments for deleted work shall include a credit for profit and may include a credit for indirect costs. On proposals covering both increases and decreases in the amount of the

contract, the application of indirect costs and profit shall be on the net- change in direct costs for the Contractor or subcontractor performing the work

- (g) The Contractor shall include in the proposal its request for time extension (if any), and shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the contract in its entirety.
- (h) The Contracting Officer shall act on proposals within 30 days after their receipt, or notify the Contractor of the date when such action will be taken.
- (i) Failure to reach an agreement on any proposal shall be a dispute under the clause entitled Disputes herein. Nothing in this clause, however, shall excuse the Contractor from proceeding with the contract as changed.
- (j) Except in an emergency endangering life or property, no change shall be made by the Contractor without a prior order from the Contracting Officer.

28. Suspension of Work

- (a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of DOH/Homeowner.

If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified (or within a reasonable time if not specified) in this contract an adjustment may be made for any increase in the cost of performance of the contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or for which any equitable adjustment is provided for or excluded under any other provision of this contract.

- (b) A claim under this clause shall not be allowed without prior written approval of the Contracting Officer.

29. Disputes

- (a) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract. A claim arising under the contract, unlike a claim relating to the contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim. The submission may be converted to a claim by complying with the requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.
- (b) Except for disputes arising under the clauses entitled Labor Standards - Davis Bacon and Related Acts, herein, all disputes arising under or relating to this contract, including any claims for damages for the alleged breach thereof which are not disposed of by agreement, shall be resolved under this clause.
- (c) All claims by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision.
- (d) A claim by the Homeowner against the Contractor shall be subject to a written decision by the Contracting Officer.
- (e) The Contracting Officer shall, within 60 (unless otherwise indicated) days after receipt of the request,

decide the claim or notify the Contractor of the date by which the decision will be made.

- (f) The Contracting Officer's decision shall be final unless the Contractor (1) appeals in writing to a higher level in DOH in accordance with DOH's policy and procedures, (2) refers the appeal to an independent mediator or arbitrator, or (3) files suit in a court of competent jurisdiction. Such appeal must be made within (30 unless otherwise indicated) days after receipt of the Contracting Officer's decision.
- (g) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

30. Default

- (a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with the diligence that will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the Contracting Officer may, by written notice to the Contractor, terminate the right to proceed with the work (or separable part of the work) that has been delayed. In this event, DOH may take over the work and complete it, by contract or otherwise, and may take possession of and use any materials, equipment, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to DOH/Homeowner resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by DOH/Homeowner in completing the work.
- (b) The Contractor's right to proceed shall not be terminated or the Contractor charged with damages under this clause if—
 - (1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God, or of the public enemy, (ii) acts of DOH or other governmental entity in either its sovereign or contractual capacity, (iii) acts of another contractor in the performance of a contract with DOH, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and
 - (2) The Contractor, within days (5 days unless otherwise indicated) from the beginning of such delay (unless extended by the Contracting Officer) notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, time for completing the work shall be extended by written modification to the contract. The findings of the Contracting Officer shall be reduced to a written decision which shall be subject to the provisions of the Disputes clause of this contract
- (c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been for convenience of DOH.

31. Liquidated Damages

- (a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, as specified in the clause entitled Default of this contract, the Contractor may pay to DOH as liquidated damages, the sum of \$100.00 for each day of delay. If different completion dates are specified in the contract for separate parts or stages of the work, the amount of liquidated damages

shall be assessed on those parts or stages which are delayed. To the extent that the Contractor's delay or nonperformance is excused under another clause in this contract, liquidated damages shall not be due DOH. The Contractor remains liable for damages caused other than by delay.

- (b) If DOH terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned DOH in completing the work.
- (c) If DOH does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

32. Termination for Convenience

- (a) The Contracting Officer may terminate this contract in whole, or in part, whenever the Contracting Officer determines that such termination is in the best interest of DOH/Homeowner. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which the performance of the work under the contract is terminated, and the date upon which such termination becomes effective.
- (b) If the performance of the work is terminated, either in whole or in part, DOH/Homeowner shall be liable to the Contractor for reasonable and proper costs resulting from such termination upon the receipt by DOH of a properly presented claim setting out in detail: (1) the total cost of the work performed to date of termination less the total amount of contract payments made to the Contractor; (2) the cost (including reasonable profit) of settling and paying claims under subcontracts and material orders for work performed and materials and supplies delivered to the site, payment for which has not been made by DOH to the Contractor or by the Contractor to the subcontractor or supplier; (3) the cost of preserving and protecting the work already performed until DOH or assignee takes possession thereof or assumes responsibility therefore; (4) the actual or estimated cost of legal and accounting services reasonably necessary to prepare and present the termination claim to DOH/Homeowner; and (5) an amount constituting a reasonable profit on the value of the work performed by the Contractor.
- (c) The Contracting Officer will act on the Contractor's claim within days (60 days unless otherwise indicated) of receipt of the Contractor's claim.
- (d) Any disputes with regard to this clause are expressly made subject to the provisions of the Disputes clause of this contract.

33. Assignment of Contract

The Contractor shall not assign or transfer any interest in this contract; except that claims for monies due or to become due from DOH/Homeowner under the contract may be assigned to a bank, trust company, or other financial institution. Such assignments of claims shall only be made with the written concurrence of the Contracting Officer. If the Contractor is a partnership, this contract shall inure to the benefit of the surviving or remaining member(s) of such partnership as approved by the Contracting Officer.

34. Insurance

- (a) Before commencing work, the Contractor and each subcontractor shall furnish DOH with certificates of insurance listing DOH and the Homeowner as additionally insured A.T.I.M.A. showing the following insurance is in force and will insure all operations under the Contract:
 - (1) Workers' Compensation, in accordance with state or Territorial Workers' Compensation laws.
 - (2) Commercial General Liability with a combined single limit for bodily injury and property damage of not less than \$1,000,000 per occurrence to protect the Contractor and each subcontractor against claims for bodily injury or death and damage to the property of others. This shall cover the use of all equipment, hoists, and vehicles on the site(s) not covered by Automobile Liability under

- (3) below. If the Contractor has a “claims- made” policy, then the following additional requirements apply: the policy must provide a “retroactive date” which must be on or before the execution date of the Contract; and the extended reporting period may not be less than five years following the completion date of the Contract.
- (3) Automobile Liability on owned and non -owned motor vehicles used on the site(s) or in connection therewith for a combined single limit for bodily injury and property damage of not less than \$1,000,000 per occurrence.
 - (4) Cargo Insurance in the amount of \$250,000 is required when the project involves raising the structure above the Base Flood Elevation.
- (b) Before commencing work, the Contractor shall furnish DOH with a certificate of insurance evidencing that Builder’s Risk (fire and extended coverage) Insurance on all work in place and/or materials stored at the building site(s), including foundations and building equipment, is in force. The Builder’s Risk Insurance shall be for the benefit of the Contractor, the Homeowner and DOH as their interests may appear and each shall be named in the policy or policies as an insured. The Contractor in installing equipment supplied by DOH shall carry insurance on such equipment from the time the Contractor takes possession thereof until the Contract work is accepted by DOH. The Builder’s Risk Insurance need not be carried on excavations, piers, footings, or foundations until such time as work on the superstructure is started. It need not be carried on landscape work. Policies shall furnish coverage at all times for the full cash value of all completed construction, as well as materials in place and/or stored at the site(s), whether or not partial payment has been made by DOH. The Contractor may terminate this insurance on buildings as of the date taken over for occupancy by the Homeowner. The Contractor is not required to carry Builder’s Risk Insurance for modernization work which does not involve structural alterations or additions and where the Homeowner’s existing fire and extended coverage policy can be endorsed to include such work.
- (c) All insurance shall be carried with companies which are financially responsible and admitted to do business in the State in which the project is located with a minimum Best rating of A-. If any such insurance is due to expire during the construction period, the Contractor (including subcontractors, as applicable) shall not permit the coverage to lapse and shall furnish evidence of coverage to the Contracting Officer. All certificates of insurance, as evidence of coverage, shall provide that no coverage may be canceled or non- renewed by the insurance company until at least 30 days prior written notice has been given to the Contracting Officer.

35. Subcontracts

- (a) Definitions. As used in this contract -
- (1) “Subcontract” means any contract, purchase order, or other purchase agreement, including modifications and change orders to the foregoing, entered into by a subcontractor to furnish supplies, materials, equipment, and services for the performance of the prime contract or a subcontract.
 - (2) “Subcontractor” means any supplier, vendor, or firm that furnishes supplies, materials, equipment, or services to or for the Contractor or another subcontractor.
- (b) The Contractor shall not enter into any subcontract with any subcontractor who has been temporarily denied participation in a HUD program or who has been suspended or debarred from participating in contracting programs by any agency of the United States Government or of the state in which the work under this contract is to be performed.
- (c) The Contractor shall be as fully responsible for the acts or omissions of its subcontractors, and of persons either directly or indirectly employed by them as for the acts or omissions of persons directly employed by the Contractor.
- (d) The Contractor shall insert appropriate clauses in all subcontracts to bind subcontractors to the terms and conditions of this contract insofar as they are applicable to the work of subcontractors.
- (e) Nothing contained in this contract shall create any contractual relationship between any subcontractor

and DOH or between the subcontractor and HUD.

36. Subcontracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms

The Contractor shall take the following steps to ensure that, whenever possible, subcontracts are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

- (a) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- (b) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;
- (c) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;
- (d) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises; and
- (e) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

37. Equal Employment Opportunity

During the performance of this contract, the Contractor agrees as follows:

- (a) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or handicap.
- (b) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship.
- (c) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.
- (d) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, or handicap.
- (e) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.
- (f) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.
- (g) The Contractor shall furnish all information and reports required by Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto. The Contractor shall permit access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- (h) In the event of a determination that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, or Federally assisted construction contracts under the procedures authorized in Executive Order 11246,

as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

- (i) The Contractor shall include the terms and conditions of this clause in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor. The Contractor shall take such action with respect to any subcontract or purchase order as the Secretary of Housing and Urban Development or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.
- (j) Compliance with the requirements of this clause shall be to the maximum extent consistent with, but not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act and the Indian Preference clause of this contract.

38. Employment, Training, and Contracting Opportunities for Low-Income Persons, Section 3 of the Housing and Urban Development Act of 1968.

- (a) The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.
- (b) The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 135, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 135 regulations.
- (c) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this Section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.
- (d) The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135.
- (e) The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR Part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR Part 135.
- (f) Noncompliance with HUD's regulations in 24 CFR Part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.
- (g) With respect to work performed in connection with Section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians,

and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of Section 3 and Section 7(b) agree to comply with Section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

39. Interest of Members of Congress

No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

40. Interest of Members, Officers, or Employees and Former Members, Officers, or Employees

No member, officer, or employee of DOH, no member of the governing body of the locality in which the project is situated, no member of the governing body of the locality in which DOH was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this contract or the proceeds thereof.

41. Limitations on Payments made to Influence Certain Federal Financial Transactions

- (a) The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.
- (b) The Contractor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) 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 a Federal contract, grant, loan, or cooperative agreement.

42. Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringement of any patent rights and shall save DOH/Homeowner harmless from loss on account thereof; except that DOH shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified and the Contractor has no reason to believe that the specified design, process, or product is an infringement. If, however, the Contractor has reason to believe that any design, process or product specified is an infringement of a patent, the Contractor shall promptly notify the Contracting Officer. Failure to give such notice shall make the Contractor responsible for resultant loss.

43. Examination and Retention of Contractor's Records

- (a) DOH, HUD, or Comptroller General of the United States, or any of their duly authorized representatives shall, until 3 years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.
- (b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders not exceeding \$10,000.

- (c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the Disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which DOH, HUD, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

44. Labor Standards - Davis-Bacon and Related Acts

Except for housing rehabilitation/reconstruction projects designed to contain fewer than eight (8) units, if the total amount of this contract exceeds \$2,000, the Federal labor standards set forth in the clause below shall apply to the development or construction work to be performed under the contract.

(a) Minimum Wages.

- (1) All laborers and mechanics employed under this contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof (if applicable), regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. If applicable, such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers (if applicable).
- (2) (i) Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met: (A) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (B) The classification is utilized in the area by the construction industry; and (C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
(ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

- (iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- (iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (a)(2)(ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in classification.
- (3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
- (4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.
- (b) Withholding of funds. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working in the construction or development of the project, all or part of the wages required by the contract, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.
- (c) Payrolls and basic records.
- (1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of

the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

- (2)
- (i) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph (c)(1) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1214-0149.)
 - (ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
 - a. That the payroll for the payroll period contains the information required to be maintained under paragraph (c) (1) of this clause and that such information is correct and complete;
 - b. That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and
 - c. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
 - (iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c)(2)(ii) of this clause.
 - (iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.
- (3) The Contractor or subcontractor shall make the records required under subparagraph (c)(1) available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.
- (d) (1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage rate on the wage determination for the

classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- (3) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.
- (e) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.
- (f) Contract termination; debarment. A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.
- (g) Compliance with Davis-Bacon and related Act requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.
- (h) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of

its subcontractors) and DOH, HUD, the U.S. Department of Labor, or the employees or their representatives.

(i) Certification of eligibility.

(1) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(3) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

(j) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in subparagraph (j)(1) of this clause.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.

(k) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions

45. . Non-Federal Prevailing Wage Rates

(a) Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the contract, is inapplicable to the contract and shall not be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever such non-Federal prevailing wage rate exceeds:

(1) The applicable wage rate determined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 3141 et seq.) to be prevailing in the locality with respect to such trade;

- (b) An applicable apprentice wage rate based thereon specified in an apprenticeship program registered with the U.S. Department of Labor (DOL) or a DOL- recognized State Apprenticeship Agency; or
- (c) An applicable trainee wage rate based thereon specified in a DOL-certified trainee program.

46. Procurement of Recovered Materials.

- (a) In accordance with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contains the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition. The contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items:
 - (1) Are not reasonably available in a reasonable period of time;
 - (2) Fail to meet reasonable performance standards, which shall be determined on the basis of the guidelines of the National Institute of Standards and Technology, if applicable to the item; or
 - (3) Are only available at an unreasonable price.
- (b) Paragraph (a) of this clause shall apply to items purchased under this contract where: (1) the Contractor purchases in excess of \$10,000 of the item under this contract; or (2) during the preceding Federal fiscal year, the Contractor: (i) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was within a Federal agency or a State agency of a political subdivision of a State; and (ii) purchased a total of in excess of \$10,000 of the item both under and outside that contract

SECTION 00 01 15

LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

- A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled 'Project 1247 – 12 Jacob Street, Norwalk, CT, Connecticut Department of Housing, Community Development Block Grant, Disaster Recovery Program, Owner Occupied Rehabilitation and Rebuilding Program, dated January 2017, as modified by subsequent Addenda and Contract modifications.
- B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of the type indicated.

SHEET NO.	TITLE
T-0.0	TITLE SHEET
G-0.0	GENERAL NOTES & PROJECT INFORMATION
1 of 1	TOPOGRAPHIC AND BOUNDARY SURVEY
C-1.0	IMPROVEMENT LOCATION PLAN
C-1.1	SOIL EROSION, SEDIMENT CONTROL AND DEMOLITION PLAN
C-1.1-A	DEMOLITION PLAN – DETAIL AT HOUSE
C-1.2	SITE PLAN
C-1.2-A	SITE PLAN – DETAIL AT HOUSE
C-1.3	SITE UTILITY PLAN
C-2.0	SOIL EROSION AND SEDIMENT CONTROL DETAILS
C-2.1	SITE DETAILS
C-2.2	SITE UTILITY DETAILS
A-1.0	FLOOR PLANS - 1
A-1.1	FLOOR PLANS - 2
A-1.2	FRAMING PLANS – 1
A-1.3	FRAMING PLANS – 2
A-1.4	FRAMING DETAILS
A-2.0	BUILDING ELEVATIONS
A-2.1	BUILDING SECTIONS – 1
A-2.2	BUILDING SECTIONS – 2
A-2.3	BUILDING SECTIONS – 3
A-2.4	ROOF SECTIONS
A-3.0	DECK AND STAIR DETAILS
A-3.1	ARCHITECTURAL DETAILS
A-5.0	DETAILS AND SCHEDULES
S-1	FOUNDATION DESIGN - FOUNDATION PLAN

S-2	FOUNDATION DESIGN - FIRST FLOOR FRAMING SUPPORT PLAN
S-3	FOUNDATION DESIGN – SECTIONS & NOTES
MP-1.0	MECHANICAL AND PLUMBING PLANS – 1
MP-1.1	MECHANICAL AND PLUMBING PLANS – 2
E-1.0	ELECTRICAL PLANS – 1
E-1.1	ELECTRICAL PLANS – 2

END OF SECTION

SECTION 00 31 26

EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for the Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. Asbestos, lead, PCB's, mold or other hazardous materials: Reports were prepared to investigate hazardous materials at the site and these reports are attached. It is the Contractor's responsibility to appropriately characterize, remove, and dispose of soil and hazardous materials at the site.
- C. Related Requirements:
 - 1. Specification 00 31 32 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.
 - 2. Specification 02 41 19 "Selective Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.
- D. Attachments:
 - 1. NEPA Environmental Review Report, prepared by Triton Environmental, Inc., dated July 2014.

END OF SECTION

NEPA ENVIRONMENTAL REVIEW REPORT

**Community Development Block Grant – Disaster Recovery
Owner Occupied Rehabilitation and Rebuilding Program**

**Site ID No. 1247
12 Jacob Street
Norwalk, Connecticut**

July 2014

Ref. No. 104318/2/R01

Prepared for:

Merritt Construction Services, Inc.
1177 High Ridge Road
Stamford, CT 06905

Prepared by:



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FIGURES

Figure 1	Site Location Map
Figure 2	Site Diagram

APPENDICES

Appendix A	Public Resource Maps
Appendix B	Photographs of Work Area and Mold Inspection Photographs
Appendix C	Rosters of Building Materials Surveyed
Appendix D	Laboratory Analytical Data

1.0 - INTRODUCTION

Triton Environmental, Inc. (Triton) has prepared this National Environmental Policy Act (NEPA) evaluation for the property located at 12 Jacob Street in Norwalk, Connecticut (the site) on behalf of Merritt Construction Services, Inc. (Merritt). The location of the site is depicted on Figure 1. The NEPA review is being prepared as a required component of the Community Development Block Grant – Disaster Recovery (CDBG-DR) program for properties impacted by Superstorm Sandy. The CDBG-DR program, run by the U.S. Department of Housing and Urban Development (HUD), provides funding to address repairs to certain impacted Connecticut properties. In order to receive funding from HUD, an environmental review of applicable properties is required.

The project is considered “categorically excluded” from NEPA. However, the project is still subject to additional statutory requirements. As such, Triton has completed the Statutory Checklist for state and federal laws, regulations, and Executive Orders (other than NEPA) in accordance with 24 CFR 58.5 and 58.6. In addition, Triton has completed specific testing at the site, as described in detail in this report.

1.1 - Proposed Site Modifications and Work Zone

Triton has completed two building materials testing events at the site. During the initial event, the anticipated scope of work was to elevate the dwelling above the flood plain. It was then determined that the total cost of the project would exceed \$150,000.00, at which point the proposed scope of work was transitioned to full demolition and rebuilding of the dwelling. As such, the work zone as described by Merritt consists of the entire interior and exterior of the structure.

2.0 - PRELIMINARY INSPECTION AND RESOURCE REVIEW

2.1 - Preliminary Site Inspection

As a preliminary step in the NEPA evaluation, Triton completed an initial inspection of the site, focused on the work zone described in Section 1.1. The inspection was completed on March 5, 2014, by Mr. Brian Sirowich of Triton, accompanied by Mr. Andrew Peters of Merritt.

During the inspection, the following items were noted within the work zone that required further evaluation:

- Suspect asbestos containing materials;
- Potential lead based paint;
- Potential radon;
- Potential polychlorinated biphenyls (PCBs); and
- Visible mold.

Photographs of the work zone area are included as Appendix B.

2.2 - Preliminary Checklist Review

Following the initial site inspection, a preliminary statutory checklist review was completed in order to determine which items in the checklist did not apply to the site, and which items required additional evaluation and/or on-site surveys. As a component of the preliminary checklist review, Triton reviewed readily available resource maps, as well as online environmental databases. Copies of the maps reviewed are provided in Appendix A.

Based on the site inspection and the review of applicable public resource materials, each of the items identified on the Statutory Checklist have been assigned a code of “Not Applicable to This Project,” with the exception of the items identified below:

2.2.1 - Flood Management/Coastal Zone Management Issues (Items 2, 4, 14A and 14E)

The site is located within the coastal zone boundary. As such, a Coastal Area Management (CAM) Site Plan Review Application is required to be submitted to the Norwalk Zoning Commission (unless otherwise exempted). It is our understanding that the DEEP has approved a Flood Management Certificate for all CDBG-DR projects. Work shall be conducted in accordance with the conditions of the Certificate.

2.2.2 - Structures and Dredging Issues (Item 14B)

The project involves work waterward of the Coastal Jurisdiction Line. As such, a Structures, Dredging & Fill permit will be required from the DEEP Office of Long Island Sound Programs.

2.2.3 - Inland Wetlands (Items 3 and 14D)

The work zone is located within the wetland setback area associated with Five Mile River. As such, a permit from the Town of Norwalk will be required for the proposed work.

2.2.4 - Lead Based Paint (Item 13C)

Based on the site inspection and the age of the building (1961), potential lead based paint was observed within the work zone.

2.2.5 - Asbestos Containing Materials (Item 13D)

Based on the site inspection, potential asbestos containing materials were observed in the work zone.

2.2.6 - Radon (Item 13E)

Based on the Indoor Radon Potential Map of Connecticut published by the EPA (1997), the site is located in a moderate to high radon potential zone.

2.2.7 - Mold (Item 13F)

Based on the site inspection, visible mold was identified within the work zone.

2.3 - Additional Items (Not Included in Statutory Checklist)

Although not specifically listed on the Statutory Checklist, Triton identified the following additional potential issues associated with the project:

- Based on the site inspection, potential PCB containing building materials were observed in the work zone.

3.0 - WORK ZONE SURVEYS AND RESULTS

Based on the preliminary inspection of the work zone, Triton identified several items requiring further testing and evaluation as part of the environmental review.

3.1 - Lead Based Paint Inspection

The subject structure was reportedly constructed prior to 1978. As such, testing for the potential presence of lead in painted surfaces was conducted using X-Ray Fluorescence (XRF) testing on April 7 and May 15, 2014 for the purpose of complying with the EPA's Renovation, Repair, and Painting Rule (RRP). Because the work zone includes the entire structure (demolition) the inspection included all painted surfaces on both interior and exterior building materials. The survey was completed by a Connecticut certified lead paint inspector. The surveys were completed using a Niton XL-300A XRF instrument.

XRF readings were taken at a total of 42 locations of nine distinct building materials on the interior and exterior of the structure. Appendix C contains a spreadsheet summarizing the results. The results of the XRF testing indicate that none of the painted building materials screened contained lead concentrations greater than the action level of 1 mg/cm² (0.5% by weight).

In accordance with the HUD Lead Safe Housing Rule Subpart B (section 35.115) a residential property found not to have lead based paint by a lead based paint inspection is exempt from Subparts B through R of the rule. As such, performance of a lead hazard risk assessment is not believed to be required for this property.

3.2 - Asbestos Sampling

An asbestos survey was completed for the work zone on April 7 and May 15, 2014. In accordance with the EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation 40 CFR Part 61 (Subpart M), a property owner must ensure that a thorough inspection for asbestos-containing materials is completed prior to possible disturbance during renovation or demolition. A walk-through and inspection of the building was conducted by a Connecticut licensed inspector to identify suspect ACM. Once the

location and quantity of each suspect ACM was documented, up to three representative samples of each suspect material was collected. In accordance with EPA protocols, the samples of each suspect ACM were submitted to a state licensed laboratory and analyzed via the PLM method (EPA 600/R-93/116 Method). To avoid unnecessary sample analysis, the laboratory did not analyze duplicate homogeneous samples once asbestos was detected at concentrations greater than 1% in a related sample.

A total of 25 samples were collected from nine homogeneous building materials within the work zone. Some samples were further subdivided at the laboratory for discrete testing resulting in the reporting of 28 results. The results indicated that none of the building materials contained asbestos greater than one percent which is considered non-asbestos containing. A roster of the building materials suspected of containing asbestos (and subsequent samples) is attached as Appendix C. The laboratory analytical report is attached as Appendix D.

3.3 - Airborne Radon Sampling

Radon gas is a product of the decay series that begins with uranium. It is produced directly from radium, which can be commonly found in bedrock that contains black shale and/or granite. Radon gas can migrate through the ground and enter buildings through porous concrete or fractures and tends to accumulate in poorly ventilated basements. Long-term exposure to radon has been associated with lung cancer.

Triton conducted a radon assessment of the lowest livable space at the site (the first floor level). Two radon test kits were deployed (a sample and a duplicate) at the lowest level of the building on April 7, 2014 and allowed to sample radon levels for approximately 52 hours. The EPA has established the guideline of 4 pCi/L as an “elevated” indoor radon level. The laboratory indicated results of 0.2 pCi/L and 0.4 pCi/L for the subject site, both of which are below the EPA guideline of 4.0 pCi/L. Laboratory analytical results are attached in Appendix D.

3.4 - PCB Sampling

Caulk/sealant sampling was conducted by Triton on April 7 and May 15, 2014. Prior to sampling, Triton conducted a visual survey of the work zone for potentially PCB containing caulks and sealants. A sampling plan was then developed in order to collect a set of samples that were representative of the various materials observed. Where a significant number of homogeneous window units are present, the USEPA recommends that a minimum of 5% of windows be sampled to generate a statistically significant data set for each sealant type.

The following table summarizes the various types of materials that were observed, and the number of samples that were collected from each material type.

Sealant Material	Location	Number of Locations	Number of Samples Collected (5% Minimum)
Spray foam	Basement	multiple	1 (S1)
Black gasket	Roof vent pipe	1	1 (PCB1)
Tar	Roof	NA	1 (PCB2)

As indicated, three samples were collected from the work zone that are believed to provide a representative evaluation of the potentially PCB-containing materials observed. The samples were collected using hand tools (e.g. utility knife). Sampling was completed for purposes of: (1) identifying representative samples, (2) visually inspecting the windows miscellaneous materials, and (3) obtaining representative samples for laboratory analyses. The samples were analyzed for PCBs by EPA Method 8082 (using the soxhlet extraction method).

PCBs were not detected in the sample S-1 collected from spray foam sealant in the basement, the PCB1 sample collected from gasket around the roof vent, or the PCB2 sample collected from roof tar material. The laboratory analytical testing data is provided in Appendix D.

3.5 - Mold Inspection

Triton completed a visual mold inspection of the work area on April 7, 2014. Mold was observed on concrete walls of the basement, on the wooden ceiling joist in the basement,

on insulation in the basement, and possibly on untreated wooden roof beams in the ground floor. Although not directly observed, it is possible that mold is present on both wooden surfaces and insulation behind walls on the ground floor. Photographs of the apparent mold are provided in Appendix B.

4.0 - CONTRACTOR BID ITEMS

The building materials surveys completed by Triton within the dwelling did not result in the identification of asbestos, lead paint, PCBs, or radon. Mold was the only concern that was found to be present based on the results of the testing. Due to the intended demolition of the dwelling, abatement for mold does not appear to be necessary. Triton recommends that the demolition contractor be advised of the presence of mold within the structure such that workers can be prepared with appropriate health and safety protection.

5.0 - CONCLUSIONS AND RECOMMENDATIONS

Based on the results of NEPA evaluation and specific on-site surveys, it has been determined that this project cannot convert to Exempt per § 58.34(a)(12) at this time because one or more statutes/authorities require consultation or mitigation, as follows:

1. Flood Management/Coastal Zone Management Issues – the site is located within the coastal zone boundary. As such, a Coastal Area Management (CAM) Site Plan Review Application is required to be submitted to the Norwalk Zoning Commission (unless otherwise exempted). It is our understanding that the DEEP has approved a Flood Management Certificate for all CDBG-DR projects. Work shall be conducted in accordance with the conditions of the Certificate.
2. Inland Wetlands – The site is located within the regulated area (upland review area) associated with the Five Mile River. As such, a permit from the Norwalk Inland Wetlands Agency will be required (unless otherwise exempted by the City of Norwalk). It is our understanding that project civil engineer will pursue these approvals.
3. Coastal Permitting – the project involves work waterward of the Coastal Jurisdiction Line. As such, a Structures, Dredging & Fill permit will be required from the DEEP Office of Long Island Sound Programs. Triton will prepare and submit the permit application based on design drawings and information provided by the project architect.
4. Mold – Mold was observed on various concrete and wooden surfaces in the basement, on insulation in the basement, and possibly on untreated wooden ceiling beams in the ground floor. Mold may be present in areas that could not be observed during the inspection (i.e. behind walls). Additional mold impacted surfaces may be encountered during renovation in spaces that were inaccessible or not apparent during the inspection. Due to the intended demolition of the dwelling, abatement for mold does not appear to be necessary. Triton recommends that the demolition contractor be advised of the presence of mold within the structure such that workers can be prepared with appropriate health and safety protection.

The above items should be completed such that the project can transition to Exempt status per § 58.34(a)(12).

6.0 - LIMITATIONS

The tasks completed were performed specifically within the work zone that has been specified to Triton by the Merritt project manager (such zone may change as the project develops and re-inspection by Triton will be required). In addition, the scope of work was limited to those items that are part of the NEPA review process with the exception of PCB sampling, which was performed as an emergency concern regarding worker/occupant health and safety and for proper disposal practices. As such, Triton provides no warranty or opinion regarding conditions outside of the work area, or related to additional environmental conditions outside of the NEPA review process.

In some circumstances, Triton has relied upon available resource maps and/or visual observations to evaluate specific statutory items. In these circumstances, actual surveys have not been conducted. For example, a full wetland delineation and elevation survey with respect to the coastal jurisdiction line has not been completed. Rather, Triton has relied upon available inland wetland and tidal wetland maps (and visual observations) to complete this review.

The completion of the NEPA screen process does not constitute completion of an Environmental Assessment (EA) or a Phase I Environmental Site Assessment.

The ACM, LBP, radon, mold, and PCB inspections were completed for accessible materials within the work zone only (as defined in Section 1.1) and involved the use of selective sampling and non-destructive sampling techniques to access visible suspect materials. A lead risk assessment in accordance with 24 CFR Part 35 has yet to be performed. Although efforts were made to diligently inspect all windows and other building materials, in completing the material survey it should be noted that additional suspect materials or mold may be present behind or beneath building components that were not readily accessible. If suspect, ACM, LBP, and PCB containing materials are encountered during replacement activities, work should be halted until the materials are submitted for laboratory analysis. If mold is identified during replacement activities, it should be abated. As such, Merritt should consider having an environmental professional familiar with the project on site to aid in identifying and sampling potential materials. In most instances, CT DPH does not recommend analytical testing of the air or surfaces to find out how much or what kind of mold is present. As such, Triton's scope of

work has focused on a visual and olfactory evaluation. If requested by the homeowner, such testing can be provided both prior to, and following abatement.

In completing the survey, Triton has relied upon information provided by the client and subcontractors (i.e., testing laboratories). Triton provides no warranty regarding the accuracy and completeness of the information provided by subcontractors. A statistical methodology was used during the materials sampling (consistent with the 5% guidance recommended by EPA). Since not all materials were sampled, Triton cannot guarantee that additional materials are not present which contain higher concentrations. Without additional samples of embedded window materials for PCBs, the need for future EPA involvement cannot be confirmed.

All abatement/renovation activities should be conducted in accordance with all applicable local, state, and federal regulations and Occupational Safety and Health Association (OSHA) guidelines.

This report is intended solely to summarize the results of the ACM, PCB, radon, and XRF lead testing, and mold inspection conducted at the site. This report is not intended to serve as a technical specification for abatement and should not be used as such. All abatement activities should be conducted in accordance with applicable local, state, and federal regulations and OSHA guidelines.

This NEPA Report was prepared specifically for Merritt Construction Services, Inc. and the State of Connecticut. No person or other body shall be entitled to rely upon or use information presented in this report without written consent of Merritt Construction Services, Inc., the State of Connecticut, and Triton Environmental, Inc.

7.0 - SIGNATURES OF REPORT AUTHORS

This report has been prepared by Triton Environmental, Inc. The names listed below are the principal authors of this report. Requests for information regarding the content of this report should be directed to those individuals.



David Vasiliou, LEP
Senior Project Manager

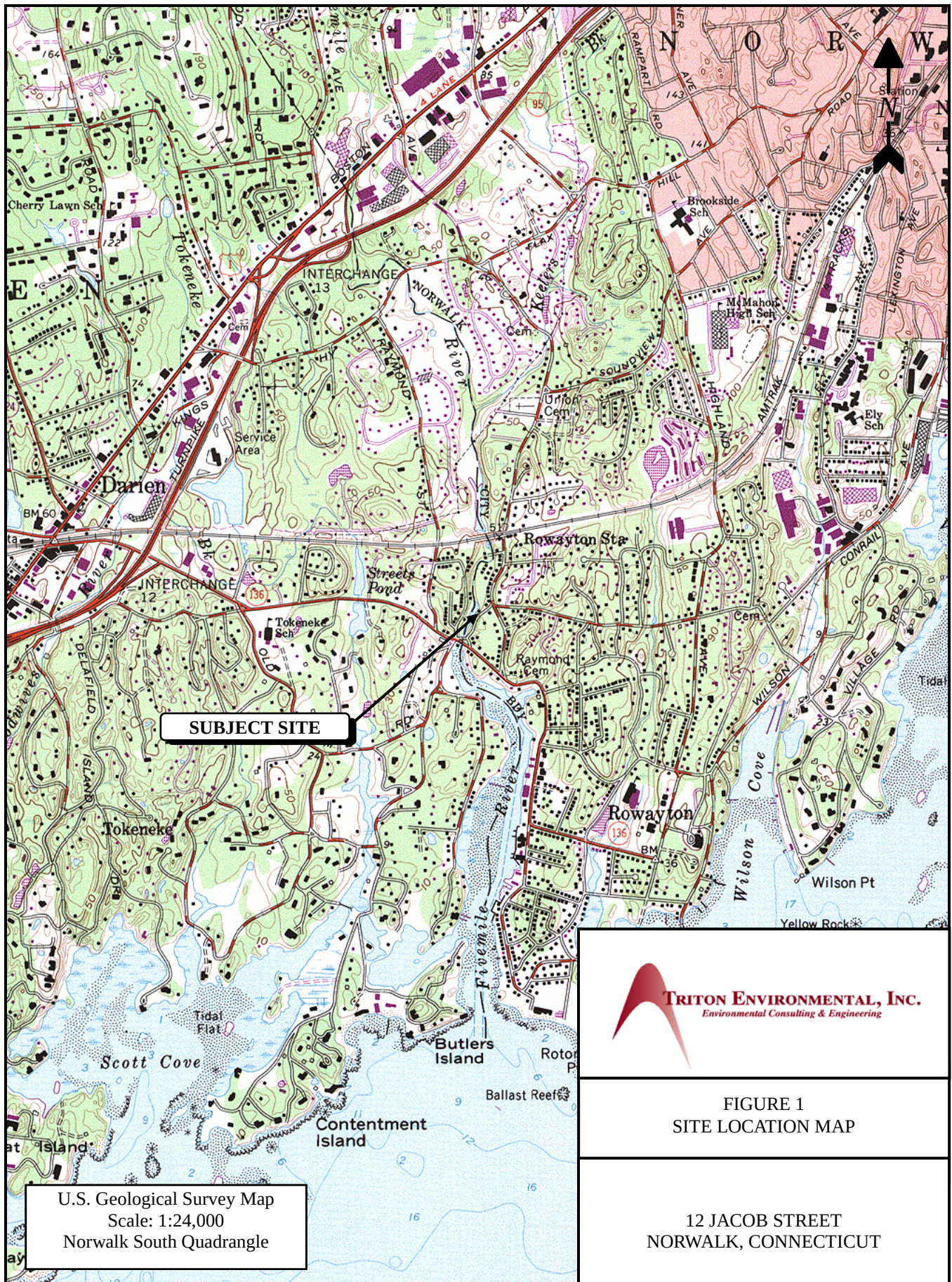


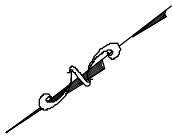
J. Carver Glezen, LEP
Senior Vice President



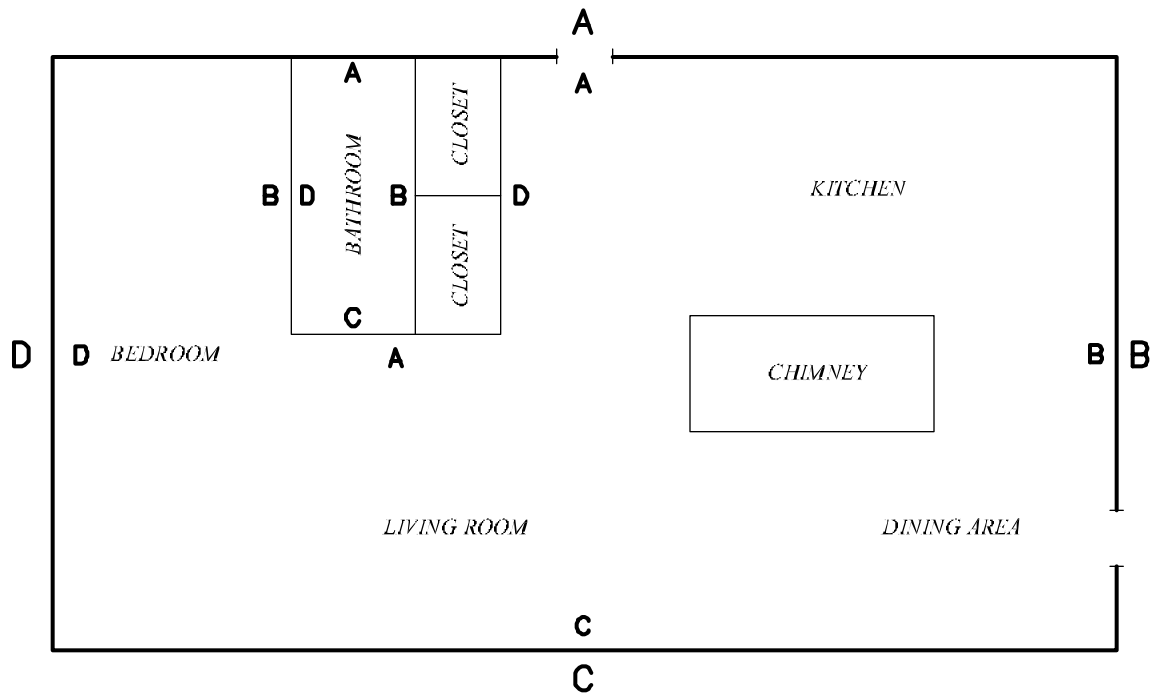
Christopher E. Marchesi
President

FIGURES





JACOB STREET



**NOT TO SCALE – SKETCH ONLY
FOR ILLUSTRATIVE PURPOSES**

NOTES:

1. THE LOCATION OF ALL STRUCTURES, EQUIPMENT, DELINEATIONS AND OTHER FEATURES PRESENTED ON THIS DRAWING SHOULD BE CONSIDERED APPROXIMATE. THIS DRAWING SHOULD ONLY BE USED FOR GENERAL PRESENTATION PURPOSES AND SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES. TRITON MAKES NO WARRANTY AS TO THE CORRECTNESS OR THE COMPLETENESS OF THE INFORMATION CONTAINED IN THIS DRAWING, AND THE USER ASSUMES ALL RISK OF LOSS TO PERSONS AND PROPERTY FROM RELIANCE THEREON.



TRITON ENVIRONMENTAL, INC.
Environmental Consulting & Engineering

385 Church Street, Suite 201 • Guilford, Connecticut 06437 • 203.458.7200

FIGURE 2

SITE DIAGRAM

APPLICANT #1247
12 JACOB STREET
NORWALK, CONNECTICUT

DRAWN BY: FSM

APPROVED BY: DSV

DATE: 6/20/14

SCALE: N.T.S. FILE No.:104318-12JACOB

Appendix A
Public Resource Maps



United States Department of the Interior



FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 COMMERCIAL STREET, SUITE 300
CONCORD, NH 3301
PHONE: (603)223-2541 FAX: (603)223-0104
URL: www.fws.gov/newengland

Consultation Tracking Number: 05E1NE00-2014-SLI-0370

June 04, 2014

Project Name: #1247 12 jacob st norwalk

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project.

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having

similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment



United States Department of Interior
Fish and Wildlife Service

Project name: #1247 12 jacob st norwalk

Official Species List

Provided by:

New England Ecological Services Field Office
70 COMMERCIAL STREET, SUITE 300
CONCORD, NH 3301
(603) 223-2541
<http://www.fws.gov/newengland>

Consultation Tracking Number: 05E1NE00-2014-SLI-0370

Project Type: ** Other **

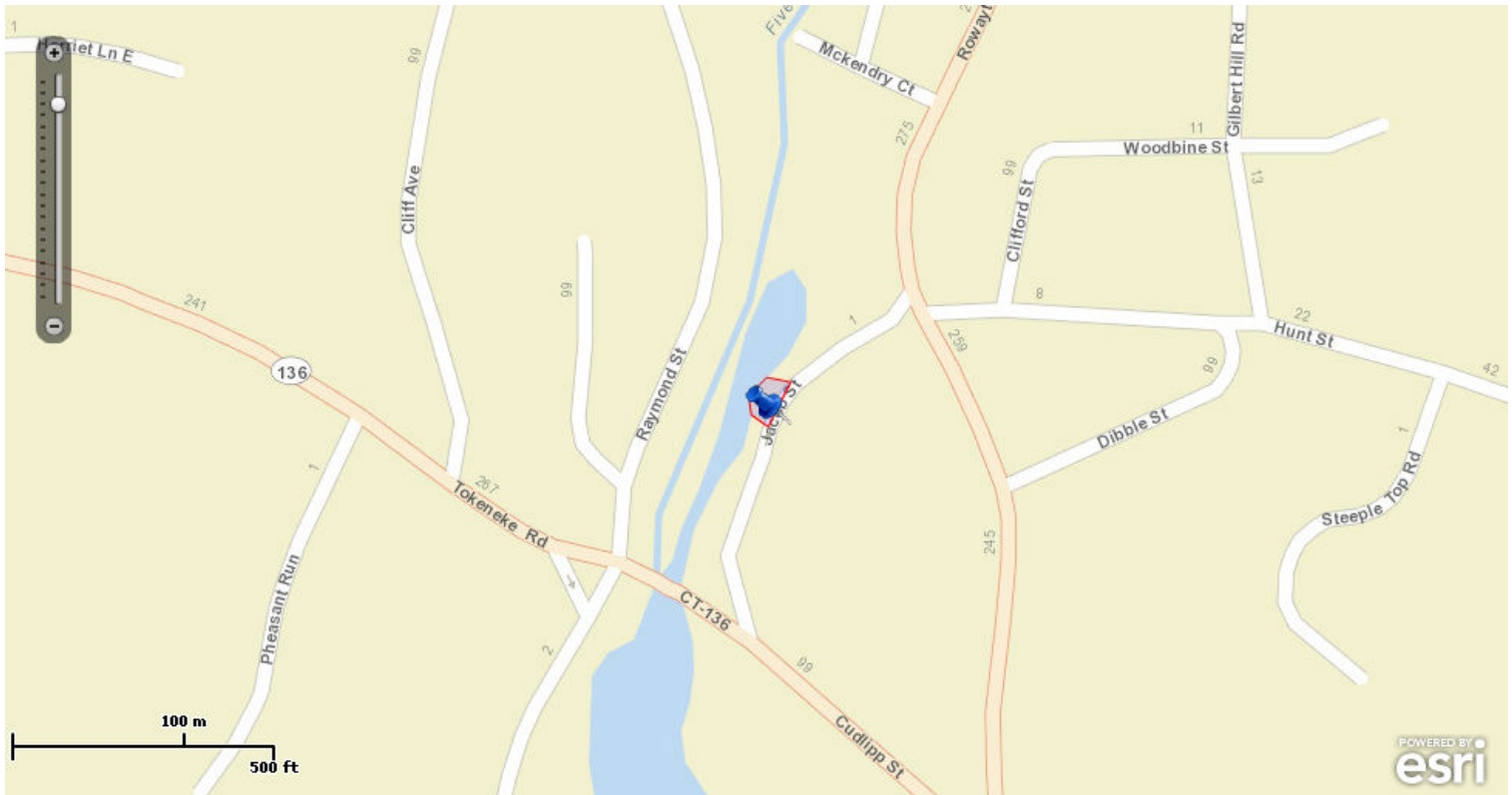
Project Description: raising of structures and basement repairs



United States Department of Interior
Fish and Wildlife Service

Project name: #1247 12 jacob st norwalk

Project Location Map:



Project Coordinates: MULTIPOLYGON (((-73.4469678 41.0741193, -73.4468015 41.0740952, -73.4469571 41.0738606, -73.4470751 41.0739233, -73.4470939 41.0740223, -73.4469678 41.0741193)))

Project Counties: Fairfield, CT



United States Department of Interior
Fish and Wildlife Service

Project name: #1247 12 jacob st norwalk

Endangered Species Act Species List

There are a total of 0 threatened, endangered, or candidate species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed on the **Has Critical Habitat** lines may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

There are no listed species identified for the vicinity of your project.



United States Department of Interior
Fish and Wildlife Service

Project name: #1247 12 jacob st norwalk

Critical habitats that lie within your project area

There are no critical habitats within your project area.



Department of Economic and
Community Development

Connecticut
still revolutionary

1247
JO

May 28, 2014

Hermia M. Delaire
Program Manager
CDBG - Sandy Disaster Recovery Program
Department of Housing
505 Hudson Street
Hartford, CT 06106

Subject: Department of Housing Superstorm Sandy Reviews
12 Jacob Street
Norwalk, CT

Dear Ms. Delaire:

The State Historic Preservation Office has reviewed the information submitted for the above-named pursuant to the provisions of Section 106 of the National Historic Preservation Act of 1966. It is the opinion of this office that the property located at 12 Jacob Street is not eligible for listing on the National Register of Historic Places.

Based on the information provided, the proposed rehabilitation of 12 Jacob Street will have no effect on the state's cultural resources.

This office appreciates the opportunity to have reviewed and commented upon the project.

For further information please contact Laura L. Mancuso, Environmental Review Coordinator, at (860) 256-2757 or laura.mancuso@ct.gov.

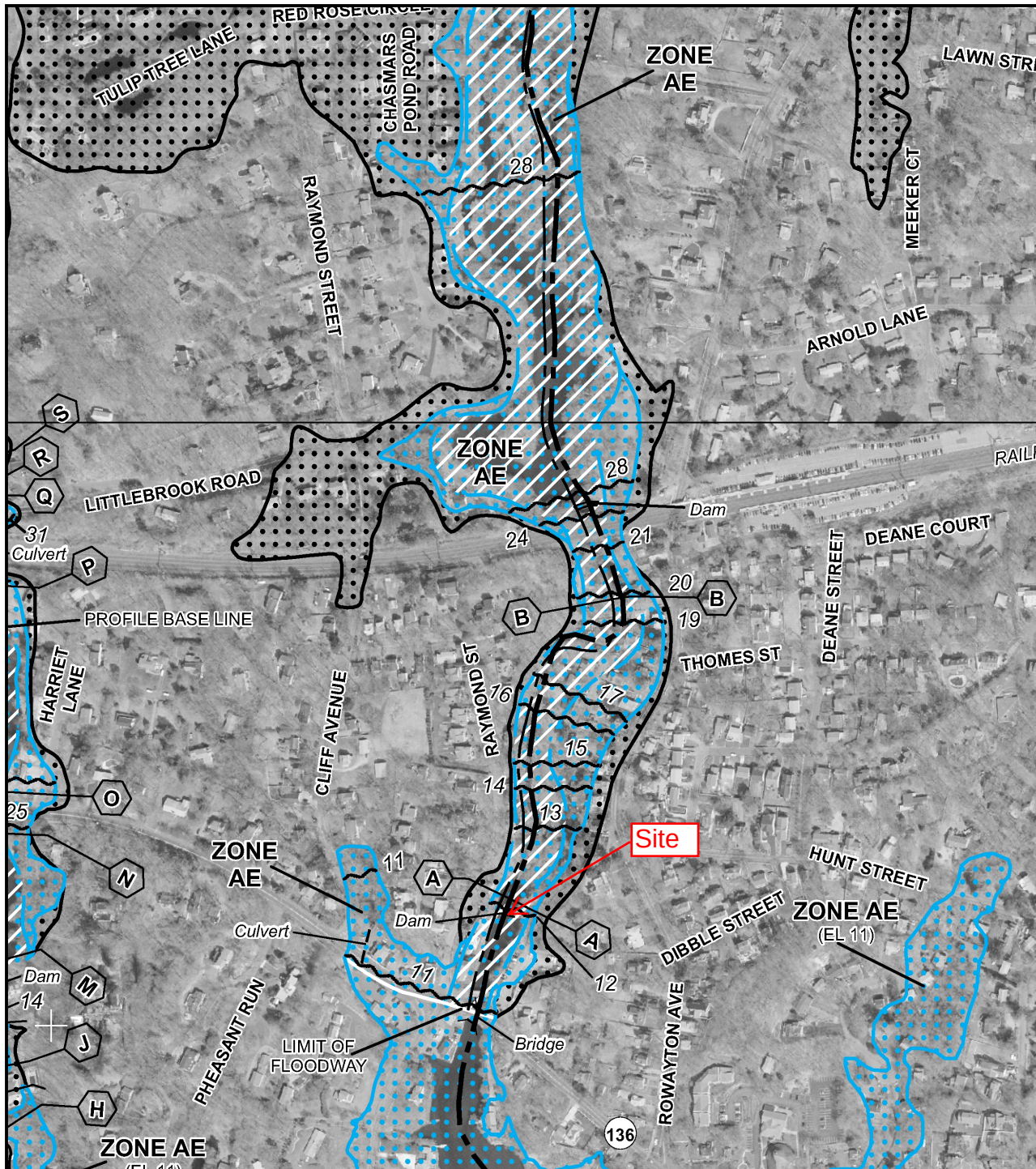
Sincerely,

Mary Dunne
Deputy State Historic Preservation Officer

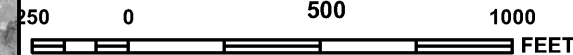
State Historic Preservation Office

One Constitution Plaza | Hartford, CT 06103 | P: 860.256.2800 | Cultureandtourism.org

An Affirmative Action/Equal Opportunity Employer An Equal Opportunity Lender



MAP SCALE 1" = 500'



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0529G

FIRM

FLOOD INSURANCE RATE MAP
FAIRFIELD COUNTY,
CONNECTICUT
(ALL JURISDICTIONS)

PANEL 529 OF 626

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DARIEN, TOWN OF	090005	0529	G
NORWALK, CITY OF	090012	0529	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.



MAP NUMBER
09001C0529G

MAP REVISED
JULY 8, 2013

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

12 Jacob Street
Norwalk, CT



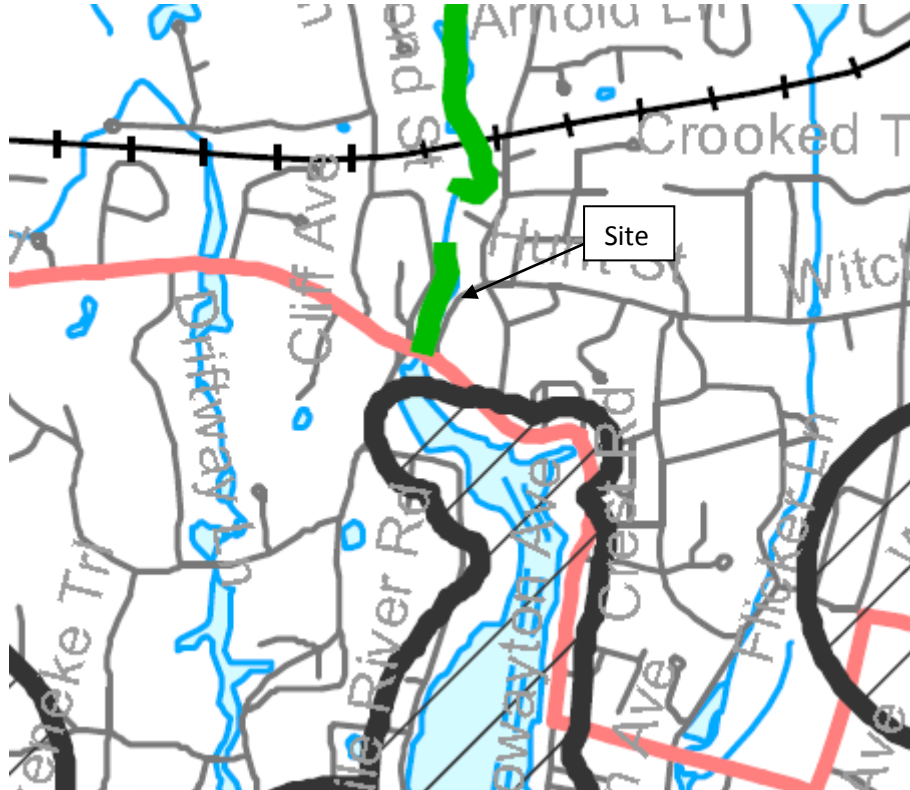
**Tidal Wetlands
(1990)**

12 Jacob Street
Norwalk, CT

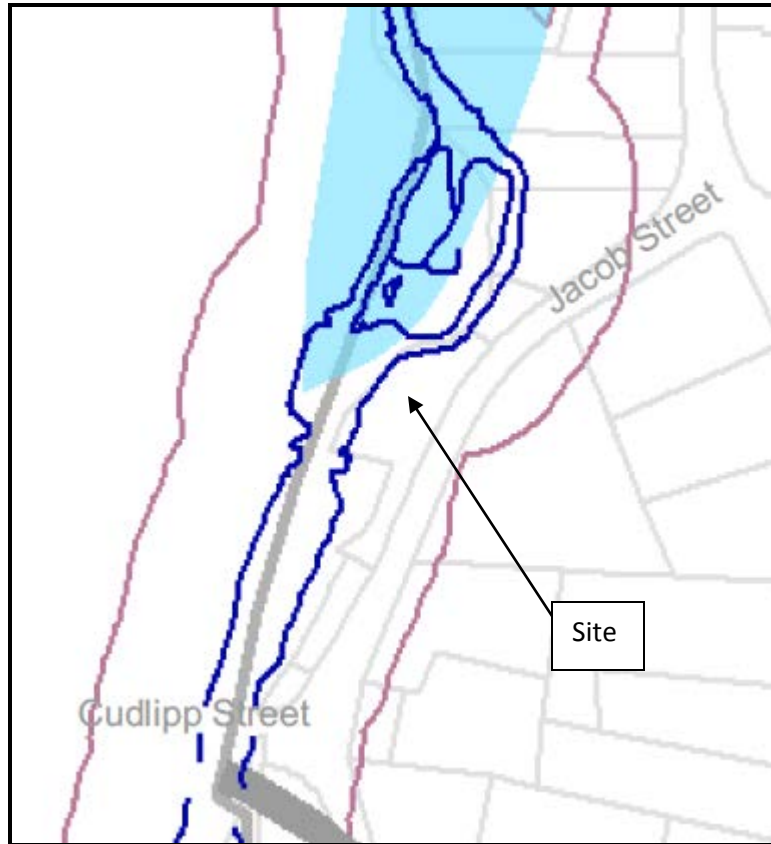


**Natural Diversity Database Map
(December 2013)**

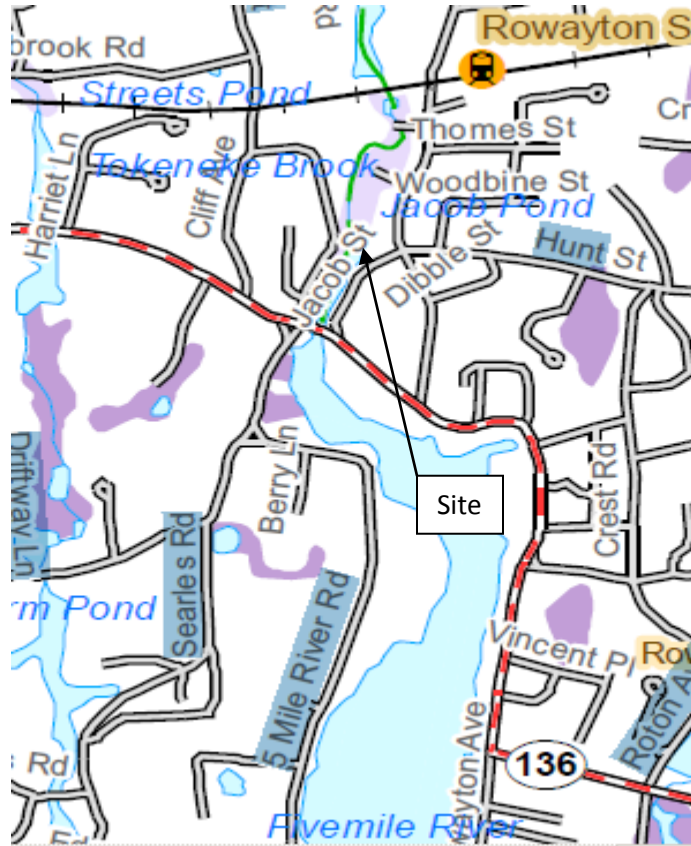
12 Jacob Street
Norwalk, CT



Inland Wetlands Map
February 2010
12 Jacob Street
Norwalk, CT



Inland Wetlands Soils Map
October 2009
12 Jacob Street
Norwalk, CT



**Inland Wetland Soil Map – Norwalk
(October 2009)**

LEGEND



Poorly Drained and Very Poorly Drained soils - Poorly drained soils occur where the water table is at or just below the ground surface, usually from late fall to early spring. The land where poorly drained soils occur is nearly level or gently sloping. Many of our red maple swamps are on those soils. Very poorly drained soils generally occur on level land or in depressions. In these areas, the water table lies at or above the surface during most of the growing season. Most of our marshes and bogs are on these soils.



Alluvial and Floodplain soils occur along watercourses occupying nearly all level areas subject to periodic flooding. These soils are formed when material is deposited by flowing water. Such material can be composed of clay, silt, sand or gravel. Alluvial and floodplain soils range from excessively drained to very poorly drained.



Open Water



River, Brook, Stream



Town Boundary



State Boundary



County Boundary



Interstate Highway



US Route Highway



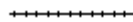
State Route Highway



Highway Ramp



Local Road

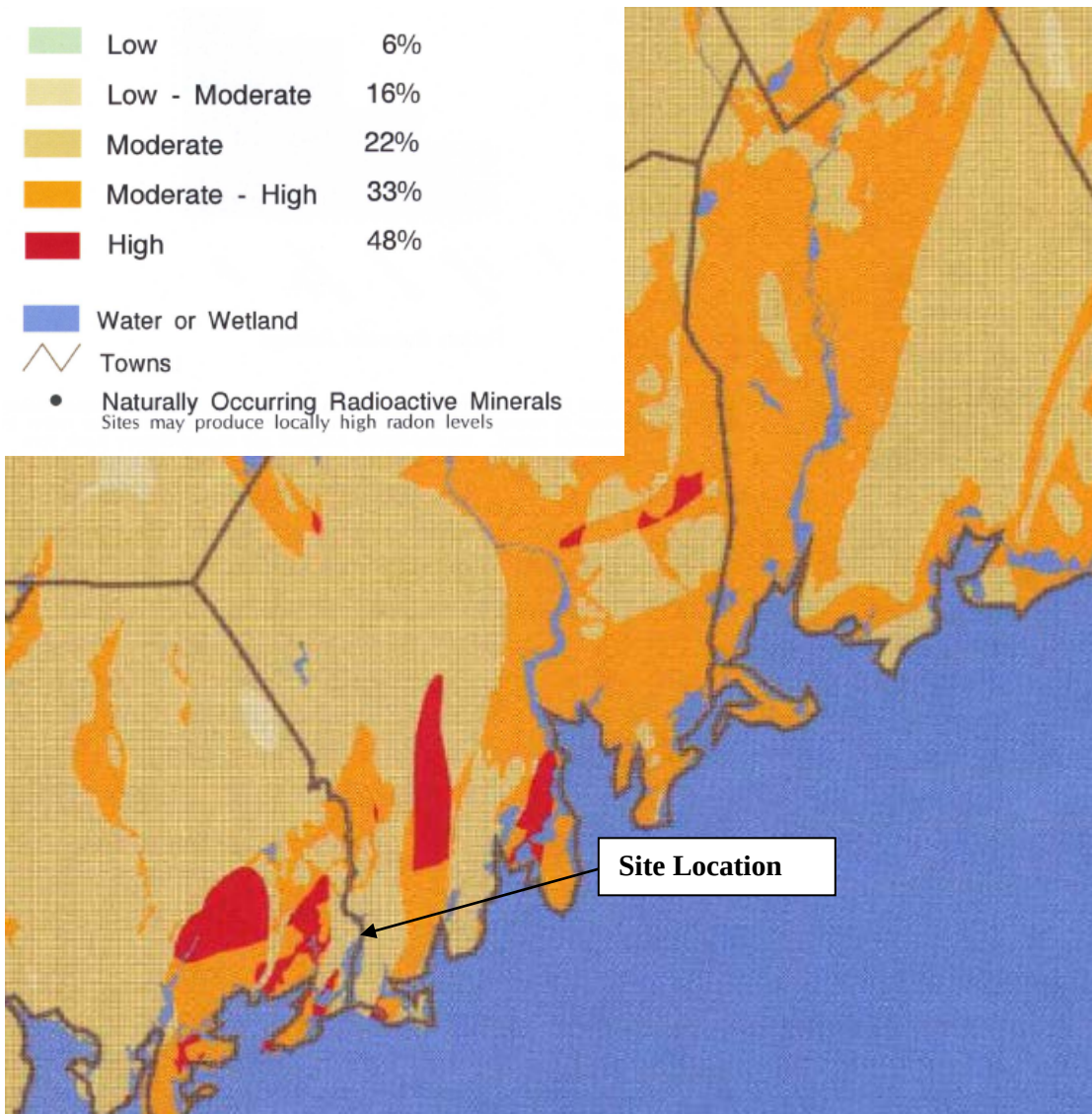


Railroad

Indoor Radon Potential Map - 1997

12 Jacob Street

Norwalk, CT



Site location is approximate

Appendix B

Photographs of Work Area and Mold Inspection Photographs



Photograph 1
12 Jacob Street



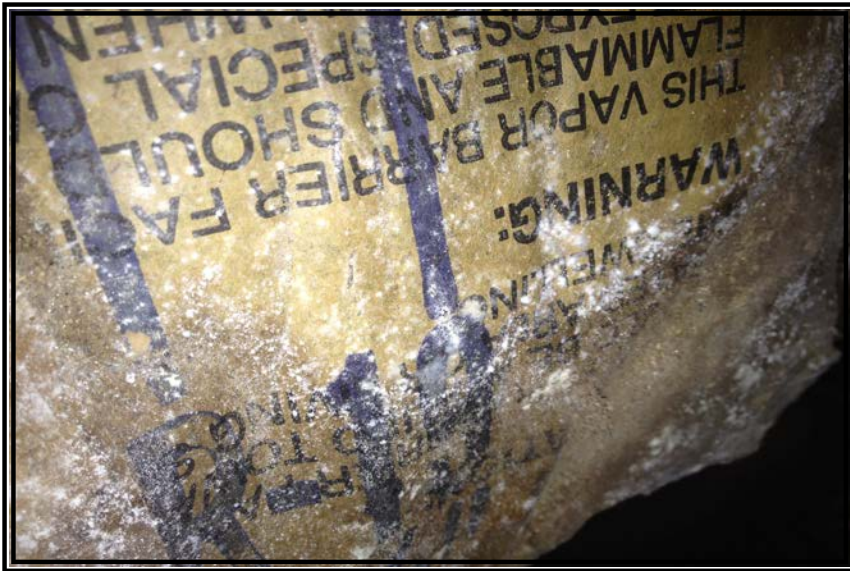
Photograph 2
Deck overhanging watercourse



Photograph 3
Interior of dwelling



Photograph 4
Front of dwelling



Photograph 5
Mold on insulation in basement



Photograph 6
Mold on concrete foundation wall



Photograph 7
Basement with mold on ceiling joist



Photograph 8
Possible mold on untreated beams of ground floor

Appendix C

Rosters of Building Materials Surveyed

- XRF Raw Data for Painted Surfaces
- Roster of Suspect Asbestos Containing Materials

XRF Lead Testing Results
12 Jacob Street - Norwalk, CT
Applicant # 1247

Reading No	Time	Type	Duration	Units	Component	Substrate	Side	Condition	Color	Site	Floor	Room	Results	Depth Index	Action Level	PbC	PbC Error	PbL	PbL Error	PbK	PbK Error
10	4/7/2014 8:32	PAINT	3.56	mg / cm ^2	WALL	CONCRETE	B	PEELING	Gray	1245	BASEMENT	Interior	Negative	3.33	1	0.16	0.1	0.16	0.1	0.5	0.9
11	4/7/2014 8:32	PAINT	1.77	mg / cm ^2	WALL	CONCRETE	B	PEELING	Gray	1246	BASEMENT	Interior	Negative	3.44	1	0.11	0.18	0.11	0.18	< LOD	0
12	4/6/2014 8:39	PAINT	3.57	mg / cm ^2	WALL	CONCRETE	A	PEELING	Gray	1247	BASEMENT	Interior	Negative	1.94	1	0.11	0.06	0.11	0.06	0.5	0.9
14	4/7/2014 8:39	PAINT	3.59	mg / cm ^2	WALL	CONCRETE	C	PEELING	Gray	1247	BASEMENT	Interior	Negative	1.08	1	0.08	0.04	0.08	0.04	0.25	0.95
15	4/7/2014 8:40	PAINT	2.97	mg / cm ^2	WALL	CONCRETE	D	PEELING	Gray	1247	BASEMENT	Interior	Negative	3.73	1	0.22	0.22	0.22	0.22	0.04	1.59
447	5/15/2014 9:28	PAINT	1.13	mg / cm ^2	WALL	WOOD	A	PEELING	TAN	12 jacob	FIRST	exterior	Negative	4.05	1	0.13	0.4	0.13	0.4	-0.36	1.52
448	5/15/2014 9:28	PAINT	1.13	mg / cm ^2	WALL	WOOD	A	PEELING	TAN	12 jacob	FIRST	exterior	Negative	1.47	1	0.05	0.14	0.05	0.14	-0.5	1.48
449	5/15/2014 9:28	PAINT	1.14	mg / cm ^2	WALL	WOOD	A	PEELING	TAN	12 jacob	FIRST	exterior	Negative	1.92	1	0.17	0.28	0.17	0.28	-0.25	1.64
450	5/15/2014 9:29	PAINT	1.12	mg / cm ^2	WALL	WOOD	D	PEELING	TAN	12 jacob	FIRST	exterior	Negative	1	1	0	0.02	0	0.02	0.27	1.56
451	5/15/2014 9:30	PAINT	1.13	mg / cm ^2	WALL	WOOD	D	PEELING	TAN	12 jacob	FIRST	exterior	Negative	1	1	0	0.02	0	0.02	-0.23	1.89
452	5/15/2014 9:30	PAINT	1.15	mg / cm ^2	WALL	WOOD	C	PEELING	TAN	12 jacob	FIRST	exterior	Negative	1	1	0	0.02	0	0.02	-0.32	1.45
453	5/15/2014 9:31	PAINT	1.14	mg / cm ^2	WALL	WOOD	C	PEELING	TAN	12 jacob	FIRST	exterior	Negative	1	1	0	0.02	0	0.02	-0.29	1.46
454	5/15/2014 9:32	PAINT	1.14	mg / cm ^2	WALL	WOOD	B	PEELING	TAN	12 jacob	FIRST	exterior	Negative	3.11	1	0.11	0.3	0.11	0.3	-0.33	1.43
455	5/15/2014 9:34	PAINT	1.12	mg / cm ^2	soffit	WOOD	A	PEELING	WHITE	12 jacob	FIRST	exterior	Negative	1	1	0	0.03	0	0.03	-0.23	1.43
456	5/15/2014 9:34	PAINT	1.14	mg / cm ^2	soffit	WOOD	A	PEELING	WHITE	12 jacob	FIRST	exterior	Negative	1.98	1	0.17	0.29	0.17	0.29	0.09	1.23
457	5/15/2014 9:35	PAINT	1.12	mg / cm ^2	WINDOW	WOOD	A	INTACT	WHITE	12 jacob	FIRST	exterior window trim	Negative	1	1	0	0.02	0	0.02	0.4	1.4
458	5/15/2014 9:36	PAINT	1.13	mg / cm ^2	WINDOW	WOOD	A	INTACT	WHITE	12 jacob	FIRST	exterior window trim	Negative	1	1	0	0.02	0	0.02	0.12	1.27
459	5/15/2014 9:36	PAINT	1.12	mg / cm ^2	WINDOW	WOOD	A	INTACT	WHITE	12 jacob	FIRST	exterior window trim	Negative	1	1	0	0.02	0	0.02	0	1.79
460	5/15/2014 9:37	PAINT	1.12	mg / cm ^2	WINDOW	WOOD	D	INTACT	WHITE	12 jacob	FIRST	exterior window trim	Negative	1	1	0	0.02	0	0.02	-0.09	1.31
461	5/15/2014 9:43	PAINT	2.25	mg / cm ^2	soffit	WOOD	D	INTACT	WHITE	12 jacob	FIRST	exterior	Negative	10	1	-0.25	1.01	0.8	0.9	-0.25	1.01
462	5/15/2014 9:43	PAINT	1.14	mg / cm ^2	soffit	WOOD	D	INTACT	WHITE	12 jacob	FIRST	exterior	Negative	2.5	1	0.15	0.3	0.15	0.3	-0.08	1.56
463	5/15/2014 9:44	PAINT	1.14	mg / cm ^2	WINDOW	WOOD	D	INTACT	WHITE	12 jacob	FIRST	exterior trim	Negative	1	1	0	0.03	0	0.03	0.4	1.4
464	5/15/2014 9:46	PAINT	1.14	mg / cm ^2	soffit	WOOD	C	INTACT	WHITE	12 jacob	FIRST	exterior	Negative	1	1	0	0.03	0	0.03	-0.24	1.34
465	5/15/2014 9:46	PAINT	1.13	mg / cm ^2	deck overhang	WOOD	C	INTACT	WHITE	12 jacob	FIRST	exterior	Negative	1	1	0	0.02	0	0.02	-0.02	1.47
466	5/15/2014 9:47	PAINT	1.15	mg / cm ^2	TRIM	WOOD	C	INTACT	WHITE	12 jacob	FIRST	exterior	Negative	1	1	0	0.02	0	0.02	-0.05	1.83
468	5/15/2014 9:50	PAINT	1.14	mg / cm ^2	WALL	DRYWALL	A	INTACT	WHITE	12 jacob	FIRST	LIVING ROOM	Negative	1	1	0	0.02	0	0.02	0.01	1.53
469	5/15/2014 9:51	PAINT	2.27	mg / cm ^2	WALL	DRYWALL	B	INTACT	WHITE	12 jacob	FIRST	LIVING ROOM	Negative	1	1	0	0.02	0	0.02	0.4	1.1
470	5/15/2014 9:51	PAINT	1.13	mg / cm ^2	WALL	DRYWALL	C	INTACT	WHITE	12 jacob	FIRST	LIVING ROOM	Negative	1	1	0	0.02	0	0.02	-0.28	1.48
471	5/15/2014 9:52	PAINT	2.26	mg / cm ^2	WALL	DRYWALL	A	INTACT	WHITE	12 jacob	FIRST	BEDROOM	Negative	1	1	0	0.02	0	0.02	0.4	1.1
472	5/15/2014 9:52	PAINT	1.7	mg / cm ^2	WALL	DRYWALL	B	INTACT	WHITE	12 jacob	FIRST	BEDROOM	Negative	1	1	0	0.02	0	0.02	0.05	1.39
473	5/15/2014 9:53	PAINT	1.69	mg / cm ^2	WALL	DRYWALL	C	INTACT	WHITE	12 jacob	FIRST	BEDROOM	Negative	1	1	0	0.02	0	0.02	0.3	1.36
474	5/15/2014 9:53	PAINT	1.13	mg / cm ^2	WALL	DRYWALL	D	INTACT	WHITE	12 jacob	FIRST	BEDROOM	Negative	1	1	0	0.02	0	0.02	-0.02	1.57
475	5/15/2014 9:54	PAINT	1.14	mg / cm ^2	WALL	DRYWALL	A	INTACT	WHITE	12 jacob	FIRST	BATHROOM	Negative	1	1	0	0.02	0	0.02	-0.36	1.47
476	5/15/2014 9:54	PAINT	1.13	mg / cm ^2	WALL	DRYWALL	B	INTACT	WHITE	12 jacob	FIRST	BATHROOM	Negative	1	1	0	0.02	0	0.02	-0.08	1.49
477	5/15/2014 9:54	PAINT	1.13	mg / cm ^2	WALL	DRYWALL	C	INTACT	WHITE	12 jacob	FIRST	BATHROOM	Negative	1	1	0	0.02	0	0.02	-0.06	1.42
478	5/15/2014 9:54	PAINT	1.12	mg / cm ^2	WALL	DRYWALL	D	INTACT	WHITE	12 jacob	FIRST	BATHROOM	Negative	1	1	0	0.02	0	0.02	0.12	1.44
479	5/15/2014 9:55	PAINT	1.14	mg / cm ^2	TRIM	WOOD	A	INTACT	WHITE	12 jacob	FIRST	BATHROOM	Negative	1	1	0	0.02	0	0.02	0.3	1.15
480	5/15/2014 9:56	PAINT	1.13	mg / cm ^2	TRIM	WOOD	A	INTACT	WHITE	12 jacob	FIRST	BEDROOM	Negative	1	1	0	0.03	0	0.03	0.18	1.12
481	5/15/2014 9:56	PAINT	1.14	mg / cm ^2	TRIM	WOOD	D	INTACT	WHITE	12 jacob	FIRST	BEDROOM	Negative	1	1	0	0.02	0	0.02	-0.04	1.29
482	5/15/2014 9:57	PAINT	3.38	mg / cm ^2	TRIM	WOOD	C	INTACT	WHITE	12 jacob	FIRST	BEDROOM	Negative	1	1	0	0.02	0	0.02	-0.01	0.76
483	5/15/2014 9:58	PAINT	1.13	mg / cm ^2	DOOR	WOOD	C	INTACT	WHITE	12 jacob	FIRST	BATHROOM	Negative	1	1	0	0.02	0	0.02	-0.12	1.08
484	5/15/2014 9:58	PAINT	1.13	mg / cm ^2	TRIM	WOOD	C	INTACT	WHITE	12 jacob	FIRST	LIVING ROOM	Negative	1	1	0	0.02	0	0.02	-0.03	1.37

Notes:
"Side" refers to location of material as shown on Figure 2.

Roster of Suspect Asbestos Containing Materials – April 2014

Site # 1247 – 12 Jacob St. Norwalk, CT

Sample ID	HA	Material	Approx. Quantity	Condition	Location
April 7, 2014					
12471 – 12473	1	Fiberglass Insulation and Paper	400 SF	Poor	Basement
12474	2	Spray-on Foam Sealer	35 SF	Good	Basement
May 15, 2014					
12471-12473	1	Grey Asphalt Roof Shingles	1,050 Sf	Poor	Roof
12474-12476	2	Roof Paper and Tar	120 SF	Poor	Roof
12477-12479	3	Grey Asphalt Roof Rolled Material	175 SF	Good	Roof
124710-124712	4	12' Ceramic Floor Tile Mastic	100 SF	Good	Kitchen and front entrance
124713-124715	5	Fiberboard Under Floor Tile	100 SF	Good	Kitchen and front entrance
124716-124718	6	Sheetrock	3,000 SF	Good	Throughout
124719-124721	7	Yellow Fiberglass Insulation	3,000 SF	Good	Throughout
<u>Notes:</u> SF = Square Feet HA = Homogeneous Area					

Appendix D
Laboratory Analytical Data

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (800) 220-3675 / (856) 786-5974

<http://www.EMSL.com>cinnasblab@EMSL.com

EMSL Order: 041409728

CustomerID: TRIT52

CustomerPO:

ProjectID:

Attn: **Brian Sirowich**
Triton Environmental, Inc.
385 Church Street
Suite 201
Guilford, CT 06437

Phone: (203) 458-7200
Fax: (203) 458-7201
Received: 04/11/14 9:30 AM
Analysis Date: 4/18/2014
Collected: 4/7/2014

Project: **SITE #1247/ 12 JACOB ST. , NORWALK, CT**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	% Fibrous	Non-Asbestos		% Type
				% Non-Fibrous		
12-1 041409728-0001	- FIBERGLASS INSULATION & PAPER	Brown/Black/Yello w Fibrous Homogeneous	50% Cellulose 15% Glass 25% Min. Wool	10%	Non-fibrous (other)	None Detected
HA: 1						
12-2 041409728-0002	- FIBERGLASS INSULATION & PAPER	Brown/Black/Pink Fibrous Homogeneous	20% Cellulose 60% Min. Wool	20%	Non-fibrous (other)	None Detected
HA: 1						
12-3 041409728-0003	- FIBERGLASS INSULATION & PAPER	Brown/Black/Yello w Fibrous Homogeneous	60% Cellulose 20% Min. Wool	20%	Non-fibrous (other)	None Detected
HA: 1						
12-4 041409728-0004	- SPRAY-ON FOAM SEALER	White Non-Fibrous Homogeneous		100%	Non-fibrous (other)	None Detected
HA: 2						

Analyst(s)

Matthew Carralero (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036, PA ID# 68-00367

Initial report from 04/18/2014 12:23:47

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (Lab Use Only):

041409728

Cinnaminson, NJ 08077

PHONE: 1-800-220-3675

FAX: (856) 786-5974

Company : Triton Environmental, Inc.		EMSL-Bill to: ☐ Different ☒ Same If Bill to is Different note instructions in Comments**	
Street: 385 Church Street Suite 201		Third Party Billing requires written authorization from third party	
City: Guilford	State/Province: CT	Zip/Postal Code: 06437	Country: United States
Report To (Name): Brian Sirowich		Telephone #: 203-458-7200	
Email Address: bsirowich@tritonenvironmental.com		Fax #: 203-458-7201	Purchase Order:
Project Name/Number:		Please Provide Results: ☐ FAX ☒ E-mail ☐ Mail	
U.S. State Samples Taken: CT		Connecticut Samples: ☐ Commercial ☐ Residential	

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour
 ☐ 6 Hour
 ☐ 24 Hour
 ☐ 48 Hour
 ☐ 72 Hour
 ☐ 96 Hour
 ☒ 1 Week
 ☐ 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PCM - Air ☐ Check if samples are from NY ☐ NIOSH 7400 ☐ w/ OSHA 8hr. TWA PLM - Bulk (reporting limit) ☒ PLM EPA 600/R-93/116 (<1%) ☐ PLM EPA NOB (<1%) Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%) Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%) ☐ NYS 198.1 (friable in NY) ☐ NYS 198.6 NOB (non-friable-NY) ☐ NIOSH 9002 (<1%)	TEM - Air ☐ 4-4.5hr TAT (AHERA only) ☐ AHERA 40 CFR, Part 763 ☐ NIOSH 7402 ☐ EPA Level II ☐ ISO 10312 TEM - Bulk ☐ TEM EPA NOB ☐ NYS NOB 198.4 (non-friable-NY) ☐ Chatfield SOP ☐ TEM Mass Analysis-EPA 600 sec. 2.5 TEM - Water: EPA 100.2 Fibers >10µm ☐ Waste ☐ Drinking All Fiber Sizes ☐ Waste ☐ Drinking	TEM- Dust ☐ Microvac - ASTM D 5755 ☐ Wipe - ASTM D6480 ☐ Carpet Sonication (EPA 600/J-93/167) Soil/Rock/Vermiculite ☐ PLM CARB 435 - A (0.25% sensitivity) ☐ PLM CARB 435 - B (0.1% sensitivity) ☐ TEM CARB 435 - B (0.1% sensitivity) ☐ TEM CARB 435 - C (0.01% sensitivity) ☐ TEM Qual. via Filtration Technique ☐ TEM Qual. via Drop-Mount Technique Other: ☐

☐ Check For Positive Stop – Clearly Identify Homogenous Group
 Filter Pore Size (Air Samples): ☐ 0.8µm ☐ 0.45µm

Samplers Name:		Samplers Signature:	

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
12 1-3	Fiberglass Insulation and Paper	1	4/7
12 4	Spray on Foam Sealer	2	4/7

RECEIVED
 EMSL
 CINNAMINSON, N.J.
 2014 APR 11 A 11:03

Client Sample # (s): 1-4	-	Total # of Samples:
Relinquished (Client): <i>[Signature]</i>	Date: 4/10/14	Time: 11:00
Received (Lab): <i>[Signature]</i>	Date: 4-11-14	Time: 930A
Comments/Special Instructions: Site # 1247 - 12 Jacob ST Norwalk, CT		

4

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (800) 220-3675 / (856) 786-5974

<http://www.EMSL.com>cinnasblab@EMSL.com

EMSL Order: 041413675

CustomerID: TRIT52

CustomerPO: 104318

ProjectID:

Attn: **Brian Sirowich**
Triton Environmental, Inc.
385 Church Street
Suite 201
Guilford, CT 06437

Phone: (203) 458-7200
 Fax: (203) 458-7201
 Received: 05/16/14 9:50 AM
 Analysis Date: 5/23/2014
 Collected: 5/15/2014

Project: 104318

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>	
			%	Type	%	Type
1 041413675-0001	Exterior roof - Gray Roof Shingles	Black Fibrous Homogeneous	10%	Glass	90%	Non-fibrous (other) None Detected
2 041413675-0002	Exterior roof - Gray Roof Shingles	Black Fibrous Homogeneous	10%	Glass	90%	Non-fibrous (other) None Detected
3 041413675-0003	Exterior roof - Gray Roof Shingles	Black Fibrous Homogeneous	15%	Glass	85%	Non-fibrous (other) None Detected
4 041413675-0004	Deck overhang - Roof Paper	Black Fibrous Homogeneous	10%	Glass	90%	Non-fibrous (other) None Detected
5 041413675-0005	Deck overhang - Roof Paper	Black Fibrous Homogeneous	10%	Glass	90%	Non-fibrous (other) None Detected
6 041413675-0006	Deck overhang - Roof Paper	Black Fibrous Homogeneous	15%	Cellulose	85%	Non-fibrous (other) None Detected
7 041413675-0007	Deck overhang - Gray Rolled Roofing	Black Fibrous Homogeneous	20%	Cellulose	80%	Non-fibrous (other) None Detected
8 041413675-0008	Deck overhang - Gray Rolled Roofing	Black Fibrous Homogeneous	20%	Cellulose	80%	Non-fibrous (other) None Detected

Analyst(s)

Jamie Marczak (15)

Samantha Rundstorm (9)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036, PA ID# 68-00367

Initial report from 05/23/2014 07:40:49

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (800) 220-3675 / (856) 786-5974

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EMSL Order: 041413675

CustomerID: TRIT52

CustomerPO: 104318

ProjectID:

Attn: **Brian Sirowich**
Triton Environmental, Inc.
385 Church Street
Suite 201
Guilford, CT 06437

Phone: (203) 458-7200
 Fax: (203) 458-7201
 Received: 05/16/14 9:50 AM
 Analysis Date: 5/23/2014
 Collected: 5/15/2014

Project: 104318

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>	
			% Fibrous	% Non-Fibrous	% Type	
9 041413675-0009	Deck overhang - Gray Rolled Roofing	Black Non-Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (other)		None Detected
10-Floor Tile 041413675-0010	Kitchen & bathroom - 12" Ceramic Floor Tile	Beige Non-Fibrous Homogeneous		100% Non-fibrous (other)		None Detected
10-Mastic 041413675-0010A	Kitchen & bathroom - Mastic	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)		None Detected
11-Floor Tile 041413675-0011	Kitchen & bathroom - 12" Ceramic Floor Tile	Beige Non-Fibrous Homogeneous		100% Non-fibrous (other)		None Detected
11-Mastic 041413675-0011A	Kitchen & bathroom - Mastic					Insufficient Material
12-Floor Tile 041413675-0012	Kitchen & bathroom - 12" Ceramic Floor Tile	Beige Non-Fibrous Homogeneous		100% Non-fibrous (other)		None Detected
12-Mastic 041413675-0012A	Kitchen & bathroom - Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (other)		None Detected
13 041413675-0013	Kitchen & bathroom - Fiberboard beneath Tile	Gray Fibrous Homogeneous	20% Cellulose	80% Non-fibrous (other)		None Detected

Analyst(s)

Jamie Marczak (15)

Samantha Rundstorm (9)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036, PA ID# 68-00367

Initial report from 05/23/2014 07:40:49

**EMSL Analytical, Inc.**

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EMSL Order: 041413675

CustomerID: TRIT52

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ProjectID:

Attn: **Brian Sirowich**
Triton Environmental, Inc.
385 Church Street
Suite 201
Guilford, CT 06437

Phone: (203) 458-7200
 Fax: (203) 458-7201
 Received: 05/16/14 9:50 AM
 Analysis Date: 5/23/2014
 Collected: 5/15/2014

Project: 104318

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>	
			%	Fibrous	%	Type
14 041413675-0014	Kitchen & bathroom - Fiberboard beneath Tile	Gray Fibrous Homogeneous	20%	Cellulose	80% Non-fibrous (other)	None Detected
15 041413675-0015	Kitchen & bathroom - Fiberboard beneath Tile	Gray Fibrous Homogeneous	75%	Cellulose	25% Non-fibrous (other)	None Detected
16 041413675-0016	Living room, bedroom, bath - Sheetrock	Brown/White Fibrous Homogeneous	15%	Cellulose	85% Non-fibrous (other)	None Detected
17 041413675-0017	Living room, bedroom, bath - Sheetrock	Brown/White Fibrous Homogeneous	15%	Cellulose	85% Non-fibrous (other)	None Detected
18 041413675-0018	Living room, bedroom, bath - Sheetrock	Gray Fibrous Homogeneous	15%	Cellulose	85% Non-fibrous (other)	None Detected
19-Paper 041413675-0019	Living room, bedroom, bath - Yellow Fiberglass Insulation	Brown/Black Fibrous Homogeneous	80%	Cellulose	20% Non-fibrous (other)	None Detected
19-Insulation 041413675-0019A	Living room, bedroom, bath - Yellow Fiberglass Insulation	Yellow Fibrous Homogeneous	90%	Min. Wool	10% Non-fibrous (other)	None Detected
20-Paper 041413675-0020	Living room, bedroom, bath - Yellow Fiberglass Insulation	Brown/Black Fibrous Homogeneous	60%	Cellulose	40% Non-fibrous (other)	None Detected

Analyst(s)

Jamie Marczak (15)

Samantha Rundstorm (9)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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Initial report from 05/23/2014 07:40:49

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

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EMSL Order: 041413675

CustomerID: TRIT52

CustomerPO: 104318

ProjectID:

Attn: **Brian Sirowich**
Triton Environmental, Inc.
385 Church Street
Suite 201
Guilford, CT 06437

Phone: (203) 458-7200
Fax: (203) 458-7201
Received: 05/16/14 9:50 AM
Analysis Date: 5/23/2014
Collected: 5/15/2014

Project: 104318

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	<u>Non-Asbestos</u>		<u>Asbestos</u>	
			%	Fibrous	%	Type
20-Insulation 041413675-0020A	Living room, bedroom, bath - Yellow Fiberglass Insulation	Yellow Fibrous Homogeneous	98%	Glass	2%	Non-fibrous (other) None Detected

Analyst(s)

Jamie Marczak (15)

Samantha Rundstorm (9)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

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Initial report from 05/23/2014 07:40:49

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Asbestos Bulk Building Material Chain of Custody

EMSL Order Number (Lab Use Only):

041413675

Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

Company: Triton Environmental, Inc.		EMSL-Bill to: ☐ Same ☒ Different If Bill to is Different note instructions in Comments**	
Street: 385 Church Street Suite 201		Third Party Billing requires written authorization from third party	
City: Guilford	State/Province: CT	Zip/Postal Code: 06437	Country: United States
Report To (Name): Brian Sirowich		Telephone #: 203-458-7200	
Email Address: bsirowich@tritonenvironmental.com		Fax #: 203-458-7201	Purchase Order: 104318
Project Name/Number: 104318		Please Provide Results: ☐ Fax ☒ Email ☐ Mail	
U.S. State Samples Taken: CT		CT Samples: ☐ Commercial/Taxable ☐ Residential/Tax Exempt	

Turnaround Time (TAT) Options* - Please Check							
☐ 3 Hour	☐ 6 Hour	☐ 24 Hour	☐ 48 Hour	☐ 72 Hour	☐ 96 Hour	☒ 1 Week	☐ 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.

PLM - Bulk (reporting limit)	TEM - Bulk
☒ PLM EPA 600/R-93/116 (<1%) ☐ PLM EPA NOB (<1%) Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%) Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%) ☐ NIOSH 9002 (<1%) ☐ NY ELAP Method 198.1 (friable in NY) ☐ NY ELAP Method 198.6 NOB (non-friable-NY) ☐ OSHA ID-191 Modified ☐ Standard Addition Method	☐ TEM EPA NOB - EPA 600/R-93/116 Section 2.5.5.1 ☐ NY ELAP Method 198.4 (TEM) ☐ Chatfield Protocol (semi-quantitative) ☐ TEM % by Mass - EPA 600/R-93/116 Section 2.5.5.2 ☐ TEM Qualitative via Filtration Prep Technique ☐ TEM Qualitative via Drop Mount Prep Technique Other ☐

☒ Check For Positive Stop - Clearly Identify Homogenous Group	Date Sampled: 5/6/14
Samplers Name: Brian Sirowich	Samplers Signature: <i>[Signature]</i>

Sample #	HA #	Sample Location	Material Description
1-3	1	Exterior Roof	Grey Roof Shingles
4-6	2	Deck Overhang	Roof Pgn
7-9	3	" "	Grey Rolled Roofing
10-12	4	Kitchen & Bathroom	12" Ceramic Floor Tiles & Mosaic
13-15	5	" "	Fiberboard beneath Tile
16-18	6	Living Room, Bedroom, Bath	Sheetrock
19-21	7	" " "	Yellow Fiberglass Insulation

Client Sample # (s): - 21	Total # of Samples: 21 minimum
Relinquished (Client): <i>[Signature]</i>	Date: 5/6/5 Time: 3:40
Received (Lab): <i>AK</i> <i>EMSL FX</i>	Date: 5/16/14 Time: 0950
Comments/Special Instructions: 12 Jacob Street Norwalk CT BillTo: Triton Environmental, Inc., 385 Church Street, Suite 201, Guilford, CT, 06437, United States Attention: Brian Sirowich Phone: 203-458-7200 Email: bsirowich@tritonenvironmental.com Purchase Order:	

Sample #21 not received
AK 5/16/14 1210

20AK

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (800) 220-3675 / (856) 786-0327

<http://www.EMSL.com>RadonLab@emsl.com

EMSL Order: 381401635

CustomerID: TRIT52

CustomerPO:

ProjectID:

Attn: **Dave Vasiliou**
Triton Environmental, Inc.
385 Church Street Ste. 201
Guilford, CT 06437

Phone: (203) 458-7200
Fax: (203) 458-7201
Received: 04/11/14 4:12 PM
Analysis Date: 4/13/2014
Collected: 4/7/2014

Project: **12 Jacob St.**

Test **12 Jacob St.**
Site: **Norwalk, CT 06853**

Test Report: Radon in Air Test Results**Samples for EMSL Kit 97820**

Liquid Scintillation ID	Location	Radon Activity pCi/L	Start	Stop	Temperature F	Humidity %	Sample Type
164780	First Floor - Living Room	0.2	4/7/2014	4/9/2014	78	30	Customer
381401635-0001			9:00:00 AM	1:00:00 PM			

Sample Notes:

164867	First Floor - Living Room	0.4	4/7/2014	4/9/2014	78	30	Customer
381401635-0002			9:00:00 AM	1:00:00 PM			

Sample Notes:**Summary for EMSL kit 97820****Average Radon Result: 0.3 pCi/L**

The results indicate that both testing devices registered below the United States Environmental Protection Agency (EPA) action level of 4.0 picoCuries per liter of air (pCi/L). The EPA recommends fixing your home if the average of two short-term tests taken in the lowest lived-in level of the home show radon levels that are equal to or greater than 4.0pCi/L. The radon test was performed using a liquid scintillation radon detector/s and counted on a liquid scintillation counter using approved EPA testing protocols for Radon in Air testing.

The EPA recommends retesting your home every two years.

Please contact EMSL Analytical, Inc. or your State Health Department for further information.

All procedures used for generating this report are in complete accordance with the current EPA protocols for the analysis of Radon in Air.

Report Notes

Analyst(s)

Laura Freeman (2)

Garrett A. Ray, Laboratory Manager
Certified Radon Measurement Specialist NRSB 5SS0093
NJ MES12264, FL R2001, NE 116, PA 2572

In no event shall EMSL be liable for indirect, special, consequential, or incidental damages, including, but not limited to, damages for loss of profit or goodwill regardless of the negligence (either sole or concurrent) of EMSL and whether EMSL has been informed of the possibility of such damages, arising out of or in connection with EMSL's services thereunder or the delivery, use, reliance upon or interpretation of test results by client or any third party. We accept no legal responsibility for the purposes for which the client uses the test results. In no event shall EMSL be liable to a client or any third party, whether based upon theories of tort, contract or any other legal or equitable theory, in excess of the amount paid to EMSL by client thereunder. The test results meets all NELAC requirements unless otherwise specified. Accreditations: NRSB ARL6006, NJ DEP 03036, MEB 92525, PA 2573, IN 00455, IA L00032, RI RAS-024, ME 20200C, NE RMB-1083, NY ELAP 10872, NM 885-10L, FL RB2034, OH RL-39, NRPP #106178AL, KS-LB-0005

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ

Initial report from 04/14/2014 08:17:24

Please visit www.radontestinglab.com

Test Report RadonMultiKit-7.26.5 Printed: 4/14/2014 8:17:24 AM

Page 1 of 1



EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Tel: 800-220-3675 • Fax: 856-786-0327
www.radontestinglab.com

3814 01635

2014 APR 11 P 4: 12

DOM: 3/17/14
EXP: 3/17/15

TRIT52
5-Jay

M#2

Radon In Air Data Sheet

Send Written Report To:

Name David Vasilev
Address 385 Church St Suite 201
City Guilford State CT Zip 06437
Phone 203 458 7200 Fax 203 458 7201
Email dvasilev@tr.imcinnaminson.com
Technician Name Brian Souch

Technician Certification # ABRTechnician Signature ABR1ST RED VIAL # 164780

LOCATION

☐ Basement ☒ First Floor ☐ Bedroom ☐ Den

☒ Living Room ☐ Other _____

☐ Location in Room _____

2ND RED VIAL # 164867

(If Purchased)

The device has been scientifically tested to provide reliable indoor radon measurements when exposed to temperatures between 60 and 80 degrees F; temperatures outside this range will invalidate the test results.

Kit # 97820 (Outside of Box)

The test device must remain open for 48 to 96 hours • Return this section with the test device to the laboratory

Property Tested:

Name ~~Brian Souch~~
Address 12 Jacob St
City ~~Guilford~~ Norwalk
Municipality _____ County CT
State CT Zip 06853

☐ Check here if this is a Post Mitigation test.

Technician Name Brian SouchTechnician Certification # ABRTechnician Signature ABR

INDOOR CONDITIONS

Temperature 78 °F Humidity 30 %

EXPOSURE PERIOD

Beginning Date: 4 / 7 / 14Time: 9:00 AM / PM (Circle)Ending Date: 4 / 9 / 14Time: 1:00 AM / PM (Circle)



Client: Mr. David Vasiliou
Triton Environmental
385 Church St.
Guilford, CT 06437

Analytical Report

CET# 4040166

Report Date: April 11, 2014
Project: Norwalk
Project Number: 104318

Connecticut Laboratory Certificate: PH 0116
Massachusetts laboratory Certificate.: M-CT903
Rhode Island Certification: 199



New York Certification: 11982
Florida Laboratory Certification: E871064

CET #:4040166
Project: Norwalk
Project Number: 104318

SAMPLE SUMMARY

The sample(s) were received at 11.3°C.

This report contains analytical data associated with following samples only.

Sample ID	Laboratory ID	Matrix	Collection Date/Time	Receipt Date

S-1-1247	4040166-01	Solid	4/07/2014 9:00	04/07/2014

Client Sample ID S-1-1247

Lab ID: 4040166-01

PCBs by Soxhlet

Method: EPA 8082A

Analyst: SJ

Matrix: Solid

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	4.8	4	EPA 3540C	B4D0828	04/08/2014	04/10/2014 14:34	
PCB-1221	ND	4.8	4	EPA 3540C	B4D0828	04/08/2014	04/10/2014 14:34	
PCB-1232	ND	4.8	4	EPA 3540C	B4D0828	04/08/2014	04/10/2014 14:34	
PCB-1242	ND	4.8	4	EPA 3540C	B4D0828	04/08/2014	04/10/2014 14:34	
PCB-1248	ND	4.8	4	EPA 3540C	B4D0828	04/08/2014	04/10/2014 14:34	
PCB-1254	ND	4.8	4	EPA 3540C	B4D0828	04/08/2014	04/10/2014 14:34	
PCB-1260	ND	0.80	4	EPA 3540C	B4D0828	04/08/2014	04/10/2014 14:34	
PCB-1268	ND	0.80	4	EPA 3540C	B4D0828	04/08/2014	04/10/2014 14:34	
PCB-1262	ND	0.80	4	EPA 3540C	B4D0828	04/08/2014	04/10/2014 14:34	

<i>Surrogate: TCMX</i>	<i>84.6 %</i>	<i>50 - 150</i>			B4D0828	04/08/2014	<i>04/10/2014 14:34</i>
<i>Surrogate: DCB</i>	<i>122 %</i>	<i>50 - 150</i>			B4D0828	04/08/2014	<i>04/10/2014 14:34</i>

CET #:4040166
 Project: Norwalk
 Project Number: 104318

QUALITY CONTROL SECTION

Batch B4D0828 - EPA 8082A

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B4D0828-BLK1)					Prepared: 4/8/2014 Analyzed: 4/10/2014				
PCB-1016	ND	0.20							
PCB-1221	ND	0.20							
PCB-1232	ND	0.20							
PCB-1242	ND	0.20							
PCB-1248	ND	0.20							
PCB-1254	ND	0.20							
PCB-1260	ND	0.20							
PCB-1268	ND	0.20							
PCB-1262	ND	0.20							
<i>Surrogate: TCMX</i>					71.5	50 - 150			
<i>Surrogate: DCB</i>					88.3	50 - 150			
LCS (B4D0828-BS1)					Prepared: 4/8/2014 Analyzed: 4/10/2014				
PCB-1016	0.788	0.20	1.000		78.8	40 - 140			
PCB-1260	0.850	0.20	1.000		85.0	40 - 140			
<i>Surrogate: TCMX</i>					70.0	50 - 150			
<i>Surrogate: DCB</i>					84.3	50 - 150			
Calibration Check (B4D0828-CCV1)					Prepared: 4/8/2014 Analyzed: 4/10/2014				
PCB-1016	1.02	0.20	1.000		102	80 - 120			
PCB-1260	1.11	0.20	1.000		111	80 - 120			
<i>Surrogate: TCMX</i>					104	50 - 150			
<i>Surrogate: DCB</i>					108	50 - 150			



80 Lupes Drive
Stratford, CT 06615

Tel: (203) 377-9984
Fax: (203) 377-9952
email: cet1@cetlabs.com

Quality Control Definitions and Abbreviations

Internal Standard (IS)	An Analyte added to each sample or sample extract. An internal standard is used to monitor retention time, calculate relative response, and quantify analytes of interest.
Surrogate Recovery	The % recovery for non-tarar organic compounds that are spiked into all samples. Used to determine method performance.
Continuing Calibration Batch	An analytical standard analyzed with each set of samples to verify initial calibration of the system. Samples that are analyzed together with the same method, sequence and lot of reagents within the same time period.
ND	Not detected
RL	Reporting Limit
Dilution	Multiplier added to detection levels (MDL) and/or sample results due to interferences and/or high concentration of target compounds.
Duplicate	Result from the duplicate analysis of a sample.
Result	Amount of analyte found in a sample.
Spike Level	Amount of analyte added to a sample
Matrix Spike Result	Amount of analyte found including amount that was spiked.
Matrix Spike Dup	Amount of analyte foun in duplicate spikes including amount that was spike.
Matrix Spike % Recovery	% Recovery of spiked amount in sample.
Matrix Spike Dup % Recovery	% Recovery of spiked duplicate amount in sample.
RPD	Relative percent difference between Matrix Spike and Matrix Spike Duplicate.
Blank	Method Blank that has been taken through all steps of the analysis.
LCS % Recovery	Laboratory Control Sample percent recovery. The amount of analyte recovered from a fortified sample.
Recovery Limits	A range within which specified measurements results must fall to be compliant.
CC	Calibration Verification

Flags:

- H- Recovery is above the control limits
- L- Recovery is below the control limits
- B- Compound detected in the Blank
- P- RPD of dual column results exceeds 40%
- #- Sample result too high for accurate spike recovery.



Connecticut Laboratory Certification PH0116
Massachussets Laboratory Certification M-CT903
Rhode Island Certification 199

New York Certification 11982
Florida Laboratory Certification E871064

CET #:4040166
Project: Norwalk
Project Number: 104318

CASE NARRATIVE

The reporting limits for PCBs were raised due to interference even after clean up.

Questions related to this report should be directed to David Ditta, Timothy Fusco, or Robert Blake at 203-377-9984.

Sincerely,



David Ditta
Laboratory Director

Report Comments:

ND is None Detected at the specified detection limit

All analyses were performed in house unless a Reference Laboratory is listed.

Samples will be disposed of 30 days after the report date.

Sample Result Flags:

E- The result is estimated, above the calibration range.

H- The surrogate recovery is above the control limits.

L- The surrogate recovery is below the control limits.

B- The compound was detected in the laboratory blank.

P- The Relative Percent Difference (RPD) of dual column analyses exceeds 40%.

D- The RPD between the sample and the sample duplicate is high. Sample Homogeneity may be a problem.

+ - The Surrogate was diluted out.

All results met standard operating procedures unless indicated by a data qualifier next to a sample result, or a narration in the QC report.

Complete Environmental Testing is only responsible for the certified testing and is not directly responsible for the integrity of the sample before laboratory receipt.



COMPLETE ENVIRONMENTAL TESTING, INC.

N OF CUSTODY RECORD

CET #

Volatile Soils Only:

Date and Time in Freezer

Client:

CET:

Page 7 of 7

[illegible]

* Additional charge may apply. ** TAT begins when the samples are received at the Lab and all issues are resolved. TAT for samples received after 3 p.m. will start on the next business day.

REV. 12/11



Client: Mr. Brian Sirowich
Triton Environmental
385 Church St.
Guilford, CT 06437

Analytical Report

CET# 4050365

Report Date: May 22, 2014
Project: 12 Jacob St, Norwalk
Project Number: 104318

Connecticut Laboratory Certificate: PH 0116
Massachusetts laboratory Certificate.: M-CT903
Rhode Island Certification: 199



New York Certification: 11982
Florida Laboratory Certification: E871064

CET #:4050365

Project: 12 Jacob St, Norwalk

Project Number: 104318

SAMPLE SUMMARY

The sample(s) were received at 22.0°C.

This report contains analytical data associated with following samples only.

Sample ID	Laboratory ID	Matrix	Collection Date/Time	Receipt Date
PCB1	4050365-01	Solid	5/15/2014 11:00	05/15/2014
PCB2	4050365-02	Solid	5/15/2014 11:30	05/15/2014

Client Sample ID PCB1

Lab ID: 4050365-01

PCBs by Soxhlet

Method: EPA 8082A

Analyst: CA

Matrix: Solid

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 18:52	
PCB-1221	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 18:52	
PCB-1232	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 18:52	
PCB-1242	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 18:52	
PCB-1248	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 18:52	
PCB-1254	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 18:52	
PCB-1260	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 18:52	
PCB-1268	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 18:52	
PCB-1262	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 18:52	
Surrogate: TCMX	85.3 %	50 - 150			B4E1922	05/19/2014	05/21/2014 18:52	
Surrogate: DCB	65.3 %	50 - 150			B4E1922	05/19/2014	05/21/2014 18:52	

CET #:4050365

Project: 12 Jacob St, Norwalk

Project Number: 104318

Client Sample ID PCB2

Lab ID: 4050365-02

PCBs by Soxhlet

Analyst: CA

Method: EPA 8082A

Matrix: Solid

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 19:11	
PCB-1221	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 19:11	
PCB-1232	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 19:11	
PCB-1242	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 19:11	
PCB-1248	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 19:11	
PCB-1254	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 19:11	
PCB-1260	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 19:11	
PCB-1268	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 19:11	
PCB-1262	ND	0.80	4	EPA 3540C	B4E1922	05/19/2014	05/21/2014 19:11	

Surrogate: TCMX

74.9 %

50 - 150

B4E1922

05/19/2014

05/21/2014 19:11

Surrogate: DCB

96.6 %

50 - 150

B4E1922

05/19/2014

05/21/2014 19:11

CET #:4050365

Project: 12 Jacob St, Norwalk

Project Number: 104318

QUALITY CONTROL SECTION**Batch B4E1922 - EPA 8082A**

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B4E1922-BLK1)					Prepared: 5/19/2014 Analyzed: 5/20/2014				
PCB-1016	ND	0.20							
PCB-1221	ND	0.20							
PCB-1232	ND	0.20							
PCB-1242	ND	0.20							
PCB-1248	ND	0.20							
PCB-1254	ND	0.20							
PCB-1260	ND	0.20							
PCB-1268	ND	0.20							
PCB-1262	ND	0.20							
<i>Surrogate: TCMX</i>					69.5	50 - 150			
<i>Surrogate: DCB</i>					87.4	50 - 150			
LCS (B4E1922-BS1)					Prepared: 5/19/2014 Analyzed: 5/20/2014				
PCB-1016	0.868	0.20	1.000		86.8	50 - 150			
PCB-1260	0.797	0.20	1.000		79.7	50 - 150			
<i>Surrogate: TCMX</i>					88.1	50 - 150			
<i>Surrogate: DCB</i>					78.2	50 - 150			
Calibration Check (B4E1922-CCV1)					Prepared: 5/19/2014 Analyzed: 5/21/2014				
PCB-1016	0.833	0.20	1.000		83.3	80 - 120			
PCB-1260	0.882	0.20	1.000		88.2	80 - 120			
<i>Surrogate: TCMX</i>					88.2	50 - 150			
<i>Surrogate: DCB</i>					101	50 - 150			



80 Lupes Drive
Stratford, CT 06615

Tel: (203) 377-9984
Fax: (203) 377-9952
email: cet1@cetlabs.com

Quality Control Definitions and Abbreviations

Internal Standard (IS)	An Analyte added to each sample or sample extract. An internal standard is used to monitor retention time, calculate relative response, and quantify analytes of interest.
Surrogate Recovery	The % recovery for non-tarar organic compounds that are spiked into all samples. Used to determine method performance.
Continuing Calibration Batch	An analytical standard analyzed with each set of samples to verify initial calibration of the system. Samples that are analyzed together with the same method, sequence and lot of reagents within the same time period.
ND	Not detected
RL	Reporting Limit
Dilution	Multiplier added to detection levels (MDL) and/or sample results due to interferences and/or high concentration of target compounds.
Duplicate Result	Result from the duplicate analysis of a sample. Amount of analyte found in a sample.
Spike Level	Amount of analyte added to a sample
Matrix Spike Result	Amount of analyte found including amount that was spiked.
Matrix Spike Dup	Amount of analyte foun in duplicate spikes including amount that was spike.
Matrix Spike % Recovery	% Recovery of spiked amount in sample.
Matrix Spike Dup % Recovery	% Recovery of spiked duplicate amount in sample.
RPD	Relative percent difference between Matrix Spike and Matrix Spike Duplicate.
Blank	Method Blank that has been taken through all steps of the analysis.
LCS % Recovery	Laboratory Control Sample percent recovery. The amount of analyte recovered from a fortified sample.
Recovery Limits	A range within which specified measurements results must fall to be compliant.
CC	Calibration Verification

Flags:

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- L- Recovery is below the control limits
- B- Compound detected in the Blank
- P- RPD of dual column results exceeds 40%
- #- Sample result too high for accurate spike recovery.



Connecticut Laboratory Certification PH0116
Massachussets Laboratory Certification M-CT903
Rhode Island Certification 199

New York Certification 11982
Florida Laboratory Certification E871064

CET #:4050365

Project: 12 Jacob St, Norwalk

Project Number: 104318

Questions related to this report should be directed to David Ditta, Timothy Fusco, or Robert Blake at 203-377-9984.

Sincerely,



David Ditta
Laboratory Director

Report Comments:

ND is None Detected at the specified detection limit

All analyses were performed in house unless a Reference Laboratory is listed.

Samples will be disposed of 30 days after the report date.

Sample Result Flags:

E- The result is estimated, above the calibration range.

H- The surrogate recovery is above the control limits.

L- The surrogate recovery is below the control limits.

B- The compound was detected in the laboratory blank.

P- The Relative Percent Difference (RPD) of dual column analyses exceeds 40%.

D- The RPD between the sample and the sample duplicate is high. Sample Homogeneity may be a problem.

+/- The Surrogate was diluted out.

All results met standard operating procedures unless indicated by a data qualifier next to a sample result, or a narration in the QC report.

Complete Environmental Testing is only responsible for the certified testing and is not directly responsible for the integrity of the sample before laboratory receipt.



F CUSTODY RECORD

Volatile Soils Only:

Date and Time in Freezer

Client:

CET:

Page 7 of 7

[illegible]

* Additional charge may apply. ** TAT begins when the samples are received at the Lab and all issues are resolved. TAT for samples received after 3 p.m. will start on the next business day.

REV. 12/11

SECTION 00 31 32

GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions.
- B. A geotechnical investigation report for Project, prepared by Clarence Welti, P.E., P.C. dated December 26th, 2017, is attached to this Document. The report includes logs of borings conducted at the site.
- C. Related Requirements:
 - 1. Document 00 31 26 "Existing Hazardous Material Information" for hazardous materials reports that are made available to bidders.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

WELTI GEOTECHNICAL, P.C.

Formerly Dr. Clarence Welty, PE. PC.

227 Williams Street · P.O. Box 397
Glastonbury, CT 06033-0397

(860) 633-4623 / FAX (860) 657-2514

December 26, 2017

Mr. Matthew Ranando
Martinez Couch & Associates
1084 Cromwell Avenue, Suite A-2
Rocky Hill, CT 06067

Re: Geotechnical Study for Proposed New Residence at 12 Jacob Street, Norwalk, CT

Dear Matt:

1.0 Herewith are the boring data pertaining to the above. Two borings were drilled to auger refusal at a depths of 13.5 to of 17.5 feet below the existing grades. One of the borings was cored 10 feet into the bedrock. The boring locations are shown on the attached plan. The logs from two previous borings taken by Soil Testing Inc. are also included in the Appendix. *The borings were drilled by Clarence Welty Associates, Inc. and sampling was conducted by this firm solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.*

2.0 The **Subject Project** will include the construction of a new house to be compliant with the current Building Code and FEMA standards for construction within a flood zone. The residence will be within AE flood zones with a base flood elevations (100 year flood) at Elev.12.1. The existing grades in the area of the proposed structure range from about Elev.4.5 to Elev.7. It is presumed that the new first floor of the residences will be at about Elev.15 and the ground floor level will used for storage or as a car garage. The IRC requires that structures erected in Coastal High Hazard Areas (i.e., within the LIMWA) be supported on pilings or columns, that the pilings shall have adequate penetration to resist the combined wave and wind load (lateral and uplift), and that the design of piles shall include consideration of the decreased resistance capacity caused by scour of the soil surrounding the piles or piers.

3.0 The **Soils Cross Section** from the borings is generally as follows:

Locally; Topsoil to 3" to 5"

FILL or disturbed soils; fine to medium SAND, little to some Silt, little Gravel, trace Roots, few Cobbles to 2 to 5 feet, loose to medium compact

Fine to coarse SAND, little to some Gravel, Cobbles and Boulders, little Silt to auger refusal on boulders or bedrock at 8.5 to 17.5 feet, medium compact to very dense

Bedrock; Granitic Gneiss

Note: Cored bedrock at boring B-102 from 17.5 to 27.5 feet. The rock cores had recoveries of 100% and 90% and RQD values of 48% and 46%.

3.1 The **Water Table** was at 3 feet below the existing grades at the completion of the borings (Elev.2±).

4.0 The **Criteria for Foundation Type and Loading** are as follows:

1. The maximum total settlement shall not exceed 1" and the maximum differential settlement shall not exceed ½ the maximum settlement.
2. The foundation may be required address seismic requirements of the building code (if required)
3. The Slab on Grade must not settle differentially more than ½" in excess of the structure subsidence.

The above criteria have been assumed by the writer in developing the recommendations, included herein. More stringent criteria than the above may require supplemental geotechnical input.

4.1 Regarding item 2 (above) the IBC site soil profile classification is “**C**”. The mapped MCE spectral acceleration values for Norwalk, CT are $S_s = 0.232$ for a short period and $S_1 = 0.067$ for a 1 second period.

5.0 Based on the soils cross section and building code requirements for foundation design within a coastal flood zone (i.e., Coastal AE Zone), the foundation for the new residence should be with piles or concrete piers carried below the potential scour depth. The design should address compression loading, lateral and uplifts loading from wind and moving waters, and the potential loss of lateral support due to the scour of soils around the piles and grade beam. Based on the height of the structure above the existing grades, it is assumed that the design would include a grade beam with concrete columns extending up to the first floor living space.

5.1 Based on the shallow depths to rock, driven piles and helical installed to the top of rock may not achieve fixity. These pile types would also be difficult to install thru the soils cross section which includes cobbles and boulders. The **recommended pile type** is with micro piles drilled into the bedrock. The **micro piles** would be typically be with a 7-5/8" diameter casing drilled to the rock and 6" diameter hole drilled into the rock. A single reinforcing bar is placed thru the center of the pile. The allowable compression and tension loading would be based on the bond between the sound

bedrock and the cement. A 7 foot socket into sound bedrock would provide an allowable compression and tension loading of at least 20 Tons/pile. The allowable design loading should be no more than ½ the ultimate capacity. The micro piles are cased and can be drilled thru soils with cobbles and boulders.

5.3 Summary of Foundation Design Parameters:

Parameter	Value
Allowable Cement/Rock Bond for design of Micro Piles	75 psi
Soil Unit Weight (Backfill) *	125 pcf
Internal Friction Angle (Backfill) *	34°
Seismic Soil Profile Site Classification	D
Mapped MCE Spectral Response Acceleration for one second period, S_1	0.067
Mapped MCE Spectral Response Acceleration for short period, S_s	0.232

* Backfill material conforming to section 6.0 below

6.0 Regarding **Backfill of Excavations for Grade Beams and Pile Caps, and Fill Beneath the Slabs on Grade** the material should conform generally to the following gradation or be 3/8" crushed stone.

Percent Passing	Sieve Size
100	3.5"
50 - 100	3/4"
25 - 80	No.4

The fraction, passing the No.4 sieve should have less than 15%, passing the No. 200 sieve.

All backfill and fill must be compacted to at least 95% of modified optimum density.

Where filling below water or over a wet sub grade the fill should be with the 3/8" crushed stone. The crushed stone should be carried to at least 6" above the water table. The crushed stone does not require compaction testing.

7.0 Regarding **Earthwork** the soils are in OSHA Class C and all excavations deeper than 5 feet,

which are not shored, must be cut back to slopes less than 34°.

8.0 This report has been prepared for specific application to the subject project in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. In the event that any changes in the nature, design and location of structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

The analyses and recommendations submitted in this report are based in part upon data obtained from referenced explorations. The extent of variations between explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

Wolti Geotechnical, P.C., should perform a general review of the final design and specifications in order that geotechnical design recommendations may be properly interpreted and implemented as they were intended.

Based on the deductible for owner occupied residences in our error and omissions policy, our liability for errors and omissions to such owners or their agents would be \$10,000.

If you have any questions please call me.

Very truly yours,

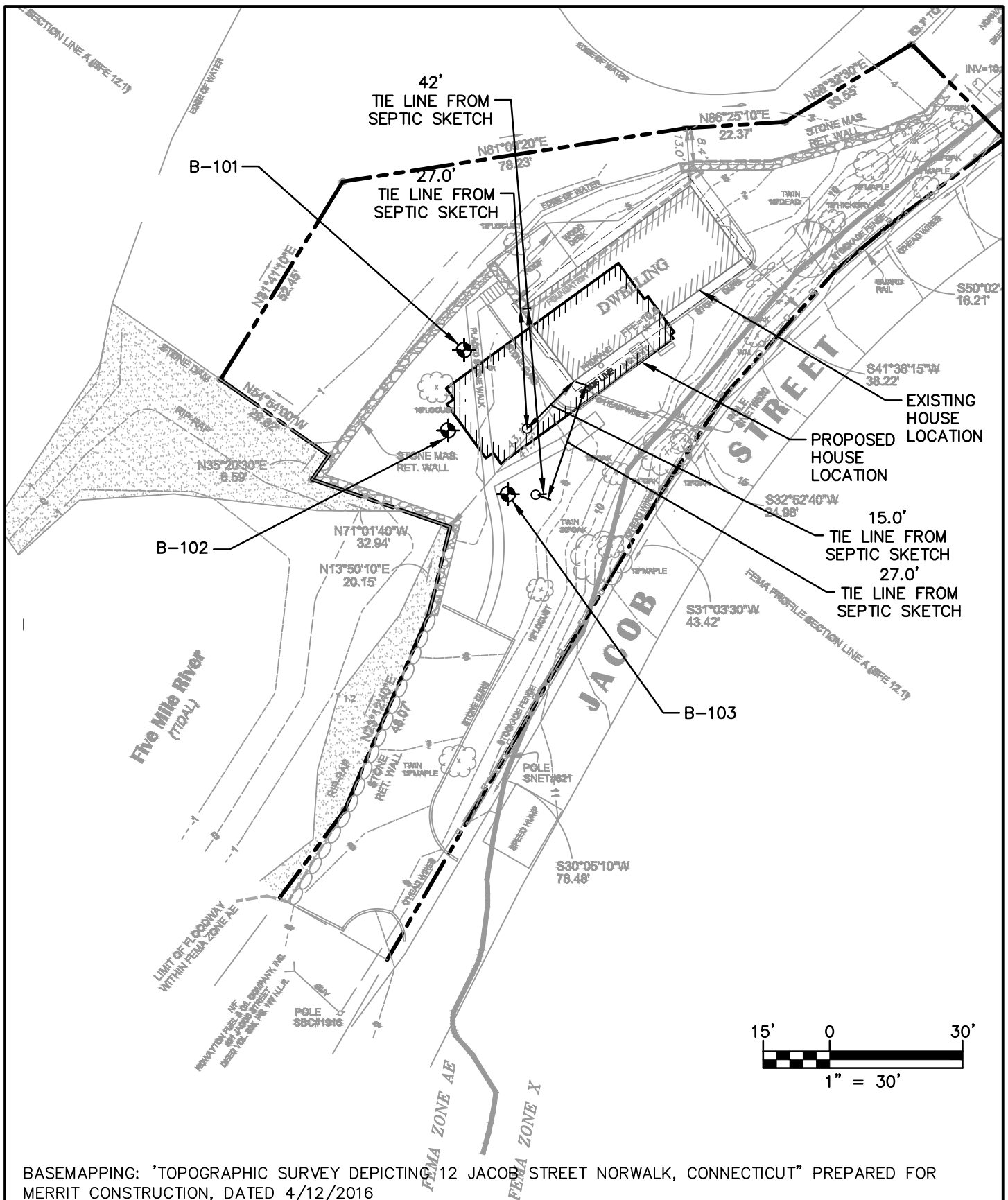


Max Welti, P.E.
President



Clarence Welti Ph.D., P. E.
Vice President

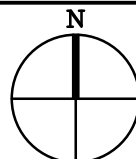
APPENDIX
TEST BORING LOCATION PLAN
+
TEST BORING LOGS



BASEMAPPING: 'TOPOGRAPHIC SURVEY DEPICTING 12 JACOB STREET NORWALK, CONNECTICUT' PREPARED FOR MERRIT CONSTRUCTION, DATED 4/12/2016



PROJECT 1247 JACOB STREET NORWALK CT

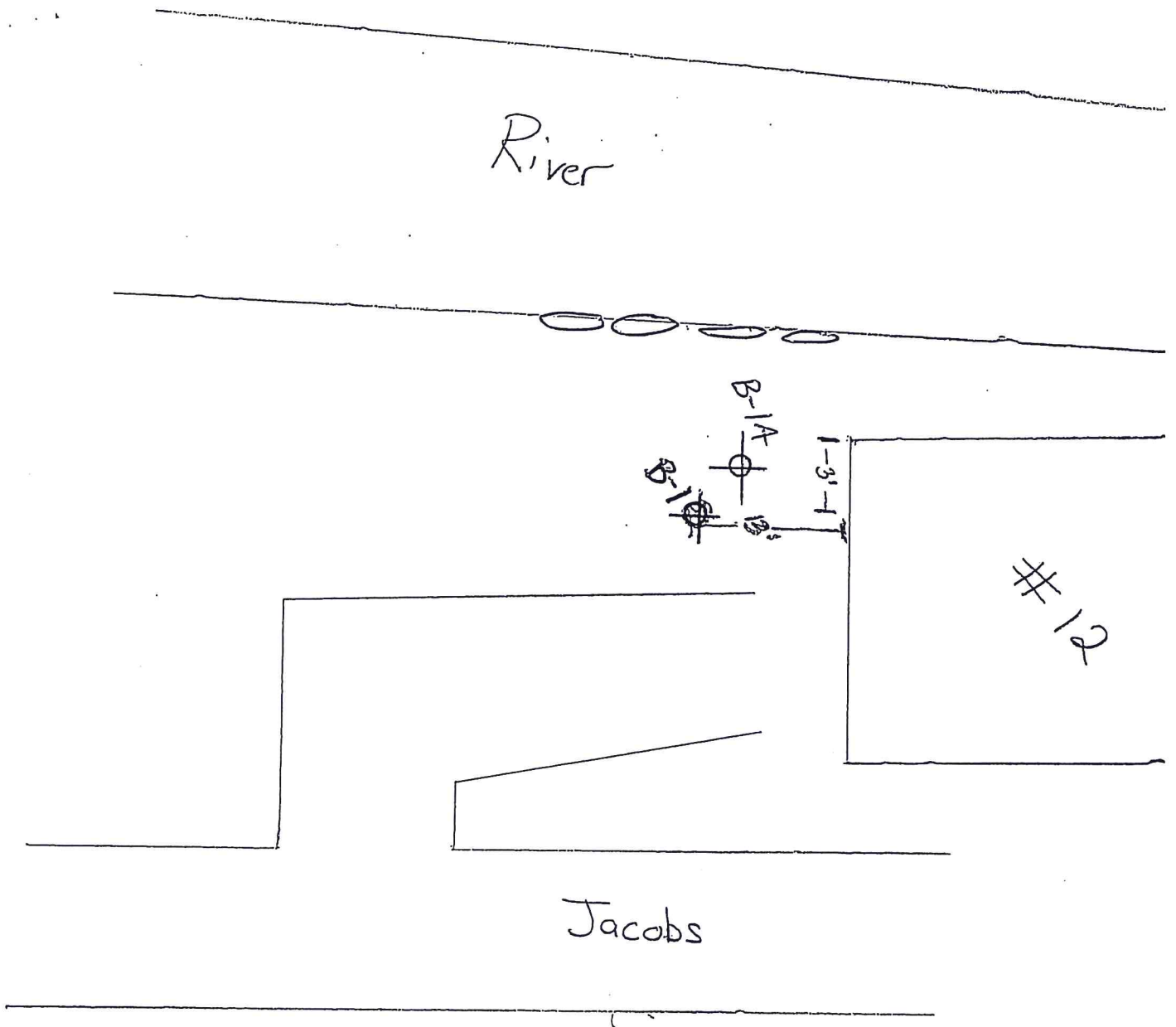


PROJECT NO.	33-262-1247
FIGURE	BORING SKETCH
SCALE	1" = 30'
DATE	2017-11-21

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT		PROJECT NAME PROPOSED RESIDENCE			
				MCA		LOCATION 12 JACOB STREET, NORWALK, CT			
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV.		HOLE NO. B-102	
TYPE	HSA		SS	NQ	LINE & STA.	GROUND WATER OBSERVATIONS			START DATE 12/20/17
SIZE I.D.	3.75"		1.375"	2.0"	N. COORDINATE	AT 3.0 FT. AFTER 0 HOURS			
HAMMER WT.			140lbs		E. COORDINATE	AT FT. AFTER HOURS			FINISH DATE 12/20/17
HAMMER FALL			30"						
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS				ELEV.
	NO.	BLOWS/6"	DEPTH						
0	1	1-3-3-1	0.0'-2.0'		TOPSOIL 0.40				
					DARK BR.FINE-MED.SAND, LITTLE SILT & GRAVEL				
	2	7-6-14-60	2.0'-4.0'						
					BR.FINE-CRS.SAND, SOME COBBLES & BOULDERS, LITTLE SILT & GRAVEL 3.0				
5	3	55-24-60	5.0'-6.5'						
10	4	24-60	10.0'-11.0'						
15	5	60	15.0'-15.3'						
					CORED BEDROCK - GRANITIC GNEISS 17.5				
20					RUN #1 17.5' - 22.5' RECOVERED 60" RQD = 48%				
					RUN #2 22.5' - 27.5' RECOVERED 54" RQD = 46%				
25									
					BOTTOM OF BORING @ 22.5' 27.5				
30									
35									
LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: T. CZMYR INSPECTOR:			
						SHEET 1 OF 1		HOLE NO. B-102	

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT		PROJECT NAME PROPOSED RESIDENCE			
				MCA		LOCATION 12 JACOB STREET, NORWALK, CT			
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV.		HOLE NO. B-103	
TYPE	HSA		SS		LINE & STA.	GROUND WATER OBSERVATIONS		START DATE 12/20/17	
SIZE I.D.	3.75"		1.375"		N. COORDINATE	AT 3.0 FT. AFTER 0 HOURS			
HAMMER WT.			140lbs		E. COORDINATE	AT FT. AFTER HOURS		FINISH DATE 12/20/17	
HAMMER FALL			30"						
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS				ELEV.
	NO.	BLOWS/6"	DEPTH						
0	1	3-5-11-21	0.0'-2.0'		TOPSOIL 0.25				
					DARK BR.FINE-MED.SAND, SOME SILT, TRACE GRAVEL				
	2	6-7-15-24	2.0'-4.0'		BR.FINE-CRS.SAND, LITTLE SILT & GRAVEL, FEW COBBLES & BOULDERS 2.0				
5	3	16-13-9-16	5.0'-7.0'						
10	4	60	10.0'-10.2'						
15					BOTTOM OF BORING @ 13.5' (AUGER REFUSAL) 13.5				
20									
25									
30									
35									
LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: T. CZMYR INSPECTOR:			
						SHEET 1 OF 1		HOLE NO. B-103	

SOILTESTING, INC. 90 DONOVAN RD. OXFORD, CT 06478 CT (203) 262-9328 NY (914) 946-4850		CLIENT: Merritt Construction				SHEET <u>1</u> OF <u>1</u>						
		PROJECT NO. G21-9952-15				HOLE NO. B-1						
		PROJECT NAME				BORING LOCATIONS per Plan						
FOREMAN - DRILLER TP/ad		LOCATION 12 Jacob Street Norwalk, CT										
INSPECTOR		CASING SAMPLER CORE BAR TYPE HSA SS NWD4 SIZE I.D. 3 3/4" 1 3/8" 2 1/8" HAMMER WT. 140# BIT HAMMER FALL 30" dia				OFFSET						
GROUND WATER OBSERVATIONS AT <u>4</u> FT AFTER <u>0</u> HOURS AT <u> </u> FT AFTER <u> </u> HOURS						DATE START 2/11/15 DATE FINISH 2/11/15 SURFACE ELEV. GROUND WATER ELEV.						
DEPTH	CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6 IN ON SAMPLER (FORCE ON TUBE) 0 - 6 6 - 12 12 - 18		CORE TIME PER FT (MIN)	DENSITY OR CONSIST	STRATA CHANGE DEPTH	FIELD IDENTIFICATION OF SOIL REMARKS INCL. COLOR, LOSS OF WASH WATER, SEAMS IN ROCK, ETC.
		NO	Type	PEN	REC.	DEPTH @ BOT						
5		1	ss	24"	8"	2'0"	3	5		moist stiff wet loose wet compact v dense v dense	8'6"	drk brn SILT & F-M SAND, tr F gravel, roots brn FM-C SAND, tr F gravel, silt brn gry FMC SAND, lit F gravel, tr silt, C gravel (poss fill to 5') some cobble at 5' gry FMC SAND, lit silt, F gravel some cobbles, boulders 6 - 8' gry FMC SAND, lit silt, F gravel AUGER REFUSAL
						5	4					
		2	ss	24"	6"	4'0"	4	3				
						2	2					
		3	ss	24"	8"	6'0"	2	2				
						12	31					
		4	ss	7"	3"	6'7"	49	50/1"				
		5	ss	3"	2"	8'3"	50/3"					
10		1	c	60"	6"	13'6"	RQD = 0%		3	2 1 2 2	13'6"	fractured BEDROCK or BOULDERS
15										E.O.B. 13'6"	Offset 5' toward stone wall	
GROUND WATER OBSERVATIONS AT <u>4</u> FT AFTER <u>0</u> HOURS AT <u> </u> FT AFTER <u> </u> HOURS												
10	B-1A									wet dense wet v dense	15'0" 17'0"	Cobble, Boulders 5 - 8' brn FMC SAND, sm F gravel, tr silt Cobble, Boulders 12 - 15' brn FMC SAND, it silt, F gravel BOULDERS or fractured BEDROCK AUGER REFUSAL
15		1	ss	24"	16"	12'0"	10	18		2 3 2 3 2	22'0"	E.O.B. 22'0"
20		2	ss	4"	3"	15'4"	50/4"			RQD = 0%	2	
25		1	c	60"	4"	22'0"	RQD = 0%		2	3 2 3 2	2	
NOTE: Subsoil conditions revealed by this investigation represent conditions at specific locations and may not represent conditions at other locations or times.												
GROUND SURFACE TO <u> </u> FT. USED <u> </u> CASING THEN <u> </u> CASING TO <u> </u> FT. HOLE NO. B-1 A = AUGER UP = UNDISTURBED PISTON T = THINWALL V = VANE TEST WOR = WEIGHT OF RODS WOH = WEIGHT OF HAMMER & RODS C = COARSE SS = SPLIT TUBE SAMPLER H.S.A. = HOLLOW STEM AUGER M = MEDIUM PROPORTIONS USED: TRACE = 0 - 10% LITTLE = 10 - 20% SOME = 20 - 35% AND = 35 - 50% F = FINE												



JOB NO.
G21-9952-15
SOILTESTING, INC.
90 Donovan Road
Oxford, CT 06478

SECTION 01 10 00

SUMMARY OF WORK

General Conditions

The following provisions are intended to supplement and complement each other and shall, where possible, be thus interpreted. If, however, any provision of the Project Documents irreconcilably conflicts with one or more of the following provisions, the provision imposing the greater duty or obligation on the Contractor shall govern. Where referenced herein MCA shall mean Martinez Couch & Associates, LLC.

1. Contractor shall supply all materials (except where indicated), labor, tools, equipment, and supplies required to complete the total Project in accordance with the drawings, specifications and other Contract Documents. Prior to beginning Work, Contractor shall list any deficiencies in scope and report to MCA.
2. Contractor shall provide all coordination of all Work with Owner, Owner Vendors, DOH, and DOH Agencies as required for project completion.
3. Contractor will develop a comprehensive logistics plan for all activities that affect the Owner.
4. Contractor shall, at MCA's request be responsible for submitting Construction Report's (CR's) for the periodic increments specified by MCA, indicating subcontractors, total number of people working, description of Work completed, including total hours worked that day, and any major deliveries.
5. Contractor shall secure and pay for a dumpster for all refuse and waste material. The dumpster location will be determined by the Property Owner or MCA.
6. If required for the Project (as reasonably determined by Owner) Contractor shall erect and maintain dust-barriers to separate living areas from areas of construction.
7. In the event of a required utility shutdown, Contractor will diligently schedule work with the Owner. Contractor will give the Owner Project Manager at least three (3) days advance notice of any proposed utility shutdown.
8. Contractor shall comply with all of the legal regulations, including, but not limited to, OSHA safety regulations and regulations of municipal, city, local, and other government agencies having jurisdiction concerning the Work. Contractor shall give all notices and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the Work. If Contractor performs any Work that is contrary to such laws, ordinances, codes, rules, and regulations, it shall make all changes to comply therewith and bear all costs arising therefrom.
9. All permits, required for any part of Contractor's Work, including those to be obtained in the Owner's name, shall be procured and paid for by Contractor.
10. Contractor to secure and pay for temporary sanitary facilities for use during construction period.

GENERAL SCOPE

Existing residential structure is to be demolished and removed offsite. A new wood frame residential structure is to be constructed as indicated on the contract drawings. The structure will be constructed above the indicated elevation. The new elevated structure will be supported on micro piles and a new concrete pier foundation. New steel and wood framing supports are to be installed. A new modular home furnished by others will be installed and all associated additional work completed by the contractor for a finished structure as required for issuance of a certificate of occupancy from the authority having jurisdiction.

New access stairs are to be constructed with pressure treated lumber on reinforced concrete foundations. An elevated wooden deck will be constructed. All building utilities will be extended to the elevated house. The project scope includes all trades to furnish and install all materials as indicated on the plans and meeting the requirements of the specifications.

The Contractor is responsible for obtaining, and all costs associated with, required permits from authorities having jurisdiction. The Contractor shall provide and pay for the cost of all utility coordination for utility disconnects and reconnections. All disturbed surfaces are to be restored substantially to the condition they existed prior to the start of construction. All work shall be performed in accordance with the contract drawings, specifications, and applicable codes. The Contractor is responsible for surveying the existing conditions and record existing conditions of the house by use of preconstruction photographs or video to document any conditions that might be misconstrued as damage cause by program work.

The contractor is expected to complete their own due diligence during the bid process. Any need for clarification shall be presented to MCA for resolution prior to bid submission. Bid submission is statement of understanding work required for successful completion at the offered fee. The contractor is to provide as-built prepared by CT licensed surveyor to A-2/T2 and a flood elevation certificate.

PROJECT SCOPE

1. EROSION & SEDIMENT CONTROL

- 1.1. Furnish and install Erosion and Sediment Control at the site.

- 1.2. Furnish and install temporary construction fence and chain link leaf gate to provide site access control.
- 1.3. Maintain all sediment and erosion control measures for project duration.

2. SELECTIVE DEMOLITION

- 2.1. Coordinate all utility disconnects
 - 2.1.1. Abandon existing water and septic tank; demolish and remove existing piping to property line, and return the existing water meter and propane tank to utility providers.
 - 2.1.2. Demolish and remove existing overhead aerial telecommunications and cable television wires
 - 2.1.3. Coordinate removal of overhead wires with utility provider as required to accommodate proposed home and equipment
- 2.2. Remove and dispose offsite existing structure and site features identified to be demolished as indicated on the contract drawings.
- 2.3. Remove below-grade structure foundation, including foundation walls and footings and dispose of offsite.
- 2.4. Demolish and remove offsite all items as indicated on drawings.

3. BUILDING FOUNDATION

- 3.1. Furnish and install materials for new foundation in accordance with drawings and specifications.

4. FRAMING/ROUGH CARPENTRY/WOOD DECKING/GLUED LAMINATED CONSTRUCTION

- 4.1. Furnish and install all materials for project work in accordance with drawings and specifications; items include but are not limited to the following:
 - 4.1.1. Decking and access stairs
 - 4.1.2. Structural framing.
 - 4.1.3. Attic floor, wall, floor and roof framing.

5. ARCHITECTURAL WOODWORK/FINISH CARPENTRY/SIDING/ROOFING

- 5.1. Furnish and install all materials in accordance with and as indicated in drawings and specifications for the following items but are not limited to the following:
 - 5.1.1. Asphalt shingle roofing system on site built roof and roofs over modular structure projections.
 - 5.1.2. Soffits at first and second floor cantilever sections of modular structure
 - 5.1.3. Roof eave and rake at site-built gable walls, dormer walls
 - 5.1.4. Roof eave and rake modular structure roofs at second floor
 - 5.1.5. Interior doors
 - 5.1.6. Exterior Window Trim
 - 5.1.7. Vertical board siding.

6. INSULATION

- 6.1. Furnish and install in accordance with and as indicated in drawings and specifications;
 - 6.1.1. Foamed in place insulation at underside of finished area living spaces.
 - 6.1.2. Insulation as required for utility access chase construction.
 - 6.1.3. Fiberglass batt insulation for structure.

- 6.1.4. All materials to insulate and make weather tight the first and second floor cantilever sections and roofs of the second floor of the modular structure

7. FINISHES

- 7.1. Prime, paint and stain all finished surfaces where indicated on drawings and as required to patch and repair building components damaged by construction
- 7.2. Furnish and install all materials for finishes in accordance with drawings and specifications;
- 7.2.1. Gypsum board, as specified for the structure.
- 7.2.2. Gypsum sheathing at underside of structure.

8. OPENINGS

- 8.1. Furnish and install all materials for doors and windows in accordance with drawings and specifications.
- 8.1.1. Exterior doors where indicated on drawings
- 8.1.2. Windows in site built attic level.

9. MECHANICAL

- 9.1. Complete all work in accordance with drawings and specifications. Furnish and install all materials including but not limited to the following;
- 9.1.1. Forced air heating system with gas fired furnace
- 9.1.2. Domestic hot water system with electric storage water heater.
- 9.1.3. Propane supply system and piping from buried propane tank up to and through modular structure.
- 9.1.4. Whole house ventilation system.
- 9.2. Connect, balance and fully commission all building mechanical, heating, ventilation and cooling systems.

10. PLUMBING

- 10.1. Complete all work in accordance with drawings and specifications. Furnish and install all materials.
- 10.2. Coordinate disconnects and reconnection of domestic water piping to elevated home.
- 10.2.1. Coordinate water meter relocation/replacement as shown on drawings and to local utility provider requirements.
- 10.2.2. Furnish and install all materials required for complete and functioning domestic water utility service.
- 10.3. Disconnect, abandon, and remove offsite existing septic tank and leaching galleries present onsite per Public Health Code
- 10.4. Coordinate connection of sanitary sewer service to elevated home
- 10.4.1. Furnish and install all materials required for complete and functioning gravity sewer, duplex pump grinder station, and force main sewer utility service as indicated on contract documents.
- 10.5. Coordinate connection of propane storage tank to new elevated home
- 10.5.1. Furnish and install all materials required for complete and functioning propane utility service.
- 10.6. Furnish and install all materials in accordance with drawings and specifications for,

10.6.1. Heat tracing of utilities servicing elevated house

10.6.2. Plumbing piping, fixtures, appurtenances and specialties at the underside of first finished floor and in the attic level of the structure.

10.6.3. Furnish and install all materials in accordance with the contract documents for vertical utility chase risers, and access hatches

11. ELECTRICAL

11.1. Coordinate overhead power disconnect/reconnection with local utility provider.

11.1.1. Furnish and install all materials for new electric service in accordance with the local utility provider requirements

11.2. Coordinate reconnection of telecommunications utility services.

11.3. Furnish and install all materials in accordance with specifications, drawings, and manufacturer requirements.

11.4. The scope includes the following but is not limited to;

11.4.1. Electrical and lighting installation beneath modular structure

11.4.2. Light fixture installation on exterior of modular structure.

11.4.3. Electrical and lighting installation in attic level of structure.

12. SITE WORK

12.1. Repair and restore all site features damaged by construction activities

12.2. Complete site work as indicated on drawings.

END OF SECTION

SECTION 01 21 00

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Testing and inspecting allowances.
- C. Related Requirements:
 - 1. Section 01 40 00 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise MCA of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At MCA's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by MCA from the designated supplier.

1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by MCA under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by MCA under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Contracting Authority, after installation has been completed and accepted.

1.8 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of services not required by the Contract Documents are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Contracting Officer by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. MCA reserves the right to establish the 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 Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include 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 the Contract Documents.
 - 2. No change to 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1 Lump Sum Allowance: Include the sum of \$5,000 for floor tile on floor and wall tile in shower as indicated in second floor bathroom.
 - 1. This allowance includes material cost, receiving, handling, and installation, and Contractor overhead and profit.
- B. Allowance No.2 Testing and Inspection Allowance: Include the sum of \$10,000 for all costs for testing and material Inspections specified in Section 033000 "Cast In Place Concrete", Section 052100 "Structural Steel", and Section 31 62 20 "Micropiles" and Statement of Special Inspections.
 - 1. This allowance includes Contractor overhead and profit.

SECTION 01 22 00

UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 01 40 00 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at MCA or Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price 1: Authorized Additional Excavation and Replacement

1. Description: Unsatisfactory soil excavation and disposal off site and replacement with satisfactory fill material or engineered fill from off site, as required, according to Section 31 20 00 "Earth Moving."
2. Unit of Measurement: Cubic yard of soil excavated, based on survey of volume removed.

B. Unit Price No. 2: Rock excavation and replacement with satisfactory soil material.

1. Description: Classified rock excavation and disposal off site and replacement with satisfactory fill material or engineered fill from off site, as required, according to Section 31 20 00 "Earth Moving."
2. Unit of Measurement: Cubic yard of rock excavated, based on survey of volume removed.

C. Unit Price No. 3 – Micro Pile depth beyond rock elevation reported in contract document. Additional length or shorter length due to variations in the top of rock will be paid on a add or deduct lineal foot basis where the linear footage = (Elevation) minus (Elevation of As-Built Rock.)

1. Description: Micro Piles according to Section 31 62 20
2. Unit of Measurement: Linear feet based on as-built elevation of rock of installed micropiles.

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.

- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Add Alternate No 1. – Exterior Decking Material Change
1. In lieu of pressure treated wood decking per section 06 15 33 – “Wood Patio Decking” on all exterior decks, platforms, landings, and stairs shown on contract drawings furnish and install composite decking per specification section 06 45 22 – “Composite Decking”
- B. Add Alternate No 2. – Siding Material Change
1. In lieu of drawing identified vertical prefinished cedar ship lap siding all material and labor for vinyl siding.
- C. Add Alternate No 3. – Mechanical Heating Installation by Owner
1. Owner shall furnish and install materials for forced air heating system. General contractor to provide all cutting/patching, testing services required by authorities having jurisdiction and identified on drawings, and electrical installation.
- D. Add Alternate No 4. – Gutter Leaf Guards
1. Material and Labor to Furnish and install leaf guards on all gutters.

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 01 21 00 "Allowances" for products selected under an allowance.
 - 2. Section 01 23 00 "Alternates" for products selected under an alternate.
 - 3. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

- a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of MCA's and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. MCA's Action: If necessary, MCA will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. MCA will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Forms of Acceptance: Change Order, Construction Change Directive, or MCA's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if MCA does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: MCA will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, MCA will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: MCA will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of MCA.
 - 1. Conditions: MCA will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, MCA will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution does not require extensive revisions to the Contract Documents.
- b. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- c. Substitution request is fully documented and properly submitted.
- d. Requested substitution will not adversely affect Contractor's construction schedule.
- e. Requested substitution has received necessary approvals of authorities having jurisdiction.
- f. Requested substitution is compatible with other portions of the Work.
- g. Requested substitution has been coordinated with other portions of the Work.
- h. Requested substitution provides specified warranty.
- i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 01 21 00 "Allowances" for procedural requirements governing the handling and processing of allowances.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to MCA at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of MCA.
 - c. MCA's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703 or EJCDC Document C-620. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Change Orders (numbers) that affect value.
 - d. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - a. Include separate line items under principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
6. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
7. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by MCA.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Submit Application for Payment to MCA by the 7th day of the month. The period covered by each Application for Payment is one month in accordance with Section 2 of the general conditions section of this document.
 - 1. Submit draft copy of Application for Payment 10 days prior to due date for review by MCA.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. MCA will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Stored Materials: No payment will be made for stored materials (either on-site or off-site).
- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to MCA by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit conditional final or full waivers.
 - 3. MCA reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Forms: Submit executed waivers of lien on forms acceptable to MCA.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Products list (preliminary if not final).
 5. Submittal schedule (preliminary if not final).
 6. Copies of building permits.
 7. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 8. Certificates of insurance and insurance policies.
 9. Performance and payment bonds.
- I. Application for Payment at Substantial Completion: After MCA issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 2. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 ACTION SUBMITTALS

- A. Coordination drawings. See paragraph 1.7 of this section.

1.5 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.6 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of subcontractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.7 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
 - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to MCA indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
 - 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 - 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to

- accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Review: MCA will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If MCA determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, MCA will so inform Contractor, who shall make changes as directed and resubmit.
 9. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Preparation Format: DWG, Version 2013, operating in Microsoft Windows operating system.
 3. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and Portable Data File (PDF) format.
 4. MCA will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files in PDF format.
 - a. MCA makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.

- b. Contractor shall execute a data licensing agreement in the form of AIA Document C106 or other Agreement form acceptable to MCA.

1.8 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. MCA will return RFIs submitted to MCA by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Contract
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 or Software-generated form with substantially the same content as indicated above, acceptable to MCA.
 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. MCA's Action: MCA will review each RFI, determine action required, and respond. Allow seven working days for MCA's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.

- b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of MCA's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. MCA's action may include a request for additional information, in which case MCA's time for response will date from time of receipt of additional information.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly Use CSI Log Form 13.2B. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of MCA.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date MCA's response was received.
- F. On receipt of MCA's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify MCA within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.9 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and MCA of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including MCA, within three days of the meeting.
- B. Preconstruction Conference: MCA will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and MCA, but no later than 10 days after a notice to proceed.
1. Conduct the conference to review responsibilities and personnel assignments.

2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, MCA, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises and existing building.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and MCA, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, MCA and its consultants, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

- a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- D. Progress Meetings: Conduct progress meetings at biweekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and MCA and its consultants, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Deliveries.
 - 4) Off-site fabrication.
 - 5) Access.
 - 6) Site utilization.
 - 7) Temporary facilities and controls.
 - 8) Progress cleaning.

- 9) Quality and work standards.
 - 10) Status of correction of deficient items.
 - 11) Field observations.
 - 12) Status of RFIs.
 - 13) Status of proposal requests.
 - 14) Pending changes.
 - 15) Status of Change Orders.
 - 16) Pending claims and disputes.
 - 17) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's construction schedule.
 - 3. Construction schedule updating reports.
 - 4. Biweekly construction reports.
 - 5. Site condition reports.
 - 6. Special reports.
- B. Related Requirements:
 - 1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
 - 2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by MCA.

- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 ACTION SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
 - 3. Two paper copies.
- B. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Weekly Construction Reports: Submit at biweekly intervals.
- G. Material Location Reports: Submit at biweekly intervals.
- H. Site Condition Reports: Submit at time of discovery of differing conditions.

- I. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including phasing work, stages area, separations, interim milestones, and partial Owner occupancy.
 4. Review submittal requirements and procedures.
 5. Review time required for review of submittals and resubmittals.
 6. Review requirements for tests and inspections by independent testing and inspecting agencies.
 7. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
 8. Review and finalize list of construction activities to be included in schedule.
 9. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts (where applicable), submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice of Award to date of final completion. Contract completion date shall not be changed by submission of a schedule that shows an early or delayed completion date, unless specifically authorized by a Construction Change Directive or Change Order
- B. Activities: Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by MCA.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items as separate activities. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Startup and Testing Time: If required for project systems include no fewer than 5 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for MCA's administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 15 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Uninterruptible services.
 - b. Partial occupancy before Substantial Completion.
 - c. Use of premises restrictions.
 - d. Provisions for future construction.
 - e. Seasonal variations.
 - f. Environmental control.
 4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Submittals.
 - b. Installation.
 - c. Tests and inspections.
 - d. Adjusting.
 - e. Curing.
 5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Substantial Completion.
 - b. Final Completion
 6. Other Constraints: Not Used.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones where applicable by project scope:

1. Site work for New Foundation
2. Pile Installation
3. Formwork for Structural Concrete
4. Rebar Placement for Structural Concrete
5. Completion of Concrete Foundation
6. Completion of Superstructure Framing
7. Completion of Mechanical, Electrical, and Plumbing Installations
8. Completion of Building Utility Connections and Service Restorations
9. Re-occupancy of property by owner.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Software shall be Microsoft Project or other software acceptable to MCA.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within 10 days of date established for the Notice of Award.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. Format: Submit Microsoft Excel format, latest software version or other software acceptable to MCA.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit a comprehensive, fully developed, horizontal, bar-chart-type, Contractor's construction schedule within 15 days of date established for the commencement of

Work. Base schedule on the startup construction schedule and additional information received since the start of Project.

- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.
- C. Format: Submit using Microsoft Project file format for Windows Operating Systems or other software acceptable to MCA

2.4 REPORTS

- A. Biweekly Construction Reports: Prepare a biweekly construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. Accidents.
 - 7. Meetings and significant decisions.
 - 8. Unusual events (see special reports).
 - 9. Stoppages, delays, shortages, and losses.
 - 10. Meter readings and similar recordings.
 - 11. Emergency procedures.
 - 12. Orders and requests of authorities having jurisdiction.
 - 13. Change Orders received and implemented.
 - 14. Construction Change Directives received and implemented.
 - 15. Services connected and disconnected.
 - 16. Equipment or system tests and startups.
 - 17. Partial completions and occupancies.
 - 18. Substantial Completions authorized.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

- A. General: Submit special reports directly to MCA within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At biweekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to MCA, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require MCA's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require MCA's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
- D. Martinez Couch & Associates LLC (MCA) is the Project Manager and for this project. MCA will provide technical consultation, review all project materials, and provide project management. All references to MCA in this specification and in all other specifications means Martinez Couch & Associates, LLC of Rocky Hill, Connecticut.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by MCA and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 2. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for MCA final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. MCA's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by MCA for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. MCA reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on MCA's receipt of submittal. No extension of the Contract

Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. MCA will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 21 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by MCA's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to MCA and to MCA's consultants, allow 21 days for review of each submittal. Submittal will be returned to MCA before being returned to Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by MCA.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to MCA, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of MCA.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.

- o. Indication of full or partial submittal.
- p. Transmittal number, numbered consecutively.
- q. Submittal and transmittal distribution record.
- r. Other necessary identification.
- s. Remarks.

E. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately **6 by 8 inches** on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Engineer.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - j. Number and title of appropriate Specification Section.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will discard submittals received from sources other than Contractor.
 - a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Name and address of Engineer.
 - 6) Name of Contractor.
 - 7) Name of firm or entity that prepared submittal.
 - 8) Names of subcontractor, manufacturer, and supplier.
 - 9) Category and type of submittal.
 - 10) Submittal purpose and description.
 - 11) Specification Section number and title.

- 12) Specification paragraph number or drawing designation and generic name for each of multiple items.
- 13) Drawing number and detail references, as appropriate.
- 14) Indication of full or partial submittal.
- 15) Transmittal number numbered consecutively.
- 16) Submittal and transmittal distribution record.
- 17) Remarks.
- 18) Signature of transmitter.

- F. Options: Identify options requiring selection by MCA.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by MCA on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from MCA's action stamp.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from MCA's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submit electronic submittals via email as PDF electronic files to mranando@martinezcouch.com and couchre@martinezcouch.com
 - a. MCA will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.

- d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. Three opaque copies of each submittal. MCA will retain two copies; remainder will be returned.
- D. Samples: When requested by MCA Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: When requested by MCA Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. MCA will return submittal with options selected.

6. Samples for Verification: When requested by MCA Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. MCA will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements of contract documents

- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of MCAs and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to MCA.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to MCA.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date

of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 MCA'S ACTION

- A. Action Submittals: MCA will review each submittal, make marks to indicate corrections or revisions required, and return it. MCA will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
 - 1. Approved
 - 2. Approved As Noted
 - 3. Approved As Noted/Confirm
 - 4. Approved As Noted/Resubmit.
 - 5. Not Approved
 - 6. Comments Attached
 - 7. Receipt Acknowledged
- B. Informational Submittals: MCA will review each submittal and will not return it, or will return it if it does not comply with requirements. MCA will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from MCA.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the MCA without action.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
- C. The contractor shall bear sole responsibility for the costs of complying with quality requirements in this Section.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. MCA: Where referenced in this section, MCA is defined as Martinez Couch and Associates, LLC.
- C. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and

completed construction comply with requirements. Services do not include contract enforcement activities performed by MCA or Construction Manager.

- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to the Construction Manager for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to MCA for a decision before proceeding.

1.5 ACTION SUBMITTALS

1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system.
 - 2. Main wind-force-resisting system.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 15 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to MCA. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.

- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated in paragraph 1.11 of this section
 - 3. MCA performed tests and inspections indicated in the Contract Documents
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work MCA has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.

- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to MCA, the MCA, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

- F. Testing Agency Responsibilities: Cooperate with MCA, the MCA, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify MCA, the MCA, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services as required by Martinez Couch and Associates, LLC, the Construction Manager. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Martinez Couch and Associates, LLC the Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
1. Cast in Place Concrete –
 - a. Mix Design – Inspector Certification shall be ACI-CCT or ICC-RCSI. Inspector scope shall review concrete batch tickets and verify compliance with approved mix design. Verification that water added at the site does not exceed that allowed by mix design.
 - b. Reinforcement Installation – Inspector certification shall be ACI-CCI or ICC-RCSI. Inspection scope shall include size, spacing, cover, positioning and grade of reinforcing steel. Verification that reinforcing bars are free from deleterious materials, adequate bar ties, chair supports or bolsters, bar laps, and mechanical splices shall be included in inspection scope.
 - c. Welding of Reinforcing – Inspector certification shall be AWS-CWI. Inspection scope shall include visual inspection of all reinforcing steel welds, verification of weldability of reinforcing steel, and preheating of steel when required.
 - d. Concrete Placement – Inspector certification shall be ACI-CCI or ICC-RCSI. Inspection scope shall include the verification of concrete conveyance and depositing avoids segregation or contamination, proper consolidation, and placement of concrete
 - e. Sampling and Testing of Concrete – Inspector certification shall be ACI-CFTT, ACI-STT to sample;
 - 1) Concrete Compressive Strength, ASTM C31 & C39
 - 2) Concrete Slump, ASTM C143
 - 3) Concrete Air Content, ASTM C231 or ASTM C173
 - 4) Temperature, ASTM C1064
 - f. Curing and Protection – Inspector Certification shall be ACI-CCI or ICC-RCSI. Inspection scope shall verify cold weather protection and hot weather protection procedures as necessary.
 2. Structural Steel –
 - a. Material Certification – Inspector Certification shall be AWS/AISC-SSI or ICC-SWSI. Inspection scope shall include review certified mill test reports and identification marking on wide flange shapes, high strength bolts, nuts and welding electrodes.
 - b. Bolting – Inspector certification shall be AWS/AISC-SSI or ICC-SWSI. Inspection scope shall include installation and tightening of high strength bolts and verification of proper tightening sequence.
 - c. Welding – Inspector certification shall be AWS-CWI or ASNT. Inspection scope shall include visual inspection of all welds, surface preparation between passes, and verification of size and length of fillet welds.
 3. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
 4. Notifying MCA and the MCA, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 5. Submitting a certified written report of each test, inspection, and similar quality-control service to MCA and the MCA, with copy to Contractor and to authorities having jurisdiction.

6. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
7. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
8. Retesting and reinspecting corrected work.
9. Where appropriate a Professional Engineer, P.E., designated by MCA or MCA shall be allowed to inspect structural steel and cast in place concrete work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to MCA.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for the Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General: During the construction period various types of services are necessary to record or support the construction process, which are not an integral part of the final construction. Provide temporary facilities and controls in accordance with the Contract Documents.
- B. Scope of Work includes but is not limited to:
 - 1. Layout and measurements.
 - 2. Staging areas.
 - 3. Rubbish removal.
 - 4. Safety, protection and security.
 - 5. Temporary toilets.
 - 6. Water Service
 - 7. Site Fence
 - 8. Temporary scaffolding, ladders, stairs, hoists, etc.
 - 9. Temporary closures
 - 10. Labor disputes
 - 11. Temporary light and power
 - 12. Temporary heat
 - 13. Ventilation and Humidity Control

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Ladders, scaffolds, planks, hoists and similar items required for a specific item of work shall be part of that Scope of Work

1.3 QUALITY ASSURANCE

- A. Codes: Comply with applicable Building Code and Standards.
- B. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

- C. Standards: Comply with the State and Local Board of Health, Environmental Protection Agency, Fire Department and other applicable standards.
- D. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- E. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.4 SUBMITTALS

- A. Refer to Section 01 33 00 or certain individual items of this section.

1.5 PRODUCT HANDLING

- A. Maintain temporary facilities and controls in proper safe condition throughout progress of the Work.

1.6 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

PART 2 - PRODUCTS AND EXECUTION

2.1 TEMPORARY FACILITIES INSTALLATION

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to Martinez Couch and Associates, testing agencies, and authorities having jurisdiction.
- B. Layout and Measurements:
 - 1. Use of Data Furnished: Boring, and survey data made available to the Contractor is for information only, and the Contractor shall use his own judgment as to the actual conditions. He is warned that reliance on the information presented is at his own risk, and neither the Owner, State, nor the MCA and his consultants will be liable for errors relating to such data.
 - 2. Additional Data Required By Contractor: The Contractor may make borings or drive test pits he requires to verify the conditions at the site at his own expense. The location and size of such exploratory holes will be subject to approval by the MCA.

3. Protection of Survey: Land monuments, bench marks, survey points and other such references shall be protected from damage unless and until their removal is authorized. If they are disturbed, they shall be replaced in their proper positions.
 4. Measurements: Take measurements of the work and be responsible for it.
 - a. Discrepancies: Thoroughly examine the drawings and specifications, carefully checking the figured dimensions, before commencing work, and report to the MCA if any discrepancy, error, or defect appears.
 - b. Dimensions: If figured dimensions are lacking on the drawings, the MCA will supply them.
- C. Staging Area:
1. Scope: Access and staging areas for purposes of this Contract shall be confined to areas as directed by MCA within the property boundary.
 2. Location of Apparatus: The locations of material, apparatus, equipment, fixtures, piping outlets, etc., are not specified. The actual location shall be as directed or as required to suit the conditions at the time of installation. Before installation, the Contractor shall consult the MCA and ascertain the actual location.
 3. Provide temporary storage sheds if necessary, and other storage facilities on the job site for the storage of materials that may be subject to weather damage when interior or covered space is not available.
 4. Provide for adequate timber bridging and planking or other suitable means as required for legal egress, and for the safeguarding of existing paving, walks and curbs, structures and utilities from damage due to construction vehicle traffic. Safeguard existing conditions from damage during construction. Repair or replace the damaged existing surroundings within the designated access and staging areas which is needed to remain in place and which is damaged by operations under this Contract.
 5. Do not encumber the premises nor overload the structures beyond their allowable design live load with his/her apparatus, storage of materials and the operation of his/her workmen, and shall be confined within the limits designated by MCA.
- D. Rubbish Removal:
1. Clean-up debris, rubbish and old materials resulting from the Work on a daily basis.
 2. Cleaning Responsibility: Remove from the work area of building and site debris, resulting from the work daily or as often as necessary if it interferes with the work or staging area under the contract or presents a fire hazard. No rubbish or debris shall be dropped from a height of more than 6 feet, or thrown out of windows or openings without a chute. An adequate number of cleaning personnel shall be provided during working hours, who shall keep areas within and adjacent to the building free from dust and loose dirt by sweeping and wet mopping.
 3. Rubbish Disposal: Furnish containers at central collection locations as designated by MCA on the site to receive construction debris. Cost of containers, removal and disposal charges shall be paid by the Contractor. Containers shall be removed as often as necessary to minimize interference with work in progress.
 4. Clean the site around the building and maintain it clean and free from food and beverage containers, waste and other debris. Provide and rigidly enforce the use of waste receptacles by construction personnel. Burning of refuse is not permitted.
 5. Salvage Materials: Construction salvage materials, not indicated items elsewhere to be returned to the Owner, shall become the property of the Contractor and shall be

taken from the premises. Storage of materials and equipment on the site, other than for this project, will not be permitted.

E. Safety, Protection and Security:

1. Provide safety and protection in accordance with Contract Documents.
2. Protection: Protection shall be maintained for the duration of the Project and shall include:
 - a. Weather Protection: Arrange to provide protection against rain, wind, storms, frost, heat and other weather conditions, so as to maintain work, materials, apparatus and fixtures free from injury or damage. At the end of each day's work items likely to be damaged shall be covered. Remove snow and ice for the proper protection and/or execution of the construction work.
 - b. Protection of Finished or Existing Work: Provide protection for the finished work. Finished or Existing floors that will remain shall be protected from traffic or construction work by covering with materials approved by the finish manufacturer. Finished construction and materials shall be protected from rain, snow and windstorm damage throughout the construction period.
 - c. Fire Protection: Maintain fire-fighting equipment for the duration of construction in accordance with the requirements of the Fire Department and the Insurance Underwriters and subject to approval of the Owner's insurance agent. Provide fire extinguishers as required by the local Fire Department and the Building Code. Coordinate with existing firefighting equipment in existing building.
 - d. Volatile Liquids: Bulk storage of volatile liquids shall be outside the building at designated location. Only as much volatile liquid shall be allowed within the building at any given time as is needed for that day's operation.
 - e. Vermin and Rodent Control: Prevent the infestation and multiplication of vermin and rodents, and, if necessary, employ an exterminator to rid the premises of them if there is evidence that they exist.
 - f. Dust Protection: Prevent the nuisance of dust to the surrounding areas, and provide coverings or water sprinkling materials and equipment as required for such dust prevention for the work.
 - g. Structural Alterations: Do not permit endangering work by excavation or otherwise and shall not cut or alter the work without the consent of the Structural MCA. Written instruction shall be obtained from the Structural MCA's representatives before cutting beams or other structural members, arches, lintels, etc.
3. Protection of Adjacent Property:
 - a. Scope: Take necessary precautions to protect public and private property on or adjacent to the job site, including utilities, street signs, light standards, hydrants, pavements and walks, planting and natural features, against damage or injury including settlement or collapse.
 - b. Building Damage: Should damage result to structures or property, the Contractor shall correct or repair it without undue delay and to the complete satisfaction of MCA. No "Waiver of Responsibility" for incomplete,

- inadequate or defective adjoining work will be accepted unless otherwise stated by the MCA.
- c. Excavation Damage: Maintain the existing and adjoining structures safety. Concrete or rock excavation in the proximity of the adjoining structures shall be done by line drilling. Existing footings and foundation work exposed shall be underpinned as directed by MCA. Prevent damage to pipes, conduits, wires, cables or structures above or below ground.
 - d. Site Damage: Repair and restoration of existing roads, pavements, walks, curbs, manholes, hydrants, light standards, street signs, catch basins, railings and plantings, and other construction or surfaces required due to the work under this contract shall be included in the work under the Contract even if not specifically called for in the various sections of the Specifications. Repair and restoration work shall match existing work. Costs incurred in repair work, including permits, bonds and supervision by public authorities, shall be borne by the Contractor causing the damage.
4. Welding & Cutting:
- a. Handling of Welding Materials: The handling and storage of welding materials, acetylene and oxygen tanks, burners, and other equipment required for the execution of welding and cutting work at the job shall be subject to the approval of the Building Department and Fire Marshal.
 - b. Welding Standards: Work shall be performed in accordance with the standard specifications of the American Welding Society.
 - c. Fire Protection: Welders shall take precautions required to prevent fires as a result of his/her operations. When welding tools or torches are in used, the Contractor shall have available, in the immediate vicinity of the work, a fire extinguisher of the CO₂ type. The fire extinguisher shall be provided and maintained by the Installer. Fuel for cutting and heating torches shall be gas only, and shall be contained in Underwriters Laboratory listed containers. Storage of gas shall be in locations approved by the Fire Department. Provide fireproofed tarpaulins where applicable at welding and cutting operations.
 - d. Power: The Owner will not provide power for electric welders.
5. Tree Protection: Trees identified by the Owner or MCA to remain must be protected by the Contractor during the construction period. Avoid driving vehicles or storing materials within the tree root area and excavating in the root area unless accepted by the Owner or MCA.
6. Security: The Contractor shall secure his/her tools, materials and assemblies. Claims shall not be made against the Owner or MCA for equipment or tool losses or damage to installed assemblies.
- F. Temporary Toilets:
- 1. Chemical Toilets: The Contractor shall provide and maintain temporary enclosed and weatherproof chemical toilets located on the site. Use of the owner's toilets by construction personnel within occupied areas of the building is not permitted.

2. Cleaning of Toilets: Toilets shall be maintained in a clean and sanitary condition and shall conform to the requirements of the local Department of Health and Labor requirements. Toilets shall be pumped and cleaned a minimum of once per week.
- G. Water Service:
1. Water shall be available for the various trades as coordinated with the property Owner. Prevent freeze-ups. Have water available for the various trades during the normal working periods and for fire prevention purposes.
 2. Cost: the Contractor shall pay the cost of water.
- H. Temporary Scaffolding, Ladders, Stairs, Hoists, Etc.:
1. Scope: Coordinate the installation and maintenance and safety of temporary stairs, ladders, ramps, scaffolds, runways, sidewalk bridges, fences, derricks, hoists, chutes, and other such operational facilities as may be needed for the proper execution of the work. Apparatus, equipment and construction shall meet the requirements of the Labor Law and other State and local Building Department Requirements.
 2. Scaffolding: Coordinate the location, erection, maintenance and removal of scaffolding and other temporary facilities as required for the proper installation of the work.
 3. Hoists and/or Crane: (for General Use) Coordinate and maintain the use of conventional construction hoists of sufficient size and capacity to raise materials and equipment and give access to construction levels.
- I. Site Fence:
1. Location: A site fence shall be installed by the Contractor at the construction site perimeter and adjacent staging areas if required by the contract documents. New construction work, including trailer and staging shall be contained within the site fence.
 2. Type:
 - a. Woven Wire Mesh: 6'-0" high with gates and required bracing.
 - b. Maintain fence and gates during entire construction period in a neat and orderly way free of graffiti or unauthorized signs.
- J. Temporary Closures:
1. Take special precautions against damage to materials and work installed in cold or freezing weather, by providing adequate special heat and/or covering to prevent damage by the elements.
 2. Temporary Partitions: (adjacent to occupied areas) after relocation of occupancy from spaces requiring access, provide temporary partitions to isolate occupied areas from work areas. Temporary partitions shall be of gypsum board on suitable studs and shall not interfere with the emergency exit requirements of occupied areas.
 3. Exterior partitions shall be suitably weather protected insulated and otherwise sealed off to prevent dirt and weather infiltration.
 4. Interior partitions shall be suitably sealed to limit noise and dirt infiltration.
- K. Labor Disputes:

1. Notifications: Immediately notify the MCA of actual or impending labor disputes that may affect or is affecting the schedule of the Work. Take appropriate measures to eliminate or minimize the effect of such labor dispute on the schedule, including but not limited to, such measures as: promptly seeking appropriate injunctive relief; filing appropriate charges with the National Labor Relations Board under the applicable provisions of the Labor Management Relations Act of 1947, as amended; filing appropriate damage actions; taking such measures as establishing a reserved gate, where appropriate; seek other sources or supply or service; and other measures that may be appropriately utilized to limit or eliminate the effect of the labor dispute.
 2. Damage - Time Extension: To the extent the Contractor fails to promptly initiate measures that are appropriate, no extension of time for completion shall be allowed. In addition, any delay impact on any Contractor's schedule or on the schedule for the Project, which is a direct result of such failure, shall be considered as a Contractor caused delay under applicable provisions of the Contract. The rights and remedies provided in this paragraph are in addition to other rights or remedies provided by law or under this Contract. The Contractor shall include this clause in every Contract, together with a requirement that Sub-Subcontractors include a substantially similar clause in each lower tier subcontract.
- L. Temporary Light and Power:
1. Scope: The Contractor shall provide labor, materials, tools, appliances, and equipment and perform operations necessary for the complete execution of a separate system of temporary electric light and power throughout the project suitable for supplying electrical energy for illumination and for power tools and equipment. Such system shall be installed and maintained in place as needed and removed promptly as its necessity ceases to exist. Maintaining shall and include energizing and de-energizing the electrical systems each working day, and turning on and off of lights daily.
 2. Lighting Standards: The minimum temporary lighting to be provided, and maintained in each room and changed as needed when interior walls are being erected as directed by OSHA standards. Temporary lighting must be maintained for twenty-four (24) hours a day, and seven (7) days a week at stairs and corridors below ground. In other spaces, temporary lighting and power shall be energized approximately thirty (30) minutes before the starting time and after the quitting time of the latest stopping unless otherwise directed by code.
 3. Wiring Standards: Temporary wiring and equipment shall conform to the requirements of the National Electrical Code, regulations of the Building Code.
 4. Energy Costs: The Contractor shall pay the Electric Utility bills, as they become due, for electric energy used for temporary lighting and power to perform work in the building.
 5. Other Costs: The Contractor shall be responsible for the other costs in connection with providing and maintaining the temporary electrical power system.

M. Temporary Heat:

1. Scope of Enclosed Building Protection: Prior to the winter weather, protection as required to accomplish the following:
2. To protect the finish work.
3. If the heat not available from existing heating plant, the Contractor is responsible to provide sufficient heat so that the work can be accomplished in accordance with the Contract.
4. Cost: If the other than existing plant used for heat the Contractor shall pay for temporary heat equipment, safety provisions and fuel charges.
5. Damage Due to Lack of or Improperly Operated Temporary Heat: Maintain heat to prevent damage due to frost and freezing during the period when temporary heat is needed. Prevent damage due to defective equipment or the use of equipment, including but not limited to damage such as stains, smudges, soot or fire, and repair damage in a manner satisfactory to the Owner and MCA.

N. Ventilation and Humidity Control (Where necessary for project work): Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

2.2 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Maintain support facilities until MCA schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will not be permitted to use permanent facilities.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Construction personnel shall park offsite. Vehicle parking onsite shall only be for work vehicles and limited to paved areas. All damage to site surfaces by contractor vehicles shall be repaired at contractors expense and no additional compensation.

2.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 01 10 00 "Summary of Work."
- B. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- C. Barricades and Warning Signs: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs.
- D. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- E. Prohibit smoking in construction areas.
- F. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

2.4 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary dehumidifiers or permanent HVAC system, if available to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to MCA.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

2.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

The State of Connecticut Department of Housing Bid Documents
Community Development Block Grant
Disaster Recovery Program (CDBG-DR)
Owner Occupied Rehabilitation and Rebuilding Program

Bid Documents
Project #1247
12 Jacob Street
Norwalk, CT

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 01 21 00 "Allowances" for products selected under an allowance.
 - 2. Section 01 23 00 "Alternates" for products selected under an alternate.
 - 3. Section 01 25 00 "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other

characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 2. MCA's Action: If necessary, MCA will request additional information or documentation for evaluation within one week of receipt of a comparable product request. MCA will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 10 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
 - b. Use product specified if MCA does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, MCA will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," MCA will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
 - a. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
 - a. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable

Products" Article for consideration of an unnamed product by one of the other named manufacturers.

- C. Visual Matching Specification: Where Specifications require "match MCA's sample", provide a product that complies with requirements and matches MCA's sample. MCA's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by MCA from manufacturer's full range" or similar phrase, select a product that complies with requirements. MCA will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: MCA will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, MCA may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. List of similar installations for completed projects with project names and addresses and names and addresses of MCAs and owners, if requested.
 - 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 73 00

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 011000 "Summary of Work" for limits on use of Project site.
 - 2. Section 013300 "Submittal Procedures" for submitting surveys.
 - 3. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
 - 4. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 ACTION SUBMITTALS

- A. Construction As-Built Survey – Survey substantially accurate to indicate compliance with design drawings and zoning compliance for location of concrete formwork prior to concrete pour and elevations/locations of concrete piers as poured.
 - 1. Do not proceed with work if survey indicates non-compliance with design drawings and zoning compliance
 - 2. Repair and replace work not in compliance with design drawings and zoning compliance including variance setbacks.
- B. Final As-Built Property Survey – Survey substantially accurate to indicate compliance with design drawings and zoning compliance for project construction of foundation walls, major site improvements, and all other project work.
 - 1. Prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.
- C. Certified Surveys: Submit two copies signed by land surveyor on 4-mil mylar suitable for recording.
- D. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

1.6 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in Connecticut where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify MCA of locations and details of cutting and await directions from MCA before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Mechanical systems piping and ducts.
 - c. Control systems.
 - d. Communication systems.
 - e. Electrical wiring systems.
 - f. Operating systems of special construction.
 - 3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in MCA's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to MCA for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: 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, mechanical and electrical systems, and other construction affecting the Work.
 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to MCA according to requirements in Section 01 31 00 "Project Management and Coordination."
- E. Surface and Substrate Preparation: Comply with manufacturer's written recommendations for preparation of substrates to receive subsequent work.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer promptly
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and

electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by MCA.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: 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.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Emergency Vehicle Access - Contractor must maintain emergency vehicle access at all times to all units/residential units.
- G. Disturbances/Repairs - If during the course of installation the Contractor breaks a utility (water, sewer, telephone, cable, electricity), it is the Contractor's responsibility to repair the utility within a period that will not exceed disruption of services for more than 6-hours.
- H. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- I. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- J. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by MCA.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- K. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- L. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01100 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Where authorized by MCA, cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls." Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01400 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 02 41 19 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
 - 2. Section 31 10 00 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

1.5 ACTION SUBMITTALS

- A. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 INFORMATIONAL SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days of date established for commencement of the Work.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan. Plan shall distinguish between demolition and construction waste.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - 2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, and reused.
 2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
 3. Comply with Section 31 25 13 "Erosion Controls" for erosion and sediment controls.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.

5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility at contractors option.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.

- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for progress cleaning of Project site.
 - 2. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 15 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by MCA. Label with manufacturer's name and model number where applicable.
 5. Submit test/adjust/balance records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 15 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 6. Advise Owner of changeover in heat and other utilities.
 7. Participate with Owner and MCA in conducting inspection and walkthrough.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.

10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, MCA will either proceed with inspection or notify Contractor of unfulfilled requirements. MCA will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by MCA, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of MCA's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by MCA. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements if applicable.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, MCA will either proceed with inspection or notify Contractor of unfulfilled requirements. MCA will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use an form acceptable to MCA. Present format to be used to MCA for approval.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

- a. Project name.
- b. Date.
- c. Name of MCA.
- d. Name of Contractor.
- e. Page number.

4. Submit list of incomplete items in the following format:

- a. MS Excel electronic file. MCA will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of MCA for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

- 1) Clean HVAC system in compliance with NADCA Standard 1992-01.
Provide written report on completion of cleaning.

- p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- q. Leave Project clean and ready for occupancy.

- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." And Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
1. As-Built Drawings
 2. Record Drawings.
 3. Record Specifications.
 4. Record Product Data.
 5. Miscellaneous record submittals.
- B. Related Requirements:
1. Section 017300 "Execution" for final property survey.
 2. Section 017700 "Closeout Procedures" for general closeout procedures.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit record digital data files and 2 (two) sets of plots.
 - 2) MCA will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit three paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and three set(s) of prints.
 - 3) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

- C. Record Product Data: Submit one paper copy and annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy and annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 AS-BUILT DRAWINGS

- A. As-Built Drawings Submission
 - 1. Prepare and submit as built drawings at project milestones indicated.
- B. Construction As-Built Drawings
 - 1. Formwork As-Built Drawings:
 - a. Prepare A-2/T-2 survey of concrete formwork demonstrating compliance with contract drawing identified building setback dimensions and lines.
 - b. Submit drawing on Mylar film suitable for map recording. Submit two copies on 24"x36" size mylar, 4 mil thickness.
 - 2. Structural Pier As-Built Drawings:
 - a. Prepare A-2/T-2/V-2 survey of as built concrete piers demonstrating compliance with contractor drawing identified building setback dimensions and lines.
 - b. Submit drawing on Mylar film suitable for map recording. Submit two copies on 24"x36" size mylar, 4 mil thickness.
- C. Finished Construction As-Built Drawings
 - 1. Prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.
 - a. Prepare A-2/T-2/V-2 survey of as built concrete piers demonstrating compliance with contractor drawing identified building setback dimensions and lines.
 - b. Submit drawing on Mylar film suitable for map recording. Submit two copies on 24"x36" size mylar, 4 mil thickness.

2.2 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
- a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following MCA's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with MCA. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to MCA for resolution.
 4. MCA will furnish Contractor one set of digital PDF data files of the Contract Drawings for use in recording information.
- a. See Section 013300 "Submittal Procedures" for requirements related to use of MCA's digital data files.

- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where MCA determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
 - 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 - 2. Consult MCA for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 - 1. Hard Copy Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Electronic Format: Annotated PDF electronic file with comment function enabled.
 - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 - 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of MCA.
 - e. Name of Contractor.

2.3 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 - 3. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file and one paper copy of marked-up paper copy of Specifications.

2.4 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, record Specifications, and record Drawings where applicable.

- B. Format: Submit record Product Data as annotated PDF electronic file and one paper copy of marked-up paper copy of Product Data.
 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.5 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
 1. Include the following but not limited to where project appropriate
 - a. Pile Installation Test Reports and Certifications
 - b. Foundation Inspection Reports and Certifications
 - c. Municipal and Building Official Reports and Certifications
 - d. System Commissioning data for all utilities.
- B. Format: Submit miscellaneous record submittals as PDF electronic file and paper copy.
 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for MCA's reference during normal working hours.

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 REFERENCES

- A. American National Standards Institute (ANSI/ASSE)
- B. State of Connecticut Department of Housing (CT DOH)
- C. State of Connecticut Department of Energy and Environmental Protection (CT DEEP)
- D. State of Connecticut Department of Public Health (CT DPH)
- E. Occupational Safety and Health Administration (OSHA)

1.3 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
 - 1. Section 011000 "Summary of Work" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 017300 "Execution" for cutting and patching procedures.
 - 3. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.4 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse or storage.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.5 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.6 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.7 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
- C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.9 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Notify MCA of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify MCA and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

- A. All phasing of selective demolition and new construction activities is the sole responsibility of the contractor.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
 - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

- A. Site Access and Temporary Controls – Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent properties.
- B. Temporary Facilities – Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent properties.

- C. Temporary Shoring – Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Contractor will arrange to shut off indicated services/systems.
 - 2. Arrange to shut off utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

- C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic.
- D. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area indicated on Drawings.
 - 5. Protect items from damage during transport and storage.
- E. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by MCA, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Division 7 for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.9 SELECTIVE DEMOLITION SCHEDULE

- A. Remove: As indicated on drawings.
- B. Remove and Salvage: As indicated on drawings.
- C. Remove and Reinstall: As indicated on drawings.
- D. Existing to Remain: As indicated on drawings.
- E. Dismantle: As indicated on drawings.

END OF SECTION

SECTION 03 30 00

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. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - A. Section 017300 "Execution" for as built survey preparation.
 - B. Section 017839 "Project Record Documents" for as-built survey documents.

1.3 ACTION SUBMITTALS

- A. Product Data: For each product.
- B. Concrete Design Mixtures: For each mixture.
- C. Steel Reinforcement Shop Drawings 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. As-Built Drawings: Drawings of as-built conditions of concrete formwork prior to concrete pour of piers to verify building setbacks and after concrete pour verifying compliance with zoning setbacks and height of top of piers as described in this section.
 - 1. Submit mylar drawing certified A-2/T-2/V-2 by Connecticut Licensed Land Surveyor.
 - 2. Submit AutoCAD 2013 Electronic file used for preparation of mylar drawing.

1.4 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Producer Qualifications: ASTM C 94.
- B. Comply with ACI 301, "Specification for Structural Concrete"; ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"; and CRSI "Manual of Standard Practice."
- 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on reinforcement.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed. All reinforcing steel shall be epoxy coated in accordance with ASTM A775
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, as drawn, flat sheet.
- C. Portland Cement: ASTM C 150, Type I or II.
- D. Fly Ash: ASTM C 618, Type C or F.
- E. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- F. Silica Fume: ASTM C 1240, amorphous silica.
- G. Aggregates: ASTM C 33, uniformly graded.
 - A. Maximum Aggregate Size for Concrete in Insulating Concrete Forms: 3/4 inch (19 mm).
- H. Air Entraining Admixture: ASTM C 260.
- I. Chemical Admixtures: ASTM C 494, water reducing and accelerating or retarding as applicable to project conditions. Do not use calcium chloride or admixtures containing calcium chloride.
- J. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulose fiber.
- K. Vapor Retarder: Reinforced sheet, ASTM E 1745, Class A.
- L. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- M. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- N. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.2 CONCRETE MIXES

- A. Comply with ACI 301 requirements for concrete mixtures.

- B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
1. Minimum Compressive Strength: As noted on drawings at 28 days
 2. Maximum Water-Cement Ratio: 0.45.
 3. Slump Limit: 5 inches (125 mm) with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
 4. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of floor slabs to receive steel trowel finish to exceed 3 percent.
 5. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, by not less than 25 percent.
 6. For concrete exposed to deicing chemicals, limit use of fly ash to 25 percent replacement of Portland cement by weight and granulated blast-furnace slag to 40 percent of Portland cement by weight; silica fume to 10 percent of Portland cement by weight.
- C. Measure, batch, mix, and deliver concrete according to ASTM C 94.
1. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 AS-BUILT LOCATION

- A. Pre-Pour As-built Location of Formwork – Prepare and submit a certified as built drawing of location of formwork prior to pour of concrete pile caps and piers.
1. Work may not proceed with concrete pour until certified as built demonstrates compliance with zoning set-backs on contract drawings.
 2. Remove and reset all reinforcing steel and formwork if found outside of zoning setbacks, no additional compensation will be provided for any required modifications.
- B. Post Pier Pour As-Built Pier Location – Prepare and submit a certified as built location of in place concrete pier locations and top elevations.
1. Work may not proceed until certified as built demonstrates compliance with zoning setbacks and elevations of piers tops on contract drawings.
 2. Remove and replace all concrete work found outside of zoning setbacks, no additional compensation will be provided for outside.

3.2 CONCRETING

- A. Construct formwork according to ACI 301 and maintain tolerances and surface irregularities within ACI 347R limits of Class A, 1/8 inch (3.2 mm) for concrete exposed to view and Class C, 1/2 inch (13 mm) for other concrete surfaces.
- B. Place vapor retarder on prepared subgrade, with joints lapped 6 inches (150 mm) and sealed.

- C. Comply with CRSI "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- D. Place concrete in a continuous operation and consolidate using mechanical vibrating equipment.
- E. Protect concrete from physical damage, premature drying, and reduced strength due to hot or cold weather during mixing, placing, and curing.
- F. Formed Surface Finish: Smooth-formed finish for concrete exposed to view, coated, or covered by waterproofing or other direct-applied material; rough-formed finish elsewhere. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- G. Slab Finishes: Comply with ACI 302.1R for screeding and finishing operations for concrete surfaces. Do not wet concrete surfaces. Provide the following finishes:
 - 1. Scratch finish for surfaces to receive mortar setting beds.
 - 2. Float finish for interior steps and ramps and surfaces to receive waterproofing, roofing, or other direct-applied material.
 - 3. Troweled finish for floor surfaces and floors to receive floor coverings, paint, or other thin film-finish coatings.
 - 4. Trowel and fine-broom finish for surfaces to receive thin-set tile.
 - 5. Non-slip broom finish to exterior concrete platforms, steps, and ramps.
- H. Cure formed surfaces by moist curing for at least seven days.
- I. Begin curing concrete slabs after finishing. Keep concrete continuously moist for at least seven days. Apply membrane-forming curing and sealing compound to slabs permanently exposed to view.
- J. Contractor will engage a testing agency to perform field tests and to submit test reports.
- K. Protect concrete from damage. Repair surface defects in formed concrete and slabs.

3.3 FIELD QUALITY CONTROL

- A. Special Inspections & Testing Agency: Contractor will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare and submit test reports.
- B. Concrete Tests
 - A. Testing Frequency: Obtain one composite sample for each pour of each concrete mixture
 - a. When frequency of testing provides 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.
 - B. 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.

- C. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each pour of each concrete mixture.
- D. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure four sets of two standard cylinder specimens for each pour.
- E. Compressive-Strength Tests: ASTM C 39/C 39M; test two sets of two laboratory-cured specimens at 7 days and two sets of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. 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.
- F. 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 (3.4 MPa).
- G. Test results shall be reported in writing to MCA 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.
- H. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by MCA but will not be used as sole basis for approval or rejection of concrete.
- I. 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 MCA. 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 MCA.
- J. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- K. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

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. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry-joint reinforcement.
 - 5. Ties and anchors.
 - 6. Miscellaneous masonry accessories.
 - 7. Masonry-cell fill.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD 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 down both sides of walls, and hold cover securely in place.
- B. 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.
- C. 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 TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
 - 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide square-edged units for outside corners unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
 - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
- C. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
 - 2. Density Classification: Normal weight.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 - 4. Exposed Faces: Provide color and texture matching the range represented by MCA's sample.
 - 5. Faces To Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
- E. Mortar Cement: ASTM C 1329/C 1329M.
- F. Aggregate for Mortar: ASTM C 144.
 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C 404.
- H. Water: Potable.

2.6 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

2.7 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 2. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666,
 3. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.

- C. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
 - 1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
 - 2. Where wythes, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 - 3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.9 MASONRY-CELL FILL

- A. Lightweight-Aggregate Fill: ASTM C 331/C 331M.

2.10 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.11 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

- C. Mortar for Unit Masonry: Comply with ASTM C 270, Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type M.
 - 3. For mortar parge coats, use Type S.
 - 4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 - 5. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. 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 TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that foundations are within tolerances specified.
 - 2. Verify that reinforcing dowels are properly placed.
 - 3. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build utility chases to dimensions indicate on plans.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 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 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.

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.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units and hollow brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Rake out mortar joints at pre-faced CMUs and glazed structural clay tile to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- F. Cut joints flush where indicated to receive cavity wall insulation unless otherwise indicated.

3.5 MASONRY-CELL FILL

- A. Pour lightweight-aggregate fill into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet.
- B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.6 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.7 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

3.8 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain MCA's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.9 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units. Dispose off-site.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL FRAMING

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 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
- C. Field quality control and special inspection reports.

1.3 QUALITY ASSURANCE

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A490 Bolts."

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

2.1 STRUCTURAL STEEL

- A. W-Shapes: ASTM A 572/992, Grade 50.
- B. Channels, Angles, Plates, Bars and other miscellaneous shapes: ASTM A 36.
- C. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- D. Steel Pipe: ASTM A 53, Type E or S, Grade B.

2.2 ACCESSORIES

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
- B. Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A 563 heavy hex carbon steel.
 - 3. Plate Washers: ASTM A 36 carbon steel.
 - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
- C. Primer: Fabricator's standard lead and chromate-free, non-asphaltic, rust-inhibiting gray primer.
- D. Grout: ASTM C 1107, non-metallic, non-shrink, factory packaged.

2.3 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
- B. Welded Connections: Comply with AWS D1.1 and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
- C. Shop Priming: Prepare surfaces according to SSPC-SP 2, "Hand Tool Cleaning"; or SSPC-SP 3, "Power Tool Cleaning." Shop prime steel to a dry film thickness of at least 1.5 mils (0.038 mm). Do not prime surfaces to be embedded in concrete or mortar or to be field welded.
- D. Galvanizing: All permanently exposed structural steel members shall be hot dip galvanized in accordance with ASTM A123.

3.1 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

- A. Special Inspections/Testing Agency: Contractor will engage a qualified testing agency and special inspector to perform tests and inspections and submit reports for the following:
 - 1. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 2. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base, Bearing 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 base plate.
 - 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.
- C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- D. Do not use thermal cutting during erection unless approved by Engineer of Record. Finish thermally cut sections within smoothness limits in AWS D1.1.
- E. High-Strength Bolts: Install high-strength bolts according to RCSC "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.

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

3.4 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

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. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Wood blocking and nailers.
- B. Related Requirements:
 - 1. Section 061063 "Exterior Rough Carpentry."
 - 2. Section 061533 "Wood Patio Decking" for elevated decks, including support framing.
 - 3. Section 061600 "Sheathing".

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.

1.4 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 treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: No. 2 grade.

1. Application: Interior partitions not indicated as load bearing.
2. Species: Douglas Fir North, NLGA
3. Grade: No. 2
4. Minimum Properties
 - a. Modulus of Elasticity – 1,700,000 PSI
 - b. Extreme Fiber in Bending – 875 PSI
 - c. Horizontal Shear – 95 PSI
 - d. Tension Parallel to Grain – 825 PSI
 - e. Compression Perpendicular to Grain – 385 PSI
 - f. Compression Parallel to Grain – 1,050 PSI

B. Load-Bearing Partitions: Meet requirements of drawing specified Structural Lumber but not less than requirements specified in this paragraph.

1. Application: Exterior walls and interior load-bearing partitions.
2. Species: Douglas Fir North, NLGA
3. Grade: No. 2
4. Minimum Properties
 - a. Modulus of Elasticity – 1,700,000 PSI
 - b. Extreme Fiber in Bending – 875 PSI
 - c. Horizontal Shear – 95 PSI
 - d. Tension Parallel to Grain – 825 PSI
 - e. Compression Perpendicular to Grain – 385 PSI
 - f. Compression Parallel to Grain – 1,050 PSI

C. Joists, Rafters, and Other Framing: Meet requirements of drawing specified Structural Lumber.

2.4 NON-STRUCTURAL PLYWOOD SHEATHING

- A. Plywood Sheathing: DOC PS 1, Exposure 1 sheathing
 - 1. Nominal Thickness: As indicated on drawings.
 - 2. Grade: B-B

2.5 WALL, FLOOR AND ROOF SHEATHING

- A. See Section 061600 'Sheathing'

2.6 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Mixed southern pine or southern pine; SPIB.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Hem-fir; WCLIB or WWP.
 - 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWP.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.7 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.8 METAL FRAMING ANCHORS

- A. Refer to drawings for requirements of metal framing anchor products.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.
- D. Stainless-Steel Sheet: ASTM A 666, Type 316.
 - 1. Use for exterior locations and where indicated.

2.9 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
- C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block 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. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
- I. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- J. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- K. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- L. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
- M. Use steel common 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 between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide double bottom plate and double top plates using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs. Fasten plates to supporting construction unless otherwise indicated.
 - 1. For exterior walls, provide wood studs as indicated on drawings spaced as indicated on drawings.
 - 2. For interior partitions and walls, provide wood studs as indicated on drawings spaced as indicated on drawings.
 - 3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches (2438 mm) high, using members of 2-inch nominal (38-mm actual) thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs. Provide double jamb studs and headers with depths as indicated on drawings.

3.4 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches (38 mm) of bearing on wood or metal, or 3 inches (76 mm) on masonry. Attach floor joists as indicated on drawings.
- B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches (1200 mm).
- C. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches (50 mm) from top or bottom.
- D. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist at ends of joists unless nailed to header or band.

- E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches (102 mm) or securely tie opposing members together. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist over supports.
- F. Provide solid blocking between joists under jamb studs for openings.
- G. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 - 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- H. Provide bridging of diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- (19-by-64-mm actual-) size lumber, double-crossed and nailed at both ends to joists, at intervals of 96 inches (2438 mm) o.c., between joists.

3.5 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- (19-by-184-mm actual-) size or 2-by-4-inch nominal- (38-by-89-mm actual-) size stringers spaced 48 inches (1200 mm) o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors as indicated on drawings. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
 - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against valley rafters.
 - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- (19-by-140-mm actual-) size boards between every third pair of rafters, but not more than 48 inches (1219 mm) o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.6 STAIR FRAMING INSTALLATION

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
 - 1. Size: 2-by-12-inch nominal (38-by-286-mm actual) size, minimum.
 - 2. Material: Solid lumber.
 - 3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 5 inches (127 mm) of effective depth.
 - 4. Spacing: At least three framing members for each 36-inch (914-mm) clear width of stair.
- B. Provide stair framing with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and no more than 3/8-inch (9.5-mm) variation between largest and smallest treads and risers within each flight.

3.7 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 06 10 63

EXTERIOR ROUGH CARPENTRY

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. Section Includes:
1. Exterior dimension lumber.
 2. Exterior dimension timber.
 3. Exterior posts.
 4. Plywood Sheathing (Non Structural)
 5. Wood fences.
- B. Related Requirements:
1. Section 061533 "Wood Patio Decking."

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Timber: Lumber of 5 inches nominal or greater in least dimension.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
 2. NLGA: National Lumber Grades Authority.
 3. RIS: Redwood Inspection Service.
 4. SPIB: The Southern Pine Inspection Bureau.
 5. WCLIB: West Coast Lumber Inspection Bureau.
 6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates:
 - 1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.
- B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.
- C. Evaluation Reports: For preservative-treated wood products, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Lumber Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
 - 1. Factory mark each item with grade stamp of grading agency.
 - 2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 19 percent.
2. Dimension Lumber: 19 percent.
3. Timber: 19 percent.

2.2 LUMBER

- A. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- B. Dimension Lumber: No. 2 grade Douglas Fir species (NeLMA, NLGA, WCLIB, or WWP); Lumber shall meet the requirement of structural lumber indicated on drawings.

2.3 POSTS

- A. Dimension Lumber Posts: No. 2 grade Douglas Fir species (NeLMA, NLGA, WCLIB, or WWP); Lumber shall meet the requirement of structural lumber indicated on drawings.
- B. Timber Posts: No. 2 grade Douglas Fir species (NeLMA, NLGA, WCLIB, or WWP); Lumber shall meet the requirement of structural lumber indicated on drawings.

2.4 NON-STRUCTURAL PLYWOOD SHEATHING

- A. Plywood Sheathing: DOC PS 1, Exterior sheathing
1. Nominal Thickness: As indicated on drawings.
 2. Grade: Marine – For permanently installations permanently exposed to the elements

2.5 PRESERVATIVE TREATMENT

- A. Pressure treat boards and dimension lumber with waterborne preservative according to AWP A U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
- B. Pressure treat timber with waterborne preservative according to AWP A U1; Use Category UC4a.
1. Treatment with CCA shall include post-treatment fixation process.
- C. Pressure treat poles with waterborne preservative according to AWP A U1; Use Category UC4a.
1. Treatment with CCA shall include post-treatment fixation process.
- D. Preservative Chemicals: Acceptable to authorities having jurisdiction.

1. Do not use chemicals containing arsenic or chromium.
- E. Use process for boards and dimension lumber that does not include water repellents or other substances that might interfere with application of indicated finishes.
- F. After treatment, redry dimension lumber to 19 percent maximum moisture content.
- G. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
 1. For items indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.
- H. Application: Treat all wood unless otherwise indicated.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 1. Use fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or ASTM F 2329 unless otherwise indicated.
 2. For pressure-preservative-treated wood, use stainless-steel fasteners.
 3. For redwood, use hot-dip galvanized-steel fasteners.
- B. Nails: ASTM F 1667.
- C. Power-Driven Fasteners: ICC-ES AC70.
- D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.
- E. Carbon-Steel Bolts: ASTM A 307 with ASTM A 563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.
- F. Stainless-Steel Bolts: ASTM F 593, Alloy Group 1 or 2; with ASTM F 594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.
- G. Postinstalled Anchors: Stainless-steel, chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E 488, conducted by a qualified independent testing and inspecting agency.
 1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 METAL ACCESSORIES

- A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G185 coating designation.
- B. Stainless-Steel Sheet: ASTM A 666, Type 316.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prime wood indicated to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 099000 "Paintings and Coatings."
- B. Stain wood indicated to be stained, including both faces and edges. Cut to required lengths and stain ends.

3.2 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install metal framing anchors to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Apply copper naphthenate field treatment to comply with AWPAM4, to cut surfaces of preservative-treated lumber.
- H. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES AC70 for power-driven fasteners.
 - 2. "Fastening Schedule 2304.9.1 in ICC's International Building Code and per Connecticut State Building Code.

- I. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.

END OF SECTION

SECTION 06 15 33

WOOD PATIO DECKING

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. Section Includes:
 - 1. Wood decking.
 - 2. Stairs for elevated decks.
 - 3. Railings for elevated decks.
- B. Related Requirements:
 - 1. Refer to drawings for sheet metal flashings on tops of deck framing and ledgers

1.3 DEFINITIONS

- A. Boards: Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater in width.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.

1.4 ACTION SUBMITTALS

- A. Product Data: For preservative-treated wood products, and metal framing anchors.

1. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. For metal framing anchors. Include installation instructions.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by ALSC's Board of Review.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.

C. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood products.
2. Expansion anchors.
3. Metal framing anchors.
4. Decking fasteners.

1.6 DELIVERY, STORAGE, AND HANDLING

- ### A.
- Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- ### A.
- Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
1. Factory mark each item with grade stamp of grading agency.
 2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.

3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 19 percent.
2. Dimension Lumber: 19 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness.
3. Timber: 19 percent.

2.2 WOOD DECKING AND STAIR TREADS

- A. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- B. Dimension Lumber Decking: No. 2 grade and any of the following species:
1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
 2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 3. Mixed southern pine; SPIB.
- C. Board Decking: Shall be 1-1/4-inch actual thickness radius-edged decking as indicated or to match existing construction dimensions and be of any of the following species and grades:
1. Douglas fir-larch or Douglas fir-south, Patio 1 or Patio 2; WWPA.
 2. Douglas fir-larch, Select Dex; WCLIB.
 3. Douglas fir-larch (North), Select Patio; NLGA.
 4. Hem-fir, Patio 1; WWPA.
 5. Hem-fir, Select Dex; WCLIB.
 6. Hem-fir (North), Select Patio; NLGA.
 7. Southern pine, Premium; SPIB.
- D. Board Stair Treads: Shall be 1-1/4-inch actual thickness as indicated or to match existing construction dimensions, stepping with half-round or rounded-edge nosing and one of the following species and grades:
1. Douglas fir, C & Btr VG (Vertical Grain) stepping; NLGA, WCLIB, or WWPA.
 2. Hem-fir, C & Btr VG (Vertical Grain) stepping; NLGA, WCLIB, or WWPA.

2.3 WOOD RAILINGS

- A. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- B. Dimension Lumber Railing Members: No. 2 grade and any of the following species:
 - 1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
 - 2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 - 3. Mixed southern pine; SPIB.
 - 4. Spruce-pine-fir or spruce-pine-fir (South); NeLMA, NLGA, WCLIB, or WWPA.
- C. Railing Boards: Any of the following species and grades:
 - 1. Douglas fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
 - 2. Hem-fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
 - 3. Southern pine, B & B finish; SPIB.
- D. Balusters: 2-inch nominal square, clear, kiln-dried, solid, pressure-preservative-treated Douglas fir or Southern Pine
- E. Newel Posts: Clear, kiln-dried, pressure-preservative-treated, Douglas fir pressure-preservative-treated, southern pine, turned newel posts of pattern and size indicated.

2.4 DIMENSION LUMBER FRAMING

- A. Deck and Stair Framing: No. 2 grade and the following species:
 - 1. Douglas fir-larch; WCLIB or WWPA.
 - 2. Douglas fir-south; WWPA.
 - 3. Douglas fir-larch (North); NLGA.
- B. Deck and Stair Framing: Any species and grade with a modulus of elasticity of at least 1,700,000 psi and an extreme fiber stress in bending of at least 1050 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.

2.5 POSTS

- A. Dimension Lumber Posts: No. 2 grade and the following species:
 - 1. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
- B. Timber Posts: Douglas fir-larch, Douglas fir-larch (North), No. 1; NeLMA, NLGA, SPIB, WCLIB, or WWPA.

2.6 PRESERVATIVE TREATMENT

- A. Pressure treat boards and dimension lumber with waterborne preservative according to AWPAC U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
- B. Pressure treat timber with waterborne preservative according to AWPAC U1; Use Category UC4a.
- C. Pressure treat poles with waterborne preservative according to AWPAC U1; Use Category UC4a.
- D. Preservative Chemicals: Acceptable to authorities having jurisdiction.
 - 1. Do not use chemicals containing arsenic or chromium.
- E. Use process for boards and dimension lumber that does not include water repellents or other substances that might interfere with application of indicated finishes.
- F. After treatment, redry boards, dimension lumber, timber, and poles to 19 percent maximum moisture content.
- G. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
 - 1. For items indicated to receive a stained or natural finish, mark each piece on surface that will not be exposed or omit marking and provide certificates of treatment compliance issued by inspection agency.
- H. Application: Treat all wood unless otherwise indicated.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. Use stainless steel or fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or ASTM F 2329 unless otherwise indicated.
 - 2. For pressure-preservative-treated wood, use stainless-steel fasteners.
 - 3. For wood decking, use stainless-steel fasteners where fasteners are exposed to view.
- B. Nails: ASTM F 1667.
- C. Power-Driven Fasteners: ICC-ES AC70.
- D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.

- E. Carbon-Steel Bolts: ASTM A 307 with ASTM A 563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.
- F. Stainless-Steel Bolts: ASTM F 593, Alloy Group 1 or 2; with ASTM F 594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.
- G. Postinstalled Anchors: Stainless-steel, chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.8 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Simpson Strong-Tie Co., Inc.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated on Drawings. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G185 coating designation.
- D. Stainless-Steel Sheet: ASTM A 666, Type 316.
- E. Joist Hangers: As indicated at minimum shall be, U-shaped, with 2-inch-long seat and 1-1/4-inch-wide nailing flanges at least 85 percent of joist depth.
- F. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
- G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch-minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.
- H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports shall be as indicated.

2.9 CONCEALED DECKING FASTENERS

- A. Deck Splines: Corrosion-resistant metal or plastic splines that fit in grooves routed into the sides of decking material and are fastened to deck framing with screws. Splines provide uniform spacing of decking material.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Blue Heron Enterprises, LLC.
 - b. Grabber Construction Products.
 - c. Ipe Clip Fastener Company Inc.
 - d. KK Mfg. Co., Inc.
 - e. Simpson Strong-Tie Co., Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime wood indicated to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 09 90 00 "Paints and Coatings."

3.3 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install wood decking and stair treads with crown up (bark side down).
- D. Secure decking to framing with deck splines or screws to match existing construction methods for decks to be rebuilt.
- E. Install metal framing anchors to comply with manufacturer's written instructions.

- F. Do not splice structural members between supports unless otherwise indicated.
- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Apply copper naphthenate field treatment to comply with AWPAC M4, to cut surfaces of preservative-treated lumber.
- J. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES AC708 for power-driven fasteners.
 - 2. "Fastening Schedule" in ICC's International Building Code and as indicated on drawings.
- K. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.
- L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.

3.4 ELEVATED DECK JOIST FRAMING INSTALLATION

- A. General: Install joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists where framed into wood supporting members by using wood ledgers as indicated or, if not indicated, by using metal joist hangers. Do not notch joists.
- B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- C. Lap members framing from opposite sides of beams or girders not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- D. Provide solid blocking of 2-inch nominal thickness by depth of joist at intervals of 96 inches o.c., between joists.

3.5 STAIR INSTALLATION

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
 - 1. Stringer Size: 2 by 12 inches nominal, minimum.
 - 2. Notching: Notch stringers to receive treads, risers, and supports; leave at least 5 inches of effective depth.
 - 3. Stringer Spacing: At least three stringers for each 36-inch clear width of stair.
- B. Provide stair framing with no more than 3/8-inch variation between adjacent treads and risers and no more than 1/2-inch variation between largest and smallest treads and risers within each flight.
- C. Treads and Risers: Secure as indicated on drawings.

3.6 RAILING INSTALLATION

- A. Balusters: Fit to railings, glue, and screw in place. Countersink fastener heads, fill flush, and sand filler.
- B. Newel Posts: Secure to stringers and risers with lag screws.
- C. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts and glue.

END OF SECTION

SECTION 06 16 00

SHEATHING (HEW ADVANTECH)

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. Section Includes:
 - 1. Wall sheathing.
 - 2. Roof sheathing.
 - 3. Subflooring.

1.3 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.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.
 - 2. Certificates for Credit MR 5.1 or 5.2: Certificates verifying that materials were extracted, processed, and manufactured within 500 miles of the project site.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Capable of demonstrating that all wood procurement operations are conducted in accordance with procedures and policies of the Sustainable Forestry Initiative (SFI) Program.
- B. Code Compliance: Comply with requirements of the following:
 - 1. International Code Council Evaluation Service, ICC-ES ESR-1785.
 - 2. Voluntary Product Standard, DOC PS2-10, "Performance Standard for Wood-Based Structural-Use Panels."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Outdoor Storage: Comply with manufacturer's recommendations:

1. Set panel bundles on supports to keep off ground.
2. Cover panels loosely with waterproof protective material.
3. Anchor covers on top of stack, but keep away from sides and bottom to assure adequate air circulation.
4. When high moisture conditions exist, cut banding on panel stack to prevent edge damage.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of flooring and sheathing system that fail due to manufacturing defects within specified warranty period.
 1. For subflooring and roof and wall sheathing applications, manufacturer shall warrant that the panels will not delaminate nor require sanding due to moisture absorption during installation within 500 days of purchase.
 2. Warranty Period: Limited Lifetime.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WOOD PANEL PRODUCTS

- A. Oriented Strand Board: DOC PS 2-10.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated. Thickness shall satisfy minimum and maximum requirements for referenced performance category.
- C. Factory mark panels to indicate compliance with applicable standard.

2.3 WALL SHEATHING

- A. Oriented-Strand-Board Wall Sheathing: Exposure 1, Structural I sheathing.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Huber Engineered Woods LLC; AdvanTech Sheathing or an approved equal.
 2. Span Rating and Performance Category: Not less than 32/16, 1/2 Performance Category.
 3. Edge Profile: Square edge

4. Provide fastening guide on top panel surface with pre-spaced fastening symbols for 16-inches (406 mm) and 24-inches (610 mm) on center spacings.
5. Performance Standard: DOC PS2-10 and ICC-ES ESR-1785.
6. Exposure Time: Designed to resist weather exposure for 300 days.

2.4 ROOF SHEATHING

- A. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Huber Engineered Woods LLC; AdvanTech Sheathing or an approved equal
 2. Span Rating and Performance Category: Not less than 40/20, 5/8 Performance Category
 3. Edge Profile: Tongue and groove.
 4. Provide fastening guide on top panel surface with pre-spaced fastening symbols for 16-inches (406 mm) and 24-inches (610 mm) on center spacings.

2.5 SUBFLOORING

- A. Oriented-Strand-Board Combination Subfloor-Underlayment: Exposure 1 single-floor panels.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Huber Engineered Woods LLC; AdvanTech Flooring or an approved equal
 2. Span Rating and Performance Category: Not less than 20 oc, 19/32 Performance Category.
 3. Edge Detail: Tongue and groove.
 4. Surface Finish: Fully sanded face.
 5. Performance Standard: DOC PS2-10
 6. Provide fastening guide on top panel surface with pre-spaced fastening symbols for 16-inches (406 mm) and 24-inches (610 mm) on center spacings.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article by the authority having jurisdiction, International Building Code, International Residential Code, Wood Frame Construction manual, and National Design Specification.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Subfloor Panels to Framing: Polyurethane-based or Solvent-based 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.
1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 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.
- 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. Project Drawings
 - 2. ICC-ES ESR-1539 or NES NER-272 for power-driven fasteners.
 - 3. Chapter 23 in ICC's "International Building Code."
 - 4. 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.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in American Wood Council, "ASD/LRFD Manual for Engineered Wood Construction," 2012 edition for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Combination Subfloor-Underlayment:
 - a. Glue and nail to wood framing.
 - b. Glue and screw to cold-formed metal framing.
 - c. Space panels 1/8 inch (3 mm) apart at edges and ends.
 - d. Install fasteners 3/8 inch (9.5 mm) to 1/2 inch (12.7 mm) from panel edges.
 - e. Space fasteners 6 inches (152 mm) on centers on supported edges (4-foot ends), and 12 inches (305 mm) on centers at intermediate support locations.
 - f. Penetrate wood framing members at least 1 inch (25.4 mm).
 - 2. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.
 - c. Install fasteners 3/8 inch (9.5 mm) to 1/2 inch (12.7 mm) from panel edges.

- d. Space fasteners in compliance with requirements of authority having jurisdiction.

END OF SECTION

SECTION 06 18 00

GLUED-LAMINATED CONSTRUCTION

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. Section includes framing using structural glued-laminated timber not indicated on drawings. In the event of conflict in provisions listed in this section with drawing provisions, the drawing provisions shall take precedence.
- B. Related Requirements:
 - 1. Section 061063 "Exterior Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.

1.3 DEFINITIONS

- A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on lumber, adhesives, fabrication, and protection.
 - 2. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
- B. Shop Drawings:
 - 1. Show layout of structural glued-laminated timber system and full dimensions of each member.
 - 2. Indicate species and laminating combination.

- A. General: Comply with provisions in AITC 111.
- B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Weyerhaeuser Company, P.O. Box 9777 Federal Way, WA 98063-9777
 - 2. Boise Cascade Company, 1111 West Jefferson Street, P.O. Box 50 Boise, ID 83728-0001

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Structural glued-laminated timber and connectors shall withstand the effects of structural loads shown on Drawings without exceeding allowable design working stresses listed in AITC 117 or determined according to ASTM D 3737 and acceptable to authorities having jurisdiction.

2.3 STRUCTURAL GLUED-LAMINATED TIMBER

- A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.
 - 1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.
 - 2. Provide structural glued-laminated timber made from single species.
 - 3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
 - 4. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.
- B. Species and Grades for Structural Glued-Laminated Timber: Douglas fir-larch or Southern pine that complies with structural properties, combination symbols, and beam stress classifications indicated on drawings.
- C. Appearance Grade: Architectural, complying with AITC 110.
 - 1. For Premium and Architectural appearance grades, fill voids as required by AITC 110.

- A. Preservative Treatment: Where preservative-treated structural glued-laminated timber is indicated, comply with AWP A U1, Use Category 3B.
 - 1. Do not incise structural glued-laminated timber or wood used to produce structural glued-laminated timber.
- B. Preservative:
 - 1. Wolmanized Parrallam Plus PSL
- C. After dressing members, apply a copper naphthenate field-treatment preservative to comply with AWP A M4 to surfaces cut to a depth of more than 1/16 inch (1.5 mm).

2.5 TIMBER CONNECTORS

- A. Comply with drawing requirements.

2.6 MISCELLANEOUS MATERIALS

- A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.
- B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.7 FABRICATION

- A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.
 - 1. Dress exposed surfaces as needed to remove planning and surfacing marks.
- B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.
- C. Where preservative-treated members are indicated, fabricate (cut, drill, surface, and sand) before treatment to greatest extent possible. Where fabrication must be done after treatment, apply a field-treatment preservative to comply with AWP A M4.
 - 1. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
 - 2. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

- D. End-Cut Sealing: Immediately after end cutting each member to final length and after preservative treatment, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.
- E. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

2.8 FACTORY FINISHING

- A. Wiped Stain Finish: Manufacturer's standard, dry-appearance, penetrating acrylic stain and sealer; oven dried and resistant to mildew and fungus.
 - 1. Color: As indicated by manufacturer's designations

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
 - 1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.
- B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.
- C. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.
 - 1. Predrill for fasteners using timber connectors as templates.
 - 2. Finish exposed surfaces to remove planning or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
 - 3. Coat cross cuts with end sealer.
 - 4. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.
 - a. Use copper naphthenate treatment.

D. Install timber connectors as indicated.

1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
2. Install bolts with orientation as indicated or, if not indicated, as directed by MCA.

3.3 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by MCA.

3.4 PROTECTION

- A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.
1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
 2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION

SECTION 06 20 13

EXTERIOR FINISH CARPENTRY

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. Section Includes:
 - 1. Exterior trim for windows, and doors, roof eaves, roof rakes, and soffits.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
 - 2. Section 06 15 33 "Wood Patio Decking" for elevated decks including stairs and railings.
 - 3. Section 09 93 00 "Staining and Transparent Finishing"

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
 - 4. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.
- B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- C. Samples for Verification:

1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
2. For hardboard siding, 50 sq. in. for board types and 8 by 10 inches for panels.
3. For cellular PVC trim, with 1/2 of exposed surface finished; 50 sq. in..
4. For foam plastic moldings, with 1/2 of exposed surface finished; 50 sq. in..
5. For exterior wood columns, include quarter-section Samples of cap, base, and plinth; and 6-inch- long quarter-section Sample of shaft. Samples need not be same diameter as required columns.

1.4 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

1. For lumber that is not marked with grade stamp.
2. For preservative-treated wood that is not marked with treatment-quality mark.
3. For fire-retardant-treated wood that is not marked with classification marking of testing and inspecting agency.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Cellular PVC trim.
4. Foam plastic moldings.

C. Sample Warranties: For manufacturer's warranties.

1.5 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.7 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

1. For exterior ornamental wood columns, comply with manufacturer's written instructions and warranty requirements.
 - B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
- 1.8 WARRANTY
- A. Manufacturer's Warranty for Columns: Manufacturer agrees to repair or replace columns that fail in materials or workmanship within specified warranty period.
 1. Warranty Period for Columns: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and the following grading rules:
 1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
 2. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
 3. RIS: Redwood Inspection Service, "Standard Specifications for Grades of California Redwood Lumber."
 4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
 5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
 6. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."
- B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 1. For exposed lumber, mark grade stamp on end or back of each piece.
- C. Softwood Plywood: DOC PS 1.
- D. Hardboard: ANSI A135.4.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Water-Repellent Preservative Treatment by Nonpressure Process: AWP A N1; dip, spray, flood, or vacuum-pressure treatment.
 - 1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC).
 - 2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
 - 3. Application: Exterior trim.
- B. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC3b.
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent respectively.
 - 2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
 - 4. Do not use material that is warped or does not comply with requirements for untreated material.
 - 5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.
 - a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
 - 6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
 - 7. Application: Where required by authorities having jurisdiction.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction, and comply with testing requirements; testing by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Exterior Type: Materials shall comply with testing requirements after being subjected to accelerated weathering according to ASTM D 2898.

2. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent respectively.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not contain colorants, and provide materials that do not have marks from spacer sticks on exposed face.
- D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.
- E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 1. For exposed lumber indicated to receive a stained or natural finish.
 2. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
- F. Application: Where required by authorities having jurisdiction.

2.4 EXTERIOR TRIM

- A. Lumber Trim for Opaque-Stained Finish:
 1. Species and Grade: Western Red Cedar, Grade A; NLGA, WCLIB or WWP
 2. Species and Grade: Redwood, Clear; RIS.
 3. Maximum Moisture Content: 15 percent.
 4. Finger Jointing: Not allowed.
 5. Face Surface: Mill Select STK.
 6. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.
 7. Factory Finishes: Factory stained on faces and edges with two coats.
- B. Trim Boards: Select Knotty (Mil.
 1. 1 inch x 4 inches (25 mm x 102 mm) through 1 inch x 12 inches (25 mm x 305 mm) S1S2E.
 2. 5/4 inches x 4 inches (32 mm x 102 mm) through 5/4 inches x 12 inches (32 mm x 305 mm) S1S2E.
- C. Grade: Manufactures Mill Select STK Conforming with WWP Rule 16.12 or Better

2.5 MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
 1. For face-fastening siding, provide ringed-shank siding nails unless otherwise indicated.
 2. For redwood, provide hot-dip galvanized-steel fasteners.

3. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is required.
 4. For pressure-preservative-treated wood, provide hot-dip galvanized-steel fasteners.
 5. For applications not otherwise indicated, provide hot-dip galvanized-steel or aluminum fasteners.
- B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

2.6 FABRICATION

- A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Section 09 93 00 "Staining and Transparent Finishing."

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 1. Do not use manufactured units with defective surfaces, sizes, or patterns.

- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 3. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
 - 4. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install flat-grain lumber with bark side exposed to weather.
- B. Install cellular PVC trim to comply with manufacturer's written instructions.
- C. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.
 - 1. Use scarf joints for end-to-end joints.
 - 2. Stagger end joints in adjacent and related members.
- D. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- E. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 STAIR AND RAILING INSTALLATION

- A. Treads and Risers at Exterior Stairs: Secure treads and risers by gluing and nailing to carriages. Countersink nail heads, fill flush, and sand filler. Extend treads over carriages.
- B. Balusters: Fit balusters to treads, glue, and nail in place. Countersink nail heads, fill flush, and sand filler. Let into railings and glue in place.
- C. Newel Posts: Secure newel posts to stringers and risers with lag screws.
- D. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with glue and countersunk-head wood screws or rail bolts.

3.6 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

- A. Clean exterior finish carpentry on exposed and semi exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 06 20 23

INTERIOR FINISH CARPENTRY

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. Section Includes:

1. Interior trim, including non-fire-rated interior door and sidelight frames.
2. Fire-rated interior door and sidelight frames.
3. Interior plywood paneling.

- B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
2. Section 09 90 00 "Paints and Coatings" for priming and painting of interior finish carpentry.

1.3 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. MDO: Plywood with a medium-density overlay on the face.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.

2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
4. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For fire-retardant-treated wood, from ICC-ES.
- B. Sample Warranty: For manufacturer's warranty.

1.6 QUALITY ASSURANCE

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.9 WARRANTY

- A. Manufacturer's Warranty for Columns: Manufacturer agrees to repair or replace columns that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Columns: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and the following grading rules:

1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
2. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
3. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
6. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."

B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, mark grade stamp on end or back of each piece.

C. Softwood Plywood: DOC PS 1.

D. Hardboard: AHA A135.4.

E. MDF: ANSI A208.2, Grade 130.

F. Particleboard: ANSI A208.1, Grade M-2.

G. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

1. Color: White.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent respectively.

2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
4. Do not use material that is warped or does not comply with requirements for untreated material.
5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.
 - a. For exposed lumber indicated to receive a stained or natural finish. Mark end or back of each piece.
6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
7. Application: All interior lumber and plywood.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction, and comply with testing requirements; testing by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent respectively.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not contain colorants, and provide materials that do not have marks from spacer sticks on exposed face.
- D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.
- E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

2. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.

F. Application: All interior lumber and plywood.

2.4 INTERIOR TRIM

- A. Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
1. Species and Grade: White woods, 2 Common; WHPA.
 2. Species and Grade: Douglas fir-larch or Douglas fir south, Prime or D finish; NLGA, WCLIB, or WHPA.
 3. Maximum Moisture Content: 19 percent.
 4. Finger Jointing: Not allowed.
 5. Face Surface: Surfaced (smooth).
- B. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
1. Species and Grade: Red oak; A Finish; NHLA.
 2. Maximum Moisture Content: 13 percent.
 3. Finger Jointing: Not allowed.
 4. Gluing for Width: Use for lumber trim wider than 6 inches.
 5. Veneered Material: Use for lumber trim wider than 6 inches.
 6. Face Surface: Surfaced (smooth).
 7. Matching: Selected for compatible grain and color.
- C. Lumber Trim for Opaque Finish (Painted Finish):
1. Species and Grade: White woods, 2 Common; WHPA.
 2. Species and Grade: Spruce-pine-fir, 2 Common; NeLMA, NLGA, WCLIB, or WHPA.
 3. Maximum Moisture Content: 19 percent.
 4. Finger Jointing: Not allowed.
 5. Face Surface: Surfaced (smooth).
- D. Softwood Moldings for Transparent Finish (Stain or Clear Finish): WMPA WM 4, N-grade wood moldings. Made to patterns included in WMPA WM 12.
1. Species: Southern pine or Douglas fir.
 2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
 3. Finger Jointing: Not allowed.
 4. Matching: Selected for compatible grain and color.
 5. Base Pattern: WM 713, 9/16-by-3-1/4-inch ranch base.
 6. Shoe-Mold Pattern: WM 126, 1/2-by-3/4-inch quarter-round shoe mold.
 7. Casing Pattern: WM 327, 1 1/16-by-2-1/4-inch clamshell casing.
 8. Mull-Casing Pattern: WM 983, 3/8-by-1-3/4-inch featheredge casing.
 9. Stop Pattern: WM 856, 3/8-by-1-3/8-inch ranch stop.
 10. Chair-Rail Pattern: WM 297, 1 1/16-by-3-inch chair rail.

- E. Hardwood Moldings for Transparent Finish (Stain or Clear Finish): WMMPA HWM 2, N-grade wood moldings made to patterns included in WMMPA HWM 1.
1. Species: Red oak.
 2. Kiln-dried softwood with exposed surfaces veneered with species indicated, may be used in lieu of solid wood.
 3. Maximum Moisture Content: 9 percent.
 4. Finger Jointing: Not allowed.
 5. Matching: Selected for compatible grain and color.
 6. Base Pattern: HWM 633, 7/16-by-3-1/4-inch ogee base.
 7. Shoe-Mold Pattern: HWM 129, 7/16-by-1-1/16-inch quarter-round shoe mold.
 8. Casing Pattern: HWM 328, 1/2-by-2-1/4-inch clamshell casing.
 9. Mull-Casing Pattern: HWM 989, 3/16-by-2-inch square-edge casing.
 10. Stop Pattern: HWM 856, 3/8-by-1-3/8-inch ranch stop.
 11. Chair-Rail Pattern: HWM 297, 1-1/16-by-3-inch chair rail.
- F. Moldings for Opaque Finish (Painted Finish): Made to patterns included in WMMPA WM 12.
1. Softwood Moldings: WMMPA WM 4, P grade.
 - a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
 - b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
 2. Hardwood Moldings: WMMPA HWM 2, P-grade.
 - a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
 - b. Maximum Moisture Content: 9 percent.
 3. Optional Material: Primed MDF.
 4. Finger Jointing: Not allowed.
 5. Base Pattern: WM 623, 9/16-by-3-1/4-inch ogee base or as approved by MCA.
 6. Shoe-Mold Pattern: WM 131, 1/2-by-3/4-inch ogee shoe mold or as approved by MCA.
 7. Casing Pattern: WM 327, 1-1/16-by-2-1/4-inch clamshell casing or as approved by MCA.
 8. Mull-Casing Pattern: WM 957, 3/8-by-1-3/4-inch beaded-edge casing or as approved by MCA.
 9. Stop Pattern: WM 886, 3/8-by-1-3/8-inch bullnose stop or as approved by MCA.
 10. Chair-Rail Pattern: WM 297, 1-1/16-by-3-inch chair rail or as approved by MCA.
- G. PVC-Wrapped Moldings: WMMPA WM 2 and made to patterns included in WMMPA WM 12.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Louisiana-Pacific Corporation.
 - b. Nickell Moulding Company, Inc.
 - c. Spectrum Products, Inc.
 - d. Zamma Corporation.
 2. Base Pattern: Match existing.
 3. Shoe-Mold Pattern: Match existing.

4. Casing Pattern: Match existing.
5. Mull-Casing Pattern: Match existing.
6. Stop Pattern: Match existing.
7. Chair-Rail Pattern: Match existing.
8. Colors, Textures, and Grain Patterns: Match existing.

H. Foam Plastic Moldings: Molded product of shapes indicated, with a tough outer skin on exposed surfaces; factory primed. Exposed surfaces shall not be shaped after molding.

1. Manufacturers: Subject to compliance with requirements; available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Apex Urethane Millwork.
 - b. Architectural Ornament, Inc.
 - c. Artistic Architectural Ornaments, Inc.
 - d. Carter Millwork, Inc.
 - e. Century Architectural Specialties LLC.
 - f. Chemcrest Architectural Products.
 - g. Diamond Mfg., Inc.
 - h. Focal Point Architectural Products; Focal Point, Inc.
 - i. Fypon Ltd.
 - j. Melton Classics Incorporated.
 - k. Vintage Mouldings Manufacturing Ltd.
 - l. Worthington Millwork.
2. Density: Not less than 20 lb/cu. ft..
3. Flame-Spread Index: Not more than 75 when tested according to ASTM E 84.
4. Thickness: Not more than 1/2 inch.
5. Width: Not more than 8 inches.
6. Patterns: Match MCA's samples.

2.5 FIRE-RATED INTERIOR DOOR FRAMES

- A. Frames, complete with casings, fabricated from fire-retardant particleboard or fire-retardant MDF with veneered exposed surfaces, or from solid fire-retardant-treated wood. Frames shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, based on testing according to NFPA 252.
1. Basis-of-Design Product: Subject to compliance with requirements, Species: Red oak.
 2. Fire Rating: 60 minutes.

2.6 PANELING

- A. Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1, made without urea-formaldehyde adhesive.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Chesapeake Hardwood Products, Inc.
 - b. Georgia-Pacific Building Products.
 - c. Holland Southwest International.
 2. Face Veneer Species and Cut: Plain-sliced red oak.
 3. Veneer Matching: Selected for similar color and grain.
 4. Backing Veneer Species: Any hardwood compatible with face species.
 5. Construction: Veneer core.
 6. Thickness: 1/4 inch.
 7. Panel Size: 48 by 96 inches.
 8. Glue Bond: Type II (interior).
 9. Face Pattern: Manufacturer's standard V-grooved pattern, with grooves at edges, center, and third points of panels, and at other locations to provide pattern resembling random-width boards.
 10. Finish: As selected by MCA from manufacturer's full range.
- B. Board Paneling: Interior wood-board paneling complying with WMMPA WM 9.
1. Species: Southern pine.
 2. Grade: Clear No. 2.
 3. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
 4. Pattern: V-joint, tongue and groove
 5. Net Coverage Width: Not less than 6-3/4 inches.
- C. Board Paneling:
1. Species and Grade: Southern pine, No. 2 Paneling; SPIB.
 2. Maximum Moisture Content: 19 percent.
 3. Pattern: V-joint, tongue and groove, NeLMA EWP 4.
 4. Net Coverage Width: Not less than 6-3/4 inches.

2.7 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
- C. Installation Adhesive for Foam Plastic Moldings: Product recommended for indicated use by foam plastic molding manufacturer.
- D. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.
- E. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

2.8 FABRICATION

- A. Back out or kerf backs of the following members except those with ends exposed in finished work:
 - 1. Interior standing and running trim except shoe and crown molds.
 - 2. Wood-board paneling.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 2. Install trim after gypsum-board joint finishing operations are completed.
 3. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.
 1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners and adhesive as recommended by panel manufacturer.
 2. Conceal fasteners to greatest practical extent.
 3. Arrange panels with grooves and joints over supports. Fasten to supports with nails of type and at spacing recommended by panel manufacturer. Use fasteners with prefinished heads matching groove color.
- B. Hardboard Paneling: Install according to manufacturer's written recommendations. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Butt adjacent panels with moderate contact. Use fasteners with prefinished heads matching paneling color.
 1. Wood Stud or Furring Substrate: Install with 1-inch annular-ring shank hardboard nails.
 2. Plaster or Gypsum-Board Substrate: Install with 1-5/8-inch annular-ring shank hardboard nails.

3. Nailing: Space nails 4 inches o.c. at panel perimeter and 8 inches o.c. at intermediate supports unless otherwise required by manufacturer.
- C. Board Paneling: Install according to manufacturer's written instructions. Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.
 1. Install in full lengths without end joints.
 2. Stagger end joints in random pattern to uniformly distribute joints on each wall.
 3. Install with uniform end joints with only end-matched (tongue-and-groove) joints within each field of paneling.
 4. Install with uniform end joints. Locate end joints only over furring or blocking.
 5. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards. Install with uniform tight joints between boards.
 6. Fasten paneling by face nailing, setting nails, and filling over nail heads.
 7. Fasten paneling with trim screws, set below face and filled.
 8. Fasten paneling by blind nailing through tongues.
 9. Fasten paneling with paneling system manufacturer's concealed clips.
 10. Fasten paneling to gypsum wallboard with panel adhesive.

3.6 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 06 45 22

COMPOSITE DECKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Composite Decking (Trex Transcend and Trex Enhance)

1.2 RELATED SECTIONS

- A. Section 06 10 63 – Exterior Rough Carpentry
- B. Section 06 15 33 – Wood Patio Decking

1.3 REFERENCES

- A. ASTM D-7032-04: Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails), ASTM International.
- B. ASTM D-7031-04: Standard Guide for Evaluating Mechanical and Physical Properties of Wood-Plastic Composite Products, ASTM International
- C. ASTM E-84-01: Test Method for Surface Burning Characteristics of Building Materials, ASTM International.
- D. ASTM D 570: Water Absorption of Plastics
- E. ASTM D 1761: Mechanical Fasteners in Wood
- F. ASTM D -1413-99: Test method for Wood Preservatives by Laboratory Soil-block Cultures
- G. ASTM C177: Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

1.4 DESIGN/PERFORMANCE REQUIREMENTS

- A. Structural Performance:
 - 1. Deck: Uniform Load – 100lb/sq.ft.
 - 2. Tread of Stairs: Concentrated Load: 750 lb/sq.ft., and 1/8” max. deflection with a concentrated load of 300 lbf on area of 4 sq. in.

1.5 SUBMITTALS

- A. Product Data Indicate sizes, profiles, surface style, and performance characteristics
- B. Samples: For each product specified, one sample representing actual product color, size, and finish.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store Trex products on a flat and level surface. Adjust support blocks accordingly
- B. Support Trex bundles on supplied dunnage
- C. When stacking Trex bundles, supports should start approximately 8" from each end and be spaced approximately 2ft on center. Supports should line up vertically/perpendicular to the decking product.
- D. Do not stack Trex Select decking more than 14 bundles.
- E. Keep material covered using the provided bundle cover until time of installation.
- F. See www.Trex.com for detailed storage recommendations;
 - 1. "2013 Installation Guide Trex Decking and Railing"

1.7 WARRANTY

- A. Provide manufactures warranty against rot, decay, splitting, checking, splintering, fungal damage, and termite damage for a period of 25 years for a residential installation and 10 years for a commercial installation. In addition provide the Trex Transcend and Trex Enhance Fade and Stain Warranty against food staining and fading beyond 5 Delta E (CIE units) for a period of 25 years for a residential installation and 10 years for a commercial installation. Specific terms for warranties can be found at; www.Trex.com

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Contract Documents are based on products supplied by; Trex Company, Inc., 160 Exeter Dr., Winchester, VA 22603.
- B. Substitutions: Considered under Section 01 60 00 – Product Requirements

A. Wood-Plastic Composite Lumber;

1. Material Description: Composite Decking consisting of recycled Linear Low-Density Polyethylene (LLDPE) and recycled wood. The product is extruded into shapes and sizes as follows:
 - a. Trex Transcend and Trex Enhance Decking Boards; 1 x 5.5”.
 - b. Lengths – 12, 16, and 20 feet
 - c. Color – To be specified by owner from Trex’ standard list of colors.
2. Physical and Mechanical Properties as follows:

Test	Test Method	Value	
Flame spread	ASTM E 84	60(Transcend) / 85(Enhance)	
Thermal Expansion	ASTM D 1037	1.9 x 10-5 inch/inch/degreeF	
Moisture Absorption	ASTM D 1037	< 1%	
Screw Withdrawal	ASTM D1761	558 lbs/in	
Fungus Resistance	ASTM D1413	Rating - no decay	
Termite Resistance	AWPAE1-72	Rating = 9.6	
		Ultimate (Typical)Values *	Design Values
Compression Parallel	ASTM D198	1588 psi	540 psi
Compression Perpendicular	ASTM D143	1437 psi	540 psi
Bending Strength	ASTM D198	3280 psi	500 psi
Shear Strength	ASTM D143	1761 psi	360 psi
Modulus of Elasticity	ASTM D4761	412,000psi	200,000 psi
Modulus of Rupture	ASTM D4761	3280 psi	500 psi

* Ultimate strength values are not meant for design analysis. Design values are for temperatures up to 130F (54 C)

2.3 ACCESSORIES

A. Fasteners:

1. Trex Universal Hideaway Hidden Fasteners
2. Screws; See: “2013 Installation Guide Trex Decking and Railing” for the updated recommendations on fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install according to Trex installation guidelines. See [www. Trex.com](http://www.Trex.com) for detailed installation recommendations: “2013 Installation Guide Trex Decking and Railing”
- B. Cut, drill, and rout using carbide tipped blades
- C. Do not use composite wood material for structural applications

- A. Following cleaning recommendations as found in Trex installation guide at [www. Trex.com](http://www.Trex.com);
“2013 Installation Guide Trex Decking and Railing”

END OF SECTION

SECTION 07 21 00

BUILDING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Glass-fiber blanket insulation.
- B. Spray Foam insulation.
- C. Vapor Retarders.
- D. Related Accessories.

1.2 REFERENCES

- A. American National Standards Institute (ANSI/ASSE).
- B. ASTM International (ASTM).
- C. North American Insulation Manufacturers Association (NAIMA).
- D. Occupational Safety and Health Administration (OSHA).
- E. Underwriters Laboratories (UL).

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging with labeling intact including material name, production date and product code, until ready for installation.
- B. Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow.
- C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

- D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
1. CertainTeed Corporation.
 2. Guardian Building Products, Inc.
 3. Johns Manville.
 4. Knauf Insulation.
 5. Owens Corning.
 6. Reef Industries, Inc.
- B. Substitutions: or equal.
- C. Requests for substitutions will be considered in accordance with Section 01 60 00 – Product Requirements.
1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Unfaced and Kraft Faced Batt Insulation: ASTM C 665, Type I (Unfaced) or Type II (Faced), Class A (Unfaced) or Class C (Faced); non-combustible when tested in accordance with ASTM E 136; extra wide stapling flanges.
1. Physical and Mechanical Properties
 - a. R-value to match existing conditions or meet local building codes. The greater duty or obligation on the R-value shall govern.
 - b. Size: Maximum sizes available, to avoid jointing to greatest extent possible.
 - c. Width for Metal Framing Application: Same as framing center to center dimension.
 - d. Width for Wood Framing Application: Maximum of 1 inch (25 mm) less than framing center to center dimension.
 - e. Vapor Retarder Perm Rating (For Faced Batt Insulation): Maximum 1.0 perms (57 ng/Pa s sq m) when tested in accordance with ASTM E 96.
 - f. Surface Burning Characteristics (For Unfaced Batt Insulation): Maximum flame spread of 25, maximum smoke developed of 50, when tested in accordance with ASTM E 84.
 - g. Properties:
 - 1) Free of Formaldehyde: Insulation is manufactured with bio-based binder and no formaldehyde.
 - 2) VOC Emission: Low VOC emission certified by GreenGuard Environmental Institute for Children and Schools.
 - 3) Recycled Content: Minimum of 40% "post-consumer" recycled material.
- B. Accessory Materials and Fasteners: Provide all materials required for complete and proper installation of insulation, whether specified or not.

- C. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.
- D. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by manufacturer for sealing joints and penetrations in vapor retarder.

2.3 SPRAY FOAM INSULATION

- A. Open-Cell and Closed-Cell Spray Foam Insulation: Low density, MDI-based semi-rigid polyurethane water-blown type Open Cell Foam: foam OR Medium-density, MDI-based polyurethane thermoset rigid HFC-blown type Closed Cell Foam:
 - 1. Physical and Mechanical Properties:
 - a. Thermal Performance (Open-Cell AND Closed-Cell): Thicknesses and R-value to match existing conditions or meet local building codes. The greater duty or obligation on the R-value shall govern.
 - b. Core Density: 0.45-0.55pcf (Open-Cell) OR 1.9-2.4pcf (Closed-Cell) when tested in accordance with ASTM D 1622.
 - c. Thermal Resistance: 3.6 (Open-Cell) OR 6.4(Initial) and 5.8(Aged) less than or equal to 2-1/2 inches / 6.4 when greater than 2-1/2 inches (Closed-Cell) when tested in accordance with ASTM C 518.
 - d. Open Cell Content: Greater than 95% when tested in accordance with ASTM D 2842.
 - e. Closed Cell Content: 88-95% when tested in accordance with ASTM D 2842.
 - f. Compressive Strength: Greater than 2.4psi (Open-Cell) OR Greater than 25psi (Closed-Cell) when tested in accordance with ASTM D 1621.
 - g. Tensile Strength: 5.2psi (Open-Cell) OR 23psi (Closed-Cell) when tested in accordance with ASTM D 1623.
 - h. Water Absorption: Less than 30% by volume (Open-Cell) OR Less than 2% by volume (Closed-Cell) when tested in accordance with ASTM D 2842.
 - i. Dimensional Stability: Less than 12% by volume (Open-Cell) OR Less than 9% by volume (Closed-Cell) when tested in accordance with ASTM D 2126
 - j. Water Vapor Transmission: 33 perm/inch (Open-Cell) OR 1.3 perm/inch (Closed-Cell) when tested in accordance with ASTM E 96.
 - k. Air Permeability (Open-Cell AND Closed-Cell): 0.013 when tested in accordance with ASTM E 283.
 - l. Fungi Resistance (Open-Cell AND Closed-Cell): Pass, with no growth when tested in accordance with ASTM C 1338.
 - 2. Fire performance
 - a. Flame Spread (Open-Cell AND Closed-Cell): Less than 25 when tested in accordance with ASTM E 84.
 - b. Smoke: Less than 350 (Open-Cell) OR Less than 450 (Closed-Cell) when tested in accordance with ASTM E 84.
- B. Accessory Materials and Fasteners: Provide all materials required for complete and proper installation of spray foam insulation, whether specified or not.

2.4 VAPOR RETARDERS

- A. Vapor Retarder (Fire Retardant Reinforced, Reinforced, and Standard):
 - 1. Physical and Mechanical Properties:

- a. Material (Minimums): 3-ply fire retardant laminate (Fire Retardant Reinforced) OR 3-ply laminate (Reinforced) OR Extruded polyethylene Film
 - b. Weight (Minimums): 33lbs/1,000sq.ft. (Fire Retardant Reinforced), 40lbs/1,000sq.ft. (Reinforced), 49lbs/1,000sq.ft. (Standard), when tested in accordance with ASTM D 3776.
 - c. Puncture Propagation Tear (Minimums): 26lb (Fire Retardant Reinforced) OR 30lb (Reinforced) OR 34lb (Standard), when tested in accordance with ASTM D 2582.
 - d. Permeance (Perm) (Minimums): 0.062grains/hr-sq ft-in Hg (Fire Retardant Reinforced), 0.038grains/hr-sq ft-in Hg (Reinforced), 0.018grains/hr-sq ft-in Hg (Standard), when tested in accordance with ASTM E 96.
 - e. Drop Dart (Minimums): 450g (Fire Retardant Reinforced), 475g (Reinforced), 2270g (Standard), when tested in accordance with ASTM D 1709.
 - f. Tensile Strength (1" Tensile) (Minimums): 90lb/5050psi (Fire Retardant Reinforced), 35lb/4560 psi (Reinforced), 44lb/4400 psi (Standard), when tested in accordance with ASTM D 882.
 - g. Puncture Strength (Minimums): 30lb (Fire Retardant Reinforced), 35lb (Reinforced), 24lb (Standard), when tested in accordance with ASTM D 4833.
 - h. Usable Temperature Range: Minus 25 to 170 degrees F (minus 32 to 77 degrees C).
 - i. Application(s):
 - 1) Use on roof decks under insulation.
 - 2) Use on exterior walls on inside face of framing.
 - 3) Use under concrete slabs, over aggregate fill.
 - 4) Use under concrete slabs, under aggregate fill.
- B. Accessory Materials and Fasteners: Provide all materials required for complete and proper installation of vapor retarders, whether specified or not.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that adjacent materials are dry and ready to receive insulation.

3.2 INSTALLATION , GENERAL

- A. Install in accordance with NAIMA "Recommendations for Installation in Residential and Other Light-Frame Construction - Fiber Glass Building Insulation" and manufacturer's instructions.
- 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 envelope 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 thickness, 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.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacture'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 Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill cavities formed by framing members. If more than one length is required to fill 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 clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation
 - 4. 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
 - b. With faced blankets having stapling flanges, lap blanket over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- 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.

3.4 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
 - 1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches O.C.
 - 2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
 - 3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair punctures or tears in vapor retarder facing by taping. Follow tape manufacturer's application recommendations.
- E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.
- F. Protect insulation from damage and from becoming wet before, during and after installation.

END OF SECTION

SECTION 07 21 19

FOAMED IN PLACE INSULATION

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. Section Includes:
 - 1. Closed-cell spray polyurethane foam.
 - 2. Open-cell spray polyurethane foam.
- B. Related Requirements: (Not Used)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - 3. CFC/HCFC Emissions: No CFC or HCFC emissions and total formaldehyde emissions less than 1 percent, cured for 7 days and tested to ASTM D5116 for 24 hours.

2.2 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
- B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.
- C. Protect adjacent surfaces from accidental application.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply to uniform density without voids.

- D. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer, but never greater than in a layer exceeding 2 inches thickness.
- E. Do not spray into rising foam.
- F. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.
- G. Cavity Walls: Install into cavities to a thickness of 6 inches.
- H. Miscellaneous Voids: Apply according to manufacturer's written instructions.
- I. Do not apply at temperatures less than 32 degrees F.

3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

SECTION 07 25 00

WEATHER BARRIERS

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. Section Includes:

1. Building paper.
2. Building wrap.
3. Flexible flashing.
4. Drainage material.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Manufacturers: Dupont Tyvek, Harvey Typar.
2. Water-Vapor Permeance: Not less than 75 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A).

3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E 2178.
 4. Allowable UV Exposure Time: Not less than three months.
 5. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 FLEXIBLE FLASHING

- A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 inch.
1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- B. Rubberized-Asphalt Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 inch.
1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- C. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.
- D. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

2.3 DRAINAGE MATERIAL

- A. Drainage Material: Product shall maintain a continuous open space between water-resistive barrier and exterior cladding to create a drainage plane and shall be used under siding.
1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:

1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion-or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.
3. Extend weather barrier completely over openings.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over water-resistive barrier at bottom and sides of openings.
4. Lap water-resistive barrier over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.3 DRAINAGE MATERIAL INSTALLATION

A. Install drainage material over building wrap and flashing to comply with manufacturer's written instructions.

END OF SECTION

SECTION 07 27 23

BOARD PRODUCT AIR BARRIERS

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. Section Includes:

1. Combination wall sheathing, water-resistive barrier, and air barrier.
2. Self-adhering flexible flashing.
3. Liquid-applied flashing membrane.

- B. Related Requirements:

1. Section 061600 "Sheathing".
2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 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. For panels with integral water resistive barrier, include data on air-/moisture-infiltration protection based on testing according to referenced standards.

- B. LEED Submittals:

1. Inputs for EA Prerequisite 2 and Credit EA 1: Proposed design input for exterior wall construction with air barrier performance taken into consideration.
2. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.
3. Certificates for Credit MR 5.1 or 5.2: Certificates verifying that materials were extracted, processed, and manufactured within 500 miles of the project site.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Capable of demonstrating that all wood procurement operations are conducted in accordance with procedures and policies of the Sustainable Forestry Initiative (SFI) Program.
- B. Code Compliance: Comply with requirements of the following:
 - 1. International Code Council (ICC), ICC-ESR1474 (ZIP System Wall Sheathing).
 - 2. International Code Council (ICC), ICC-ESR2227 (ZIP System Tape).
 - 3. Florida Building Code Compliance: Provide sheathing complying with Florida Building Code product and installation requirements for locations outside of high velocity wind zone.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Outdoor Storage: Comply with manufacturer's recommendations.
 - 1. Set panel bundles on supports to keep off ground.
 - 2. Cover panels loosely with waterproof protective material.
 - 3. Anchor covers on top of stack, but keep away from sides and bottom to assure adequate air circulation.
 - 4. When high moisture conditions exist, cut banding on panel stack to prevent edge damage.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sheathing system that fail due to manufacturing defects within specified warranty period.
 - 1. Construction Period Warranty: Manufacturer shall warrant the panels and tape for weather exposure for a period of 180 days from installation.
 - 2. System Limited Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WOOD PANEL PRODUCTS

- A. Oriented Strand Board: DOC PS 2-10.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated. Thickness shall satisfy minimum and maximum requirements for referenced performance category.
- C. Factory mark panels to indicate compliance with applicable standard.

2.3 COMBINATION WALL SHEATHING, WATER-RESISTIVE BARRIER, AND AIR BARRIER

- A. Oriented-Strand-Board Wall Sheathing: With integral water-resistive barrier, Exposure 1 sheathing.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Huber Engineered Woods LLC; ZIP System Wall Sheathing or a comparable product .
 - 2. Span Rating, Panel Grade and Performance Category:
 - a. Wall sheathing not less than 32/16; Structural 1; 1/2 Performance Category.
 - b. Roof sheathing not less than 40/20 Structural 1; 5/8 Performance Category.
 - 3. Edge Profile: Square edge.
 - 4. Provide fastening guide on top panel surface with pre-spaced fastening symbols for 16-inches (406 mm) and 24-inches (610 mm) on centers spacings.
 - 5. Performance Standard: DOC PS2-10 and ICC-ES ESR-1474.
 - 6. Factory laminated integral water-resistive barrier facer.
 - 7. Perm Rating of Integral Water-Resistive Barrier: 12-16 perms.
 - 8. Assembly maximum air leakage of 0.0072 cfm/sq. ft. (0.037 L/s x sq. m) infiltration and 0.0023 cfm/ sq. ft. (0.012 L/s x sq. m) exfiltration at a pressure differential of 1.57 psf (75 Pa).
 - 9. Exposure Time: Designed to resist weather exposure for 180 days.

2.4 FASTENERS

- A. General: Provide fasteners of size and type that comply with requirements specified in this article by the authority having jurisdiction, International Building Code, International Residential Code, Wood Frame Construction manual, and National Design Specification.
 - 1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

2.5 MISCELLANEOUS MATERIALS

- A. Self-Adhering Seam and Flashing Tape: Pressure-sensitive, self-adhering, cold-applied, proprietary seam tape consisting of polyolefin film with acrylic adhesive.
 - 1. Basis-of-Design Product: Subject to compliance with requirements provide Huber Engineered Woods; ZIP System Tape or a comparable product.
 - 2. Thickness: 0.012 inch (0.3 mm).
 - 3. Width: 3.75 inch (95.3 mm).
 - 4. Code Compliance: Comply with requirements of authorities having jurisdiction and ICC Evaluation Service, Inc. "AC148 - Acceptance Criteria for Flexible Flashing Materials."
 - 5. International Code Council (ICC), ICC-ES2227 (ZIP System Tape).
 - 6. American Architectural Manufacturer's Association; AAMA 711.
- B. Liquid-Applied Flashing Membrane: Gun-grade, cold-applied, silyl-terminated polyether (STPE) liquid flashing membrane compatible with sheathing/weather barrier and self-adhering seam and flashing tape, and tested as part of an assembly meeting performance requirements. Follow manufacturer's recommendation for integration with ZIP System Tape.
 - 1. Basis-of-Design Product: Subject to compliance with requirements provide Huber Engineered Woods; ZIP System Liquid Flash or a comparable product.
 - 2. Hardness, Shore A, ASTM C 661: 40 to 45
 - 3. Total Solids: 99 percent
 - 4. Tensile Strength, ASTM D412: 75 psi (517 kPa)

PART 3 - EXECUTION

3.1 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.
- 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. ICC-ES ESR-1539 or NES NER-272 for power-driven fasteners.
 - 2. Chapter 23 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 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. Only mechanically attached and drainable EIFS and exterior insulation should be used with ZIP System wall sheathing.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in American Wood Council, “ASD/LRFD Manual for Engineered Wood Construction,” 2012 edition for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall Sheathing:
 - a. Nail wood framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.
 - c. Install fasteners 3/8 inch (9.5 mm) to 1/2 inch (12.7 mm) from panel edges.
 - d. Space fasteners in compliance with requirements of authority having jurisdiction.

3.3 SHEATHING JOINT TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply ZIP System proprietary seam tape to joints between sheathing panels.
 - 2. Utilize ZIP System tape gun or hard rubber roller provided by manufacturer to ensure tape is completely adhered to substrates.
 - 3. When using ZIP System Liquid Flash to seal sheathing joints, follow manufacturer's recommendations for sealing panel seams.

3.4 FLEXIBLE OR LIQUID APPLIED FLASHING INSTALLATION

- A. Apply ZIP System Tape flexible flashing or ZIP System Liquid Flash liquid applied flashing membrane where indicated to comply with manufacturer's written instructions.
 - 1. After flexible flashing tape has been applied, roll surfaces with a hard rubber to ensure that flashing is completely adhered to substrates.
 - 2. Width of Flexible Flashing: 6 inch (152.4 mm).
 - 3. Apply liquid-applied flashing membrane at penetrations, gaps, and cracks to form continuous weathertight surface. Apply liquid membrane according to manufacturer's written instructions. Follow manufacturer's recommendation for integration with ZIP System Tape.

END OF SECTION

SECTION 07 31 13

ASPHALT SHINGLES

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. Section Includes:

1. Asphalt shingles.
2. Underlayment.
3. Ridge vents.
4. Metal flashing and trim.
5. Granule surfaced asphalt shingle roofing
6. Moisture shedding underlayment, eaves, valley and ridge protection

- B. Related Requirements:

1. Section 06 10 00 – Rough Carpentry.
2. Section 06 16 00 – Sheathing (Hew Advantech).

1.3 REFERENCES

- A. ASTM A 653/A 653M – Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron-Alloy-Coated (Galvannealed) by the Hot-Dip Process
- B. ASTM B 209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- C. ASTM B 370 – Standard Specification for Copper Sheet and Strip for Building Construction.
- D. ASTM D 225 – Standard Specification for Asphalt Shingles (Organic Felt) Surfaced with Mineral Granules.
- E. ASTM D 226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- F. ASTM D 1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials used as Steep Roofing Underlayment for Ice Dam Protection.

- G. ASTM D 3018 – Standard Specification for Class A Shingles Surfaced with Mineral Granules.
- H. ASTM D 3161 – Standard Test Method for Wind Resistance of Asphalt Shingles (Fan-Induced Method).
- I. ASTM D 3462 – Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
- J. ASTM D 4586 – Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- K. ASTM D-4869 – Standard Specification for Asphalt-Saturated Organic Felt Shingle Underlayment Used in Roofing.
- L. ASTM D 6757 – Standard Specification for Inorganic Underlayment for Use with Steep Slope Roofing Products.
- M. ASTM D7158 – Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)
- N. ASTM E 108 – Standard Test Methods for Fire Test of Roof Coverings
- O. ASTM G 21 – Determining Resistance of Synthetic Polymers to Fungi

1.4 DEFINITION

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.5 ACTION SUBMITTALS

- A. Product Data: Provide manufacturer's printed product information indicating material characteristics, performance criteria and product limitations.
- B. Submit under provisions of Section 01 33 00 – Submittal Procedures.
- C. Manufacturer's Installation Instructions: Provide published instructions that indicate preparation required and installation procedures.
- D. Certificate of Compliance: Provide Certificate of Compliance from an independent laboratory indicating that the asphalt fiberglass shingles made in normal production meet or exceed the requirements of the following:
 - 1. ASTM E 108/UL 790 Class A Fire Resistance
 - 2. ASTM D 3161/D 7158/UL 997 Wind Resistance.
 - 3. ASTM D 3462

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by a qualified testing agency.
- C. Sample Warranty: For manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For asphalt shingles to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer's written instructions.
- B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
- C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.
- D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.
- E. Store and dispose of solvent-based materials and materials used with solvent based materials in accordance with requirements of Authorities Having Jurisdiction.
- F. Deliver shingles to site in manufacturer's unopened labeled bundles. Promptly verify quantities and conditions. Immediately remove damaged products from site.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.
- B. Anticipate and observe environmental conditions (temperature, humidity and moisture) within limits recommended by manufacturer for optimum results. Do not install products under environment conditions outside manufacturer's limits.

- C. Take special care when applying WinterGuard Waterproofing Shingle Underlayment and shingles when ambient or wind chill temperature is below 45 degrees F (7 degrees C). Tack WinterGuard in place if it does not adhere immediately to the deck.

1.11 WARRANTY

- A. Manufacturer's Warranty: Furnish shingle manufacturer's warranty for the product listed below:
 - 1. CertainTeed Landmark: Lifetime limited warranty.
- B. Warranty Supplement: Provide manufacturer's supplemental warranty (CertainTeed's SureStart or SureStart PLUS) to cover labor and materials in the event of a material defect for the following period after completion of application of shingles:
 - 1. First Ten Years (Landmark Shingles)
 - 2. No SureStart or SureStart PLUS for any shingle applied to inadequately ventilated roof deck.
- C. SureStart PLUS Extended Warranty Protection (can only be provided by a CertainTeed Credentialed Contractor): Landmark shingles carry:
 - 1. 3-Star Coverage (20 years) material and labor costs for repair or replacement and tear off.
 - 2. 4-Star Coverage (50 years*) material and labor costs for repair or replacement, tear off and disposal costs. *25 years for premises not used by individual homeowners
 - 3. 5-Star Coverage (50 years**) material and labor costs for repair or replacement, tear off and disposal costs, and workmanship defects (25 years). **30 years for premises not used by individual homeowners

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. CertainTeed Landmark: Conforming to ASTM D 3018 Type I – Self-Sealing, UL Certification of ASTM D 3462, ASTM D 3161/UL997 120-mph Wind Resistance and UL Class A Fire Resistance, glass fiber mat base, ceramically colored/UV resistant mineral surface granules across entire face of shingle; algae-resistance; two-piece laminate shingle.

- B. Wind warranty upgrade – These products are warranted to resist blow-off due to wind velocities, including gusts, up to a maximum of 130 miles per hour during the first fifteen (15) years, provided all the following conditions are met:
 - 1. CertainTeed shingles are not applied over existing roof shingles (roof-overs are not permitted).
 - 2. CertainTeed specified corresponding hip and ridge accessory products are installed as cap shingles (Shadow Ridge™, Cedar Crest™, Mountain Ridge™ (& IR).
 - 3. CertainTeed specified corresponding starter shingles are installed along the roof eaves and rakes (Swiftstart™ and High-Performance Starter).
- C. Weight: 229 / 240 pounds per square (dependent on manufacturing location) (100 square feet).
 - 1. Color: As selected by Owner from manufacturer's standards

2.3 UNDERLAYMENT MATERIALS

- A. Eaves Protection: CertainTeed “WinterGuard”; ASTM D1970 sheet barrier of self-adhering rubberized asphalt membrane shingle underlayment having internal reinforcement and “split” back plastic release film; provide material warranty equal in duration to that of shingles being applied.
 - 1. CertainTeed WinterGuard Sand
- B. Waterproofing Underlayment: CertainTeed “WinterGuard”; ASTM D 1970 sheet barrier of self-adhering rubberized asphalt membrane shingle underlayment having internal reinforcement, and “split” back plastic release film; Use in “low slope” areas (below 4:12, but no less than 2:12 pitch); provide material warranty with equal in duration to that of shingles being applied .
 - 1. CertainTeed WinterGuard Sand
- C. Felt: ASTM D 226/D 226M, asphalt-saturated organic felts, nonperforated.
 - 1. Type: Type I.

2.4 ROOF DECK TAPE.

- A. Self-Adhering Polymer-modified Bitumen Roof Deck Joint Tape/Strip: A minimum 4 inch wide self-adhering membrane tape composed of a non-slip film coated with an asphalt-based adhesive.
 - 1. ASTM D 1970

2.5 RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent for use under ridge shingles.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed
 - b. Cor-A-Vent, Inc.
 - c. GAF Materials Corporation.
 - d. Lomanco, Inc.
 - e. Obdyke, Benjamin Incorporated.
 - f. Owens Corning.
 2. Minimum Net Free Area: 12 square inches per linear foot.
 3. Width: 12"
 4. Thickness: 3/4".
 5. Features: Accommodate roof pitch 3:12 to 12:12
 6. Internal Filter
 - a. Internal weather filter helps protect the attic from wind driven rain, snow, dust and insects.
 - b. Shingle over low profile ridge vent designed with external baffle to deflect wind and weather over the vent. The external baffle creates low pressure over the vent openings to "pull" air from the attic.
- B. Flexible Ridge Vent: Manufacturer's standard, compression-resisting, three-dimensional, open-nylon or polyester-mat filter bonded to a nonwoven, nonwicking, geotextile fabric cover.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. GAF Materials Corporation.
 - b. Obdyke, Benjamin Incorporated.
 - c. Tamko Building Products, Inc.
 2. Minimum Net Free Area: 12 square inches per linear foot.
 3. Width: 12"
 4. Thickness: 3/4".

2.6 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, sharp-pointed, with a minimum 3/8-inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through OSB or plywood sheathing.
1. Shank: Barbed.
 2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.

- D. Synthetic-Underlayment Fasteners: As recommended in writing by synthetic-underlayment manufacturer for application indicated.

2.7 METAL FLASHING AND TRIM

A. Material

1. Sheet Flashing: ASTM A 361/A361M; 26 Gauge (0.45 mm) steel with minimum G115/Z350 galvanized coating
2. Bituminous Paint: Acid and alkali resistant type; black color.
3. Tinner's Paint: Color as selected by Architect to coordinate with shingle color.
4. Sheet Metal: Aluminum, mill finished.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

1. Apron Flashings: Fabricate with lower flange a minimum of 5 inches (125 mm) over and 4 inches (100 mm) beyond each side of downslope asphalt shingles and 6 inches (150 mm) up the vertical surface.
2. Step Flashings: Fabricate with a headlap of 2 inches (50 mm) and a minimum extension of 5 inches (125 mm) over the underlying asphalt shingle and up the vertical surface.
3. Cricket or Backer Flashings: Fabricate with concealed flange extending a minimum of 24 inches (600 mm) beneath upslope asphalt shingles and 6 inches (150 mm) beyond each side of each chimney and skylight and 6 inches (150 mm) above the roof plane.
4. Open-Valley Flashings: Fabricate in lengths not exceeding 10 feet (3 m) with 1-inch-(25-mm-) high, inverted-V profile at center of valley and equal flange widths of 10 inches (250 mm) minimum or match existing.
5. Drip Edges: Fabricate in lengths not exceeding 10 feet (3 m) with 2-inch (50-mm) roof-deck flange and 1-1/2-inch (38-mm) fascia flange with 3/8-inch (9.5-mm) drip at lower edge.

C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches (100 mm) from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

- #### A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provisions have been made for flashings and penetrations through asphalt shingles.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION – EAVE ICE DAM PROTECTION

- A. Place eave edge and gable metal edge flashing tight with fascia boards. Weather-lap joints 2 inches (50mm). Secure flange with nails spaced 8 inches (200 mm) on center.
- B. Apply CertainTeed “WinterGuard” Waterproofing Shingle Underlayment as eave protection in accordance with manufacturer’s instructions.
- C. Extend eave protection membrane minimum 24 inches (640 mm) up slope beyond interior face of exterior wall.

3.3 UNDERLAYMENT INSTALLATION

- A. Roof deck Joints: Apply minimum 4” wide Self-adhering polymer membrane over roof deck material. Install roofing underlayment over deck joints.
- B. Roof Slopes between 2:12 and 4:12: Apply one layer of “WinterGuard” over all areas not protected by WinterGuard at eaves, with end and edges weather lapped minimum of 19 inches (480 mm) Stagger end laps each consecutive layer. Nail in place
- C. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt-underlayment nails.
 1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches (75 mm) in direction that sheds water. Lap ends of felt not less than 6 inches (150 mm) over self-adhering sheet underlayment.
 2. Install fasteners at no more than 36 inches (914 mm) o.c.
- D. Double-Layer Felt Underlayment: For roofs with slopes of 2:12 and less than 4:12 Install on roof deck parallel with and starting at the eaves. Install a 19-inch- (485-mm-) wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches (485 mm) in shingle fashion. Lap ends a minimum of 6 inches (150 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt-underlayment nails.

1. Install felt underlayment on roof sheathing not covered by self-adhering sheet underlayment. Lap edges over self-adhering sheet underlayment not less than 6 inches (150 mm) in direction that sheds water.
 2. Terminate felt underlayment extended up not less than 4 inches (100 mm) against sidewalls, curbs, chimneys, and other roof projections.
 3. Install fasteners at no more than 36 inch (914 mm) o.c.
- E. Self-Adhering Sheet Underlayment Leak Barrier: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.
1. Eaves: Extend from edges of eaves up the slope 36 inches (914 mm) or at least 24 inches (600 mm) beyond interior face of exterior wall.
 2. Rakes: Extend from edges of rake 36 inches (914 mm) beyond interior face of exterior wall.
 3. Valleys: Extend from lowest to highest point 18 inches (450 mm) on each side.
 4. Hips: Extend 18 inches (450 mm) on each side along entire length.
 5. Ridges: Extend 36 inches (914 mm) on each side without obstructing continuous ridge vent slot.
 6. Sidewalls: Extend beyond sidewall 18 inches (450 mm), and return vertically against sidewall not less than 4 inches (100 mm).
 7. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches (450 mm), and return vertically against penetrating element not less than 4 inches (100 mm).
 8. Roof Slope Transitions: Extend 18 inches (450 mm) on each roof slope.
- F. Concealed Valley Lining: For woven and closed-cut valleys. Comply with NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems." Install underlayment centered in valley and fastened to roof deck.
1. Lap roof-deck underlayment over valley underlayment at least 6 inches (150 mm).
 2. Install a 36-inch- (914-mm-) wide strip of leak barrier, centered in valley. Lap ends of strips at least 12 inches (300 mm) in direction to shed water, and seal with asphalt roofing cement. Fasten to roof deck.
- G. Metal-Flashed, Open-Valley Underlayment: Install two layers of minimum 36-inch- (914-mm-) wide underlayment centered in valley. Stagger end laps between layers at least 72 inches (1830 mm). Lap ends of each layer at least 12 inches (300 mm) in direction to shed water, and seal with asphalt roofing cement. Fasten each layer to roof deck.
1. Lap roof-deck underlayment over first layer of valley underlayment at least 6 inches (150 mm).
- H. Granular-Surfaced, Open-Valley Lining: Shall not be used.
- I. Weather-lap and seal watertight with asphalt roofing cement items projecting through or mounted on roof. Avoid contact or solvent-based cements with WinterGuard

3.4 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements:
 - 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.
- C. Step Flashings: Install with a headlap of 4 inches (100 mm) and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.
- D. Cricket or Backer Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.
- E. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches (200 mm) in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.
 - 1. Secure hemmed flange edges into metal cleats spaced 12 inches (300 mm) apart and fastened to roof deck.
 - 2. Adhere 9-inch- (225-mm-) wide strip of self-adhering sheet to metal flanges and to self-adhering sheet underlayment.
- F. Rake Drip Edges: Install rake drip-edge flashings over underlayment and fasten to roof deck seal with plastic cement.
- G. Eave Drip Edges: Install eave drip-edge flashings below underlayment and fasten to roof sheathing seal with plastic cement.
- H. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.5 ASPHALT-SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip at least 7 inches (175 mm) wide with self-sealing strip face up at roof edge.
 - 1. Extend asphalt shingles 1/2 inch (13 mm) over fasciae at eaves and rakes.
 - 2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

- D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- E. Fasten asphalt-shingle strips with a minimum of four to six roofing nails located according to manufacturer's written instructions.
 - 1. Where roof slope exceeds 21:12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.
 - 2. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
 - 3. When ambient temperature during installation is below 50 deg F (10 deg C), seal asphalt shingles with asphalt roofing cement spots.
- F. Closed-Cut Valleys: Extend asphalt-shingle strips from one side of valley 12 inches (300 mm) beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt-shingle courses from other side of valley and cut back to a straight line 2 inches (50 mm) short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
 - 1. Do not nail asphalt shingles within 6 inches (150 mm) of valley center.
 - 2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (75-mm-) wide bed of asphalt roofing cement.
- G. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- H. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
 - 1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION

SECTION 07 46 23

WOOD SIDING

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. Section Includes: Installation, preparation and material requirements for,
 - 1. Wood Siding.
 - 2. Accessories.
- B. Related Requirements
 - 1. Section 06 10 00 - Rough Carpentry.
 - 2. Section 07 25 00 – Weather Barriers.
 - 3. Section 07 92 00 - Joint Sealants
 - 4. Section 09 93 00 – Staining and Transparent Finishing.

1.3 REFERENCES

- A. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- B. ANSI-CPA 135.6 - Hardboard Siding Standard.
- C. ICC Evaluation Report ICC ES - ICC ESR-2588

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Siding shall meet the requirements of the following codes and standards:
 - 1. 2015 International Building Code.
 - 2. 2015 International Residential Code.
 - 3. ICC ESR-2588.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 – Submittal Procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall have a minimum of two years' experience installing similar materials.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging with labels intact until ready for installation.
- B. Store materials in safe area, away from construction traffic; store under cover and off ground, protected from moisture.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. Provide with manufacturers 30 year limited warranty against defects in material, workmanship and buckling (defined as more than 1/4 inch deflection between studs installed at 16 inches on center) of the basic structure.
- B. Provide with manufacturers 5 year limited warranty of the factory-applied primed coatings against defects in material and chipping, peeling and blistering.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Buffalo Lumber Co., McMinnville TN 37190
- B. Substitutions: Permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 WOOD SIDING

- A. Material: Western Red Cedar
- B. Lap Siding: 1x6, WWPA 'V-Rustic' Patter, 3/8" Bevel Shiplap
- C. Grade: Manufactures Mill Select STK Conforming with WWPA Rule 16.12 or Better
- D. Finish: Factory Stained

2.3 WOOD BOARDS

- A. Material: Western Red Cedar

- B. Boards: Select Knotty.
 - 1. 1 inch x 4 inches (25 mm x 102 mm) through 1 inch x 12 inches (25 mm x 305 mm) S1S2E.
 - 2. 5/4 inches x 4 inches (32 mm x 102 mm) through 5/4 inches x 12 inches (32 mm x 305 mm) S1S2E.
- C. Grade: Manufactures STK Conforming with WWPA Rule 16.12 or Better
- D. Finish: Factory Stained

2.4 ACCESSORIES

- A. Nails for Wood Siding:
 - 1. Material: Corrosion resistant fasteners.
 - 2. Type: 8d box head nails with a minimum head diameter of 1/4 inch.
 - 3. Length: Sufficient to penetrate solid wood a minimum of 1-1/2 inches.
- B. Caulking: Provide flexible, paintable, mildew resistant exterior grade caulking as specified in Section 07 92 00 – Joint Sealants
- C. Vapor Barriers, Ventilation and Moisture Control: Provide continuous vapor barriers, ventilation and moisture control with a perm rating of 1 perm or less as specified in Section 07 25 00 – Weather Barriers.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates including framing/sheathing, vapor barriers, ventilation and moisture control have been properly prepared in accordance with the siding manufacturer's requirements.
- B. If substrate preparation is the responsibility of another installer, notify MCA of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Coordinate work with related trades; scribe and cope siding boards for accurate fit. Allow for installation of related work to avoid cutting and patching.
- B. Do not apply siding to a rain soaked structure. Do not apply siding that is wet.
- C. 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. Install in accordance with manufacturer's printed installation instructions for the products specified.
- B. Install siding panels and boards by attaching to solid nailable sheathing, spaced nailable sheathing or to studs spaced not exceeding 16 inches O.C..

- C. Gaps, Clearances, and Corners:
1. Leave 3/16 inch gap at all butt joints, around all doors and window frames, and at joints in the soffits for all lap and square edge siding products. Caulk all gaps.
 2. Gap the siding at all corners 3/16 inch and caulk.
 3. Siding must have a minimum 2 inch separation from concrete or be appropriately flashed. Siding must be 6 inches from soil or landscaping material.
 4. Where the siding meets the roof, it must be spaced a minimum of 2 inches from the plane of the roof and be properly flashed. Cut edge must be primed and painted.
- D. Standard Lap and Self-Aligning Lap Siding: Start application by nailing a starter strip, approximately 1-1/2 inches wide, aligned with the bottom edge of the sill plate. Level and install the first course of siding so its lower edge is 1/8 inch to 1/2 inch below the starter strip.
1. For Standard Lap products overlap successive courses at least 1 inch.
 2. For Self-Aligning Lap Sidings place the self-aligning lap edge on the top of each additional course; make sure the self-aligning lap joint is resting flat on the lower piece.
 3. Nail lap products 5/8 inch to 3/4 inch above the drip edge. Be sure nails penetrate through both pieces of siding and into studs.
 4. Periodic checks are necessary to assure the lap remains level. Make adjustments as necessary.
 5. Vertical butt joints must be located only on studs. Each piece of siding must be nailed top and bottom to studs.
 6. When butting siding to inside or outside corners, use a minimum 4/4 inch thick (nominal) dry wood material.
 7. At butt joints around windows and doors, a 3/16 inch gap is required and must be caulked.
 8. At horizontal joints with stacked panels or other types of siding, overlap siding 1 inch and/or use metal Z flashing. See drawings.
- E. Vertical Applications
1. Start at one corner of wall or sided surface with grooved edge toward adjacent wall or surface.
 2. Ensure plumb installation with level
 3. Trim first piece on wall or sided surface if necessary to maintain plumb installation
 4. Blind nail up to 6" exposure vertical siding pieces. Face nail wider pieces, countersink and caulk if required.
 5. At siding end cuts in vertical board installation make 45 degree cut at top board to promote drainage away from wall or surface behind.
- F. Fastening:
1. Blind nail Shiplap pattern siding.
 2. Use corrosion resistant 8d box head nails with a minimum head diameter of 1/4 inch.
 3. All panel products require that both vertical and horizontal joints be located on framing and nailed in accordance with the manufacturer's fastening schedule.
 4. Nails must penetrate wood framing 1-1/2 inches. Avoid counter sinking nails or rupturing the surface of the siding.
 5. If countersink occurs, caulk nail prior to painting.
 6. Fasten panels from end to end or center to end to avoid internal stress.

- G. Finish paint within 90 days after installation as specified in Section 09 93 00 – Staining and Transparent Finishing. If siding is exposed for a longer period, reprime the siding with a high quality oil or alkyd-based primer.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 46 33

VINYL SIDING

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.
- B. References
 - 1. American Architectural Manufacturers Association (AAMA)
 - 2. Air Barrier Association of America (ABAA)
 - 3. American National Standards Institute (ANSI)
 - 4. ASTM International
 - 5. Occupational Safety and Health Administration (OSHA)
 - 6. Underwriters Laboratories (UL)
 - 7. Vinyl Siding Institute (VSI)

1.2 SUMMARY

- A. Section includes vinyl siding and soffit.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
 - 2. Section 06 20 13 "Exterior Finish Carpentry" for exterior cellular PVC trim.
 - 3. Section 07 25 00 "Weather Barriers" for weather-resistive barriers.

1.3 COORDINATION

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 1. For vinyl siding, include VSI's official certification logo printed on Product Data.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of vinyl siding and soffit.

- B. Research/Evaluation Reports: For each type of vinyl siding required, from ICC-ES.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish full lengths of vinyl siding and soffit including related accessories, in a quantity equal to 2 percent of amount installed.

1.8 QUALITY ASSURANCE

- A. Vinyl Siding Installer Qualifications: A qualified installer who employs a VSI-certified Installer on Project.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials under cover.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracking, fading, and deforming.
 - b. Deterioration of materials beyond normal weathering.
 - 2. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 5 Hunter color-difference units as measured according to ASTM D 2244.
 - 3. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.
- B. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Royal Building Products – Siding and Trim Board
 - 2. Ply Gem Siding Group
 - 3. CertainTeed Corporation
- C. Substitutions: Requests for substitutions will be considered in accordance with Section 01 60 00
 - 1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 MATERIALS

- A. Physical Properties
 - 1. Siding ASTM D3679 Class 2
 - 2. PVC Cell classification in accordance with ASTM D1784: 13334
 - 3. Coefficient of Linear Expansion in accordance with ASTM D696: 0.000029 in/in/°F
 - 4. Modulus of Elasticity in accordance with ASTM D638: Minimum 360,000 lb. per sq. in.
 - 5. Tensile Strength in accordance with ASTM D638: Minimum 6,000 lb. per sq. in.
 - 6. Specific Gravity: Minimum 1.39
 - 7. Impact resistance in accordance with ASTM D4226: Greater than 60 lb. per sq. in.
- B. Fire Properties
 - 1. Smoke Density rating when tested in accordance with ASTM D2843: Maximum Average 50%
 - 2. Flame spread index in accordance with ASTM E84: Less than 25
 - 3. Fuel contribution in accordance with ASTM E84: Zero

2.3 VINYL SIDING

- A. Vinyl Siding: Integrally colored product complying with ASTM D 3679.
- B. Vinyl Siding Certification Program: Provide products that are listed in VSI's list of certified products.
- C. Horizontal Pattern: 8-inch (203-mm) exposure in Dutch-lap, double, 4-inch (102-mm) board style.
- D. Vertical Pattern: 8-inch (203-mm) exposure in beaded-edge, double, 4-inch (102-mm) board style.
- E. Texture: Wood grain
- F. Nominal Thickness: 0.044 inch (1.1 mm).
- G. Minimum Profile Depth (Butt Thickness): 3/4 inch (19 mm).

- H. Nailing Hem: Double thickness.
- I. Finish: Wood-grain print with clear protective coating containing not less than 70 percent PVDF.
 - 1. Colors: As selected by Owner from manufacturer's full range of colors.

2.4 VINYL SOFFIT

- A. Vinyl Soffit: Integrally colored product complying with ASTM D 4477.
- B. Vinyl Siding Certification Program: Provide products that are listed in VSI's list of certified products.
- C. Pattern: 6-inch (152-mm) exposure in beaded-edge, triple, 2-inch (51-mm) board style.
- D. Texture: Smooth.
- E. Ventilation: Provide perforated soffit.
- F. Nominal Thickness: 0.044 inch (1.1 mm).
- G. Minimum Profile Depth: 3/4 inch (19 mm).
- H. Colors: White.

2.5 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
 - 1. Provide accessories made from same material as adjacent siding unless otherwise indicated.
- B. Vinyl Accessories: Integrally colored vinyl accessories complying with ASTM D 3679 except for wind-load resistance.
 - 1. Texture: Smooth.
- C. Decorative Accessories: Provide the following vinyl decorative accessories as indicated:
 - 1. Corner posts.
 - 2. Door and window casings.
 - 3. Fasciae.
 - 4. Moldings and trim.
- D. Colors for Decorative Accessories: Match adjacent siding.
- E. Flashing: Provide aluminum flashing at window and door heads and where indicated.
 - 1. Finish for Aluminum Flashing: Siliconized polyester coating, same color as siding.
- F. Fasteners:
 - 1. For fastening to wood, use siding nails or ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
 - 2. For fastening vinyl, use aluminum fasteners. Where fasteners are exposed to view, use prefinished aluminum fasteners in color to match item being fastened.
- G. Insect Screening for Soffit Vents: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh or PVC-coated, glass-fiber fabric, 18-by-14 or 18-by-16 (1.4-by-1.8- or 1.4-by-1.6-mm) mesh.

- H. Continuous Soffit Vents: Aluminum, hat-channel shape, with perforations; 2 inches (51 mm) wide and not less than 96 inches (2438 mm) long.
 - 1. Net-Free Area: 6 sq. in./linear ft. (420 sq. cm/m).
 - 2. Finish: White paint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of vinyl siding and soffit and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. Install vinyl siding and vinyl soffits in accordance with the latest edition of "Vinyl Siding Installation Manual", published by the Vinyl Siding Institute and details from drawings.
- B. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Center nails in elongated nailing slots without binding siding to allow for thermal movement.
- C. Install vinyl siding and soffit and related accessories according to ASTM D 4756.
 - 1. Install fasteners for horizontal vinyl siding no more than 16 inches (400 mm) o.c.
- D. Install joint sealants as specified in Section 07 92 00 "Joint Sealants" and to produce a weathertight installation.
- E. Install siding, soffits, and accessories in accordance with best practices, with all joint members plumb and true.

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

The State of Connecticut Department of Housing Bid Documents
Community Development Block Grant
Disaster Recovery Program (CDBG-DR)
Owner Occupied Rehabilitation and Rebuilding Program

Bid Documents
Project #1247
12 Jacob Street
Norwalk, CT

END OF SECTION

SECTION 07 71 23

GUTTERS DOWNSPOUTS AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Gutter Downspout and Accessories
- B. Related Accessories:
 - 1. Splash Block.
 - 2. Gutter Protection

1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA).
- B. ASTM International (ASTM) B209 –Aluminum and Aluminum Alloy Sheet
- C. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

1.3 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 33 00 'Submittal Procedures'
- B. Manufacturer's data sheets on each product to be used, including:
 - 1. Material descriptions, dimensions, and profiles.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products to prevent twisting, bending, and abrasion, and to provide ventilation. Slope stored materials to drain.
- C. During storage prevent contact with materials capable of causing discoloration, staining, or other damage.

1.5 WARRANTY

- A. Provide Manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 DOWNSPOUTS

- A. Downspouts: Aluminum sheet, ASTM B 209, Alloy 3105-H24. Minimum tensile strength 26,000 psi, minimum yield strength 25,000 psi or equivalent; Thickness: 0.019 inches; Size 4 inches by 6 inches
- B. Endcaps: Aluminum sheet, ASTM B 209, Alloy 3105-H24, thickness 0.027 inch.
- C. Inside and Outside Mitres: Aluminum sheet, ASTM B 209, Alloy 3105-H24, thickness 0.027 inch.
- D. Gutter Hangers and Anchors: Aluminum sheet, ASTM B 209, Alloy 3105-H24, thickness
- E. 0.063 inch. Provide types required to suit project requirements.
- F. Downspout Anchors: Aluminum. Provide types required to suit project requirements.
- G. Elbows: Aluminum sheet, ASTM B 209, Alloy 3105-H24. Minimum tensile strength 26,000 psi, minimum yield strength 25,000 psi or equivalent.
1. Thickness: 0.019 inch.
 2. Size: To match downspouts.
- H. Aluminum Finish: two-coat system applied in a continuous baked-on process in a single operation, comprising of an acid-based primer and baked-on high performance linear polyester topcoat on exposed surfaces.
1. Color: As selected by MCA
- I. Accessories:
1. Miscellaneous components: Provide all necessary elbows, downspout offset sections, and pop rivets as required for a complete installation. All miscellaneous components shall match downspouts.

2.2 GUTTER PROTECTION

- A. MANUFACTURERS
1. Englert Gutter – LeafGuard
 2. LeafFilter North, Inc. – LeafFilter
 3. Midwest Enterprises, Inc. – E-Z Gutter Guards
 4. Ply Gem – Leaf Relief Gutter Protection or Leaf Smart Gutter Protection
- B. Furnish and install gutter protection as recommended by Manufacturer.

1. Finish: Match gutter finish
2. Size: Match gutter size or as recommended by manufacturer.

2.3 RELATED ACCESSORIES

- A. Fasteners: Match existing materials.
 1. Finish: Match existing finish.
 2. Size: As recommended by manufacturer.
- B. Flashings: Match existing or where installation is recommended by Manufacturer. Colors to match existing.
- C. Sealants: Mildew-Resistant Joint Sealant as recommended by Manufacturer at gutter j joints. Color shall match existing.
- D. Splash Blocks: Provide reinforced concrete splash blocks (minimum 4,000 psi concrete) at end of all downspouts discharging to the ground surface. Precast splash blocks shall be approximately 30 inches long by approximately 12 inches wide by approximately 3 inches high with a color of gray or white.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that substrates are in place and ready for installation of gutters and downspouts.

3.2 INSTALLATION

- A. General: Install downspouts per manufacturer's written installation instructions. Install Work securely in place and provide for expansion and contraction of components using lapped and sealed joints.

3.3 DOWNSPOUTS

- A. Install downspouts, provide elbows and offsets, and secure downspouts to wall construction using downspout supports spaced as per Manufacturer's instructions.
- B. Cut neat holes in decking without comprising structural integrity for passage of downspouts.
- C. Provide 45-degree elbow at bottom of downspout to direct water away from wall surface or foundation.
- D. Install a splash block under each downspout.

3.4 GUTTER PROTECTION

- A. Install gutter protection as recommended by Manufacturer's instructions.

END OF SECTION

SECTION 07 84 13

PENETRATION FIRESTOPPING

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. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Not required.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction if required by authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.

2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content:
1. Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- G. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
1. Permanent forming/damming/backing materials.
 2. Substrate primers.
 3. Collars.
 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

3.5 FIELD QUALITY CONTROL

- A. Contractor will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Silicone Joint Sealants.
- B. Urethane Joint Sealants.
- C. Latex Joint Sealants.
- D. Related Accessories.

1.2 REFERENCES

- A. American National Standards Institute (ANSI/ASSE).
- B. ASTM International (ASTM).
- C. Occupational Safety and Health Administration (OSHA).
- D. Underwriters Laboratories (UL).

1.3 SUBMITTALS

- A. Manufacturer's data sheets on each product to be used, including:
 - 1. Material descriptions, dimensions, and profiles.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- B. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.5 WARRANTY

- A. Provide Manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 SILICONE JOINT SEALANTS

- A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:

1. BASF Building Systems.
 2. Dow Corning Corporation.
 3. GE Advanced Materials - Silicones.
 4. Sika Corporation; Construction Products Division.
 5. Tremco Incorporated.
- B. Type: Single component (S).
- C. Grade: Pourable (P).
- D. Class: 100/50.
- E. Uses Related to Exposure: Traffic (T) and Nontraffic (NT).

2.2 URETHANE JOINT SEALANTS

- A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
1. BASF Building Systems.
 2. Bostik, Inc.
 3. Lyntal. International. Inc.
 4. Polymeric Systems, Inc.
 5. Sika Corporation; Construction Products Division.
 6. Tremco Incorporated.
- B. Type: Single component (S).
- C. Grade: Pourable (P).
- D. Class: 100/50.
- E. Uses Related to Exposure: Traffic (T) and Nontraffic (NT).

2.3 LATEX JOINT SEALANTS

- A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
1. BASF Building Systems.
 2. Bostik, Inc.
 3. May National Associates, Inc.
 4. Pecora Corporation.
 5. Schnee-Morehead, Inc.
 6. Tremco Incorporated.
- B. Latex: Acrylic latex or siliconized acrylic latex.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
 - 1. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Install sealant types compatible with adjacent surfaces, materials, and finishes to which sealant may come in contact with.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or

curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION

SECTION 08 16 00

MOLDED COMPOSITE DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Bifold Doors
- B. Passage Doors

1.2 REFERENCES

- A. Association (NFPA)
 - 1. NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
- B. Underwriters Laboratories, Inc. (UL)
 - 1. UL10B: Standard for Fire Tests of Door Assemblies (Note: Neutral pressure testing standard)
 - 2. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies.
- C. Underwriters' Laboratories of Canada (ULC)
 - 1. CAN4-S104: Standard Method for Fire Tests of Door Assemblies.
- D. Uniform Building Code Standard 7-2 (UBC)
 - 1. UBC 7-2 (1994): Fire Tests of Door Assemblies. (Note: Neutral pressure testing standard).
 - 2. UBC 7-2 (1997): Fire Test of Door Assemblies. (Note: Positive pressure testing standard).

1.3 DESIGN REQUIREMENTS

- A. Fire-Rated Door Assemblies: Fire door assemblies shall meet or exceed fire-protection ratings indicated when tested in accordance with NFPA 252.

1.4 ACTION SUBMITTALS

- A. Refer to Section 01 33 00 "Submittal Procedures".
- B. Product Data: Submit door manufacturer current product literature, including installation instruction.
- C. Quality Assurance Submittals

1. Manufacturer Instructions: Provide manufacturer's written installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 01 60 00 "Product Requirements".
- B. Deliver doors, materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store doors as recommended by manufacturer.
- D. Project Conditions: Environmental limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and heating system is operating and maintaining temperature between 60 and 90 degree F and relative humidity between 43 and 70 percent during the remainder of the construction period.

1.6 WARRANTY

- A. Manufacturer standard warranty indicating that the door will be free from material and workmanship defects from the date of substantial completion for the time periods indicated below:
 1. Door Unit: 5 years

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain composite doors from single manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. JELD-WEN® Interior Doors; 3305 Lakeport Blvd; Klamath Falls, OR 97601, USA; Phone 877.535.3462, fax 541.882.3455; website www.jeld-wen.com.
- B. Basis of Design: Doors are based on JELD-WEN®'s Molded Interior Doors
 1. Style - Cambridge.

2.2 BIFOLD DOORS

- A. Door Design
 1. Surface Finish: Textured
 2. Panels and Sticking Profile:
 - a. Three panels, with ovolo sticking.

- B. Core
 - 1. Hollow core, thickness 1-3/8 inch.
- C. Hardware
 - 1. Finish: Brass tone
- D. Finish: Prefinished
 - 1. Color: White

2.3 PASSAGE DOORS

- A. Door Design
 - 1. Surface Finish: Textured
 - 2. Panels and Sticking Profile:
 - a. Six panels, with ovolo sticking.
- B. Core and Frame
 - 1. Solid core with combination wood/MDF frame.
 - a. Thickness: 1-3/8 inch.
 - 2. Jambs
 - a. Jamb Width: 4-9/16 inch or 5-1/4 inch
 - b. Jamb Type: Flat
 - c. Jamb Species: Finger-Jointed Pine
- C. Hardware
 - 1. Finish: As selected by owner from manufacturer's standard finishes.
- D. Finish: Pre-primed

PART 3 - EXECUTION

3.1 GENERAL

- A. Install doors in accordance with manufacturer's installation guidelines and recommendations.

3.2 EXAMINATION

- A. Inspect door prior to installation.
- B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.3 PREPARATION

- A. Prepare door for installation in accordance with manufacturer's recommendations.

- B. Trim bottom of jamb sides to achieve desired distance between door bottom and finished floor height.

3.4 PASSAGE DOOR INSTALLATION

- A. Place door unit into opening and level hinge side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
- B. Level latch side of jamb. Use shims fastened through jamb and stop to level and temporarily secure in place.
- C. Verify spacing between jamb and door is uniform on all sides. Adjust as necessary.
- D. Shim top of jamb in center of opening and fasten with nail.
 - a. Re-check for square, level and even spacing around door. Nail securely in place through stop, jamb, shims and into studs every 12 inches.
- E. Set nails.
- F. Install trim on both sides using nails every 12 to 16 inches.

3.5 BIFOLD DOOR INSTALLATION

- A. Attach door hardware to door.
- B. Attach jamb hardware.
 - 1. Fasten overhead track in center of finished opening by inserting screws through pre-drilled holes.
 - 2. Attach jamb brackets flush to finished floor in line with overhead track.
- C. Install door assemblies.
 - 1. Place pivot pin in hole at top corner bracket and place guide wheel in track.
 - 2. Lift door assembly and drop bottom pin into bottom bracket hole.
- D. Check positioning and operation. Adjust hardware if necessary.

END OF SECTION

SECTION 08 16 13

FIBERGLASS DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Exterior Door Units.
- B. Door Hardware and related accessories.

1.2 REFERENCES

- A. American National Standards Institute (ANSI/ASSE).
- B. ASTM International (ASTM).
 - 1. ASTM E283; Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 2. ASTM E330; Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Pressure Difference.
 - 3. ASTM E331; Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - 4. ASTM E547; Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
 - 5. ASTM E 1886; Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
 - 6. ASTM E 1996; Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- C. National Fenestration Rating Council (NFRC):
 - 1. NFRC 100; Procedure for Determining Fenestration Thermal Properties.
 - 2. NFRC 200; Solar Heat Gain Coefficient and Visible Transmittance.
- D. Insulating Glass Certification Council (IGCC).
- E. Underwriters Laboratories (UL).
 - 1. UL 10B – Standard for Fire Testing Door Assemblies.
 - 2. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies.
- F. Window and Door Manufacturers of America (WDMA).

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 – Submittal Procedures.
- B. Manufacturer's data sheets on each product to be used, including:
 - 1. Material descriptions, dimensions, and profiles.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- C. Hardware Selection: Submit complete descriptive literature, including finishes, for each type of new door hardware and accessory.
- D. Operation and Maintenance Data: Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.4 QUALITY ASSURANCE SUBMITTALS:

- A. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
- B. Manufacturer Instructions: Provide manufacturer's written installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.
- B. Deliver and store assembly materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
 - 1. Protect from damage and exposure to direct sunlight during storage.
 - 2. Store in a dry, well-ventilated area off of the floor.
 - 3. During storage, do not remove paper or cardboard placed between products for shipment.
 - 4. Store in a humidity and temperature controlled facility. Recommended conditions: 30 to 50 percent relative humidity and 50 to 90 degrees F (10 to 32 degrees C).
- C. Handling: Handle with clean hands and equipment. Lift and carry the products when moving them. Do not drag across one another.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions; temperature, humidity, and ventilation, within limits recommended by manufacturer for optimum results. Install only in vertical walls and when conditions are dry. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.7 WARRANTY

- A. Manufacturer's Standard Warranty: Assemblies will be free from defects in materials and workmanship from the date of manufacture for the time periods indicated below:
 - 1. Door Slab: Lifetime Limited.
 - 2. Door System: Lifetime Limited.
 - 3. Frame: Lifetime Limited.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
 - 1. Feather River Doors
- B. Substitutions: Not Permitted.

2.2 FIBERGLASS ENTRY DOORS

- A. All fiberglass doors to be 6 Lite Clear Craftsman manufactured by Feather River or approved Equal
- B. Construction
 - 1. Stiles and Rails: Engineered wood (laminated veneer lumber), composite capped
 - 2. Core: Polyurethane Foam
- C. Basis of Design
 - 1. Paneled - Smooth-Pro SP-60
 - 2. Glazing - Dual Pane Clear, ¼ Lite
- D. Structural Requirements
 - 1. Design Pressure: +/- 50
- E. NFRC Requirements
 - 1. U-Factor – .2 or greater in accordance with NFRC 100
 - 2. SHGC Factor – .1 in accordance with NFRC 200
- F. Door Style: Paneled
- G. Door Shape: Squared top.
- H. Installation Accessories
 - 1. Sill Pan/ Sill Key System
 - 2. Corner Seal Pad
 - 3. Rain deflector

4. Rain guard
5. Composite bottom rail with double sweep
6. Composite adjustable threshold
7. Weather strip head and jamb

2.3 GLAZING

- A. Glass Type
 1. Low-E, Clear

2.4 PREHUNG SYSTEMS

- A. Profile: Single Door
- B. Jamb
 1. Type: White PVC Standard
 2. Width: 4-9/16" see door schedule
 3. Profile: Rabbeted
- C. Casing: Brickmold head and jamb
- D. Sills: Aluminum with Polished Aluminum Finish
- E. Hinges: Solid brass concealed bearing ball bearing
 1. Size: 4x4 Square
 2. Finish: Owner Selected

2.5 FABRICATION

- A. Skins are adhered to engineered wood frames with core materials and bonding agents that permanently lock skin to frame.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install doors in accordance with manufacture's guidelines and recommendations.

3.2 EXAMINATION

- A. Inspect Door prior to installation.
- B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within tolerance

3.3 INSTALLATION

- A. Install door unit assembly per Manufacturer's instructions.
 - 1. Caulk sill along outside edge and 1/2" from edge of subfloor
 - 2. Set door unit into center of opening and tack in place
 - 3. Shim hinge then latch side jambs straight. Inspect jamb for square, level and plumb.
 - 4. Fasten hinge jamb to studes
 - 5. Verify door opens freely and weatherstrip meets door
 - 6. Verify door sweep contacts threshold evenly
 - 7. Fasten latch side jamb to studes
 - 8. Structurally secure sill.
 - 9. Apply sealant to interior side of jamb between outside of jamb and stud to seal gaps.
 - 10. Install hardware.
 - 11. Install interior and exterior trim.
 - 12. Set all nails below surface and fill holes with wood matched putty stick.
 - 13. Install weatherstrip wedges.
- B. Weatherproofing: Apply in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

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. Section Includes:
 - 1. Access doors and frames for walls and ceilings.
 - 2. Floor access doors and frames.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for installation.
 - 2. Section 07 29 00 "Joint Sealants" and Section 07 84 13 "Penetration Firestopping" for weathertight joints and caulking.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. LEED Submittals: Submit manufacturer's certification of the following items which contribute to USGBC LEED Certification.
 - 1. Recycled Content: Percentage of pre-consumer and post-consumer recycled content of material assembly determined by weight in accordance with USGBC requirements.
 - 2. Regional Materials: Percentage of regional materials which have been extracted, recovered, and manufactured within 500 miles of the project site determined by weight in accordance with USGBC requirements.
- C. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
- D. Samples: Up request for each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.
- E. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or Interek - Warnock Hersey, both testing and inspecting agencies acceptable to authorities having jurisdiction:
1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
 2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Cendrex, Inc. product indicated or comparable product by one of the following:
1. Cendrex, Inc.
 2. Nystrom
- B. Fire-Rated, Insulated Flush Access Doors with Exposed Flanges:
1. Basis-of-Design Product: Cendrex, Inc.; PFI Fire Rated Insulated Access Door.
 2. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
 - a. Maximum Size and Rating for Horizontal Application:
 - 1) 24-inch x 36 inch (WxH) (610 mm x 914 mm). (See notes above for exceptions) may be installed in a 1-hour combustible or 3-hour non-combustible ceiling with a temperature rise rating of 250F at 30 minutes.
 - b. Maximum Size and Rating for Vertical Applications: 48 inch x 48 inch (1219 mm x 1219 mm). 3 hour rated with temperature rise of 250 F at 30 minutes, 450 F at 60 minutes.
 3. Locations: Wall and Ceiling.
 4. Fire-Resistance Rating: Not less than 1 Hour
 5. Temperature-Rise Rating: 450 deg F (250 deg C) at the end of 60 minutes. 250 deg F (139 deg C) at the end of 30 minutes.
 6. Powder-Coated Steel Sheet for Door: Nominal 0.040 inch (1.02 mm), 20-gauge galvanized steel door.
 - a. Finish: Steel finish with DuPont white powder coat primer.
 - b. Finish: Optional galvanized steel finish, galvanized (satin-coated) steel with DuPont white powder coat primer.
 7. Stainless-Steel Sheet for Door: Nominal 0.038 inch (0.95 mm), 20 gauge.
 - a. Finish: Type No. 304 stainless steel with No. 4 brushed finish.
 8. Doors: 20-gauge galvanized (satin coated) steel door with 2 1/4-inch (57 mm) depth sandwich type assembly.
 9. Frame Material: 16 gauge cold rolled steel of 2 1/2-inch (64 mm) depth with 1-inch (25.4 mm) flange at perimeter and 1/4 inch (6 mm) mounting holes.
 10. Hinges: Flush continuous piano hinge.
 11. Latching/Locking Devices:

- a. Latch: Standard, self-latching tool-key operated slam latch and/or ring operated slam latch, both included. Quantity varies with size of door. (Refer to manufacturer's literature.)
 - b. Latch: Option, key operated cylinder cam latch with 2 keys per lock, keyed alike.
 - c. Latch: Option, hex head cam latch, regular 1/4-inch (6 mm) Allen head.
 - d. Latch: Option, mortise deadbolt lock prepared to accept a mortised cylinder 1 5/32 inches (29 mm) in diameter. Cylinders and cores specified in Section 087100 "Door Hardware".
12. Automatic Closure Devices: Spring operated automatic closure devices for each door. Number of springs varies with size of door (Refer to manufacturer's literature).
 13. Interior Latch Release: Mechanisms to allow panels to open from inside, standard on all doors over 12 inches x 12 inches (305 mm x 305 mm).
 14. Insulation: 2 inch (51 mm) thick fire rated mineral wool.
 15. Masonry Anchors: Option available on all sizes.
 16. Cendrex, Inc. PFI-GYP and PFI-PLY Access Doors are insulated with 2 inch (51 mm) thick mineral wool and can be used on fire rated walls and ceilings. They come with drywall (GYP) or plaster (PLY) flange for easy concealed flange installation on any type surface. As per UL and NFPA 80 standards, once installation is complete and the provided springs are hooked to the back of the panel, the door will be self-closing and self-locking. The largest fire rated PFI access doors available for vertical installations are 48-inch x 48 inch (1219 mm x 1219 mm) or 2304 sq. inches (14,856 sq. cm). The largest fire rated PFI access doors available for horizontal installations are 24 inch x 36 inch (610 mm x 914 mm), or 864 sq. in (5,574 sq. cm).
- C. Fire-Rated, Insulated Flush Access Doors with Concealed Flanges:
1. Basis-of-Design Product: Cendrex, Inc.; PFI-GYP Fire Rated Insulated Access Door with Drywall Flange.
 2. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide frame with gypsum board beads for concealed flange installation.
 - a. Maximum Size, Horizontal Applications:
 - 1) 24 inch x 36 inch (WxH) (610 mm W x 914 mm H).
 - b. Maximum Size, Vertical Applications: 48 inch x 48 inch (1219 mm x 1219 mm).
 3. Locations: Wall and ceiling.
 4. Fire-Resistance Rating: Not less than 1 hour.
 5. Temperature-Rise Rating: 450 deg F (250 deg C) at the end of 30 minute. 250 deg F (139 deg C) at the end of 30 minutes.
 6. Powder-Coated Steel Sheet for Door: Nominal 0.040 inch (1.02 mm), 20 gauge galvaneal steel door.
 - a. Finish: Steel finish with DuPont white powder coat primer.
 - b. Finish: Optional galvaneal steel finish, galvaneal (satin-coated) steel with DuPont white powder coat primer.
 7. Stainless-Steel Sheet for Door: Nominal 0.038 inch (0.95 mm), 20 gauge.
 - a. Finish: Type No. 304 stainless steel with No. 4 brushed finish.
 8. Doors: 20-gauge galvaneal (satin coated) steel door with 2 1/4 inch (57 mm) depth sandwich type assembly.
 9. Frame Material: 16 gauge cold rolled steel of 2 1/2 inch (64 mm) depth with 1 inch (25.4 mm) flange at perimeter with 1/4 inch (6 mm) mounting holes.
 10. Hinges: Flush continuous piano hinge.

11. Latching/Locking Devices:
 - a. Latch: Standard, self-latching tool-key operated slam latch and/or ring operated slam latch, both included. Quantity varies with size of door. (Refer to manufacturer's literature.)
 - b. Latch: Option, key operated cylinder cam latch with 2 keys per lock, keyed alike.
 - c. Latch: Option, hex head cam latch, regular 1/4 inch (6 mm) Allen head.
 - d. Latch: Option, mortise deadbolt lock prepared to accept a mortised cylinder 1 5/32 inches (29 mm) in diameter.
12. Automatic Closure Devices: Spring operated automatic closure devices for each door. Number of springs varies with size of door (Refer to manufacturer's literature).
13. Interior Latch Release: Mechanisms to allow panels to open from inside, standard on all doors over 12 inches x 12 inches (305 mm x 305 mm).
14. Insulation: 2 inch (51 mm) thick fire rated mineral wool.
15. Masonry Anchors: Option available on all sizes.

2.3 EXTERIOR (MODEL XT) FLUSH ACCESS DOORS:

1. Description: Weatherproof assembly, with face of door fit flush with frame and with exposed frame. Include extruded door gaskets and nominal 1- 3/4 inch- (45-mm) thick closed-cell polyurethane insulation.
2. Locations: Wall and ceiling.
3. Door Size: 12-inches by 12-inches.
4. Door Material: Stainless-steel; 0.025 inch (0.64 mm), 24 gauge, 2B finish.
5. Latch and Lock: Cam latch operated by handle, with keyed lock in handle.
6. Options: Frame drip cap or Padlock hasp.

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 1. Flush door edges shall be bent on all sides to prevent bending and sagging of the panel when installed in ceilings.
 2. For concealed flanges with drywall bead, provide edge trim for gypsum board and gypsum base securely attached to perimeter of frames.
 3. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
 4. Provide mounting holes in frames for attachment of units to metal or wood framing.
 5. Provide mounting holes in frame for attachment of masonry anchors.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 1. For cylinder locks, furnish two keys per lock and key all locks alike.
 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.
- F. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead-free and chromate-free, universal primer immediately after surface preparation and pretreatment.
 2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.
- E. Stainless-Steel Finishes:
 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. Directional Satin Finish: No. 4.
 3. Bright, Cold-Rolled, Unpolished Finish: No. 2B.
- F. Aluminum Finishes:
 1. Mill finish.
 2. Clear Anodic Finish: AAMA 611 or thicker.

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames. Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of fire rated access doors.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 08 52 00

VINYL CLAD WOOD WINDOWS

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. Section includes vinyl-clad wood windows.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for wood windows.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Product Schedule: For wood windows. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of wood window, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An installer acceptable to wood window manufacturer for installation of units required for this Project.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood 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: Ten years from date of Substantial Completion.
 - c. Aluminum-Cladding Finish: 10 years from date of Substantial Completion.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Deliver materials to Project in manufacturer's original unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials and accessories protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by manufacturer off ground, under cover and not exposed to weather and construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Vinyl-Clad Wood Windows:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Andersen Windows; Andersen Corporation.
- B. Source Limitations: Obtain wood windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
1. Window Certification: WDMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
1. Minimum Performance Class: CW.
 2. Minimum Performance Grade: 50.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.32 Btu/sq. ft. x h x deg F (1.83 W/sq. m x K).
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30.
- E. Windborne-Debris Resistance: Capable of resisting impact from windborne debris based on testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 and requirements of authorities having jurisdiction.

2.3 WOOD WINDOWS

- A. Operating Types: Provide the following operating types in locations indicated on Drawings:
1. Casement, Awning as indicated on drawings.
 2. Casement Performance Class LC and Grade, Non-Impact-Resistant: PG50
 3. Awning Performance Class LC and Grade, Non-Impact-Resistant: PG50.
- B. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch (0.8 mm) deep by 2 inches (51 mm) wide; water-repellent preservative treated.
1. Frame: Finger-jointed or laminated veneer lumber capped with rigid vinyl, preservative treated WDMA I.S. 4.
 2. Interior Sash: Solid lumber, kiln dried and suitable for stain or painted finish, preservative treated WDMA I.S. 4.
 3. Exterior Sash: Co-extruded rigid vinyl or liquid-applied vinyl over finger-jointed lumber.
 4. Exterior Finish:
 - a. Frame and Sash: AAMA 613/614 for color retention,
 - b. Trim: AAMA 623/AAMA 624 for color retention, Color as selected from manufacturer's standard colors
 - c. Color: As selected from manufacturer's standard colors.
- C. Insulating-Glass Units: ASTM E 2190
1. Glass: ASTM C 1036, Type 1, Class 1, q3.

- a. Tint: Clear.
 - b. Kind: Fully tempered with Stormwatch® by Anderson Windows or approved equal.
2. Lites: Two.
3. Filling: Fill space between glass lites with argon.
4. Low-E Coating: Low E-4®, with Heatlock™ by Andersen Windows or approved equal.
- D. Air Infiltration Requirements:
 1. 1. Air Infiltration Rate: < 0.2 cfm/sf².
- E. Environmental Certifications:
 1. 1. ENERGY STAR performance requirements.
 2. 2. Indoor air quality performance.
- F. Weatherstrip:
 1. Type and Material for Casement and Awning: Flexible vinyl bulb or vinyl covered foam gasket.
- G. Attachment Flange:
 1. 1. Type and Material for Double-Hung or Gliding: Attached rigid vinyl.
 2. 2. Type and Material for Casement or Awning: Integral rigid vinyl.
- H. 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: Manufacturer Standard, White Color
 2. Window Opening Control Device and Color: Provide device to restrict operable sash to less than four inches maximum clear opening, releasable in compliance with ASTM F2090, White.
- I. Window Hardware:
 1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
 2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
 3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.
- J. Awning and Casement Window Hardware
 1. Operator Gear Type and Material: Rotary, die-cast zinc and stainless-steel components.
 2. Hinge Type and Material: Concealed hinge and track, standard, 400 series galvanized steel.
 3. Crank Handle Material and Style:
 - a. Match Windows in Modular Structure from the following types
 - 1) Estate, Traditional Folding, and Contemporary folding.
 4. Sash Lock Type and Material: Single actuation, die-cast zinc and engineered polymer components.

5. Crank and Sash Lock Color, Traditional Folding: Owner Selected from the following options:
 - a. Gold Dust, White, Black, Stone, Antique Brass, Bright Brass, Brushed Chrome, Distressed Bronze, Distressed Nickel, Oil-Rubbed Bronze, Polished Chrome, Satin Nickel.
 6. Crank and Sash Lock Color, Contemporary Folding: Owner Selected from the following options
 - a. Black, Bright Brass, Gold Dust, Oil-Rubbed Bronze, Satin Nickel, Stone, White.
 7. Crank and Sash Lock Color, Estate: Owner selected from the following
 - a. Antique Brass, Bright Brass, Brushed Chrome, Distressed Bronze, Distressed Nickel, Oil-Rubbed Bronze, Polished Chrome, Satin Nickel.
 8. Window Opening Control Device and Color: Provide device to restrict operable sash to less than four inches maximum clear opening, releasable in compliance with ASTM F2090, White.
- K. Divided Lights:
1. Type: False muntin.
 - a. Width: Match modular building window.
 - b. Exterior Attachment: Permanently adhered to glass.
 - c. Glass Spacer Material: Stainless steel.
 - d. Interior Attachment: Permanently adhered to glass.
 - e. Pattern: Tall Fractional.
 - f. Exterior Material and Color: Fibrex composite.
 - g. Interior Wood Species: Match modular building window.
 - h. Interior Wood Finish: Match modular building window.
 2. Type: Contoured Finelight profile, factory installed between glass.
 - a. Pattern: As shown in Drawings.
 - b. Width, Shape and Color: Match modular building window
 - c. Material: Aluminum.
- L. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- M. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
- N. Exterior Trim and Accessories:
1. Type: 1x4 Trim and Drip cap as noted on drawings..
 2. Material: Solid Cedar .
 3. Finish and Color: Pre-finished.
- O. Mullions: Laminated veneer lumber configured to be structurally sound and designed in accordance with AAMA 450.

2.4 Non-Impact Resistant Glazing

- A. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- B. Glass Units: Provide insulating glass units certified through Insulating Glass Certification Council as conforming to the requirements of IGCC and ASTM E2190
 - 1. Manufacturer Designation: Andersen Low-E4 Glass. With HeatLock Technology where noted.
 - 2. Glazing Configuration: Dual pane.
 - 3. Seal and Spacer Type: Dual sealed insulating glass units with polyisobutylene primary seal, silicone secondary seal and stainless steel spacers.
 - 4. Glass Type: Annealed glass, ASTM C1036, where noted Fully tempered glass, ASTM C1048.
 - 5. Opacity: None.
- C. Thermal Transmission (U-Factor), NFRC 100:
 - 1. Casement/Awning: 0.25 without grilles, 0.26 with grilles.
- D. Solar Heat Gain Coefficient (SHGC), NFRC 200:
 - 1. Casement: 0.31 without grilles, 0.28 with grilles.
 - 2. Casement fixed: 0.34 without grilles, 0.31 with grilles.
 - 3. Awning: 0.30 without grilles, 0.28 with grilles.
- E. Visible Light Transmittance (VLT), NFRC 200:
 - 1. Casement: 0.52 without grilles, 0.47 with grilles.
 - 2. Awning: 0.51 without grilles, 0.47 with grilles.
 - 3. Casement fixed: 0.58 without grilles, 0.52 with grilles.
- F. D. Sound Transmission Class (STC)/Outdoor Indoor Transmission Classification (OITC), ASTM E90:
 - 1. Casement: 26/22.
 - 2. Casement fixed: 29/25.
 - 3. Awning: 26/21.

2.5 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
 - 1. Type and Location: Full, outside for sliding sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
 - 1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
 - 2. Finish for Exterior Screens: Matching color and finish of cladding.

- C. Glass-Fiber Mesh Fabric: 18-by-14 (1.1-by-1.4-mm) or 18-by-16 (1.0-by-1.1-mm) mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656.
 - 1. Mesh Color: Manufacturer's standard.

2.6 FABRICATION

- A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze wood windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Mullions: Provide mullions and cover plates, matching 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.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. 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.
- C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Gypsum Board and Joint Treatments.
- B. Mold and Mildew Resistant Gypsum Board.
- C. Exterior Gypsum Sheathing Fiberglass Mat Faced
- D. Related Accessories.

1.2 REFERENCES

- A. American National Standards Institute (ANSI/ASSE).
- B. ASTM International (ASTM).
 - 1. ASTM C 473 - Standard Test Methods for Physical Testing of Gypsum Panel Products.
 - 2. ASTM C 475 - Standard Specification for Joint Compound and Joint Tape for Finishing.
 - 3. ASTM C 514 - Standard Specifications for Nails for the Application of Gypsum Board.
 - 4. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board.
 - 5. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - 6. ASTM C 1178 - Standard Specification for Coated Glass Mat Water Resistant Gypsum Backing Panel.
 - 7. ASTM C 1280 - Standard Specification for Application of Gypsum Sheathing.
 - 8. ASTM C 1658 - Standard Specification for Glass Mat Gypsum Panels.
- C. Gypsum Association (GA).
 - 1. GA-214 - Recommended Levels of Gypsum Board Finish.
 - 2. GA-216 - Application and Finishing of Gypsum Panel Products.
 - 3. GA-231 - Assessing Water Damage to Gypsum Board.
 - 4. GA-238 - Guidelines for the Prevention of Mold Growth on Gypsum Board
 - 5. GA-253 - Application of Gypsum Sheathing.
 - 6. GA-801 - Handling and Storage of Gypsum Panel Products: A Guide For Distributors, Retailers, and Contractors.
- D. Occupational Safety and Health Administration (OSHA).
- E. Underwriters Laboratories (UL).

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 – “Submittal Procedures”.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Comply with ASTM C 840 or GA-216 requirements, whichever are more stringent.
- B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.
- C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- D. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
 - 1. American Gypsum.
 - 2. CertainTeed Gypsum, Inc.
 - 3. Georgia-Pacific Gypsum
 - 4. National Gypsum Co.
 - 5. Pabco Gypsum, Inc.
 - 6. USG Corporation.
- B. Substitutions: or equal.
- C. Requests for substitutions will be considered in accordance with Section 01 60 00 – Product Requirements.
 - 1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 GYPSUM PRODUCTS, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area that correspond with the support system indicated.
- B. Recycled Content: Provide gypsum panel products with recycled content such that post consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum 50 percent by weight.

2.3 INTERIOR GYPSUM MATERIALS

- A. Regular Gypsum Board: Gypsum core panel surfaced with paper on front and back edges and complying with ASTM C 1396 and ASTM C 36.
 - 1. Thickness: 1/2 inch (12.7 mm), unless otherwise indicated.
 - 2. Width: 48 inches (1219 mm).
 - 3. Length: Use longest length available, avoiding unnecessary joints.
 - 4. Edges: Use square, rounded tapered, or tapered per required application.
- B. Regular Mold Resistant Gypsum Board: Gypsum core panel enhanced with moisture-resistant wax emulsion and chemically treated to resist mold and mildew in the core and surfaced with mold and mildew resistant paper on front, back and long edges and complying with ASTM C 1396 Section 7 and ASTM C 630.
 - 1. Thickness: 1/2 inch (12.7 mm), unless otherwise indicated.
 - 2. Width: 48 inches (1219 mm).
 - 3. Length: Use longest length available, avoiding unnecessary joints.
 - 4. Edges: Use square, rounded tapered, or tapered per required application.
 - 5. Mold and Mildew Resistance: Panel score of 10 when tested in accordance with ASTM D 3273.

2.4 GYPSUM JOINT TREATMENT AND FINISH PRODUCTS

- A. Joint Treatment Tape: Complying with ASTM C 475 and GA-216.
- B. Joint Compound: Vinyl type pre-mixed compound; complying with ASTM C 475.
- C. Joint Compound: Level Five vinyl type pre-mixed compound; off-white color or tinted gray color; complying with ASTM C 475 and fulfilling ASTM C 840; designed for joint finishing of Level Five gypsum board.

2.5 EXTERIOR GYPSUM SHEATHING FIBERGLASS-MAT FACED

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Georgia Pacific Gypsum LLC. Fire Rated Fiberglass-Mat Faced Gypsum Board: DensArmor Plus Fireguard
 - 2. Pabco Gypsum, a Division of Pabco Building Products, LLC. Pabco Glass Type X Sheathing Fire Resistant Gypsum Core Moisture/Water Resistant Coated fiberglass Mat Face
 - 3. Approved Equal.
- B. 5/8 Inch Fire-Rated Fiberglass-Mat Faced Gypsum Board:
 - 1. Thickness: 5/8 inch.

2. Width: 4 feet.
3. Length: 8 feet.
4. Weight: 2.5 pounds per square foot.
5. Edges: Tapered.
6. Surfacing: Coated fiberglass mat on face, back, and long edges.
7. Flexural Strength, Parallel (ASTM C473, ASTM C1658): Not less than 100 lbf.
8. Flexural Strength, Perpendicular (ASTM C473, ASTM C1658): Not less than 140 lbf.
9. R-Value (ASTM C518): Not less than 0.67.
10. Nail Pull Resistance (ASTM C473, ASTM C1658): Not less than 90 lbf.
11. Humidified Deflection (ASTM C473, ASTM C1658): Not more than 1/8 inch.
12. Hardness, Core, Edges, and Ends (ASTM C473, ASTM C1396): Not less than 15.
13. Water Absorption (ASTM C630, ASTM C1396, ASTM C1658): Less than 5 percent of weight.
14. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
15. Microbial Resistance (ASTM D6329): Will not support microbial growth.

2.6 ACCESSORY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Corner Bead: Formed galvanized steel angle, min. base steel 0.014 in. thick, and complying with ASTM C 1047.
- C. Casing Bead: Formed galvanized steel or vinyl trim, matching existing application and complying with ASTM C 1047, type(s) as follows:
 1. J-shaped U-bead, for face nailing and finishing with joint treatment.
 2. J-shaped U-bead, requiring no finishing.
 3. L-shaped, for application over edge and finishing with joint treatment.
- D. Control Joint: Extruded vinyl formed with V-shaped slot covered with removable flexible vinyl strip; complying with ASTM C 1047.
- E. Control Joint: Bent zinc sheet formed with V-shaped slot, covered with plastic tape, with perforated flanges; complying with ASTM C 1047.
- F. Screws: ASTM C 954 or ASTM C 1002 or both with heads, threads, points, and finish as recommended by panel manufacturer.
- G. Nails: ASTM C 514 with heads, lengths, configurations, and finish as recommended by panel manufacturer.
- H. Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable type as recommended by panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.2 INSTALLATION

- A. Application: Apply and maintain conditions during installation in accordance with GA-216 and GA-238 and as follows:
 - 1. Keep gypsum board dry throughout application.
 - 2. Do not use gypsum board that has visible mold growth.
 - 3. Apply gypsum board on walls with a minimum 1/4 inch (6.4 mm) gap between the gypsum board and the floor.
 - 4. Do not apply gypsum board over other building materials where conditions exist that are favorable to mold growth.
 - 5. Maintain a sound weather-tight building envelope including, such elements as the roof, sealants, windows, etc.
 - 6. Immediate and appropriate remediation measures must be taken as soon as water leaks or condensation sources are identified.
 - 7. If gypsum board is damaged by water, assess the need for replacement in accordance with GA-231.
- B. Install accordance with GA 216 and the following:
 - 1. Gypsum Sheathing Board: ASTM C 1280 and GA-253.
 - 2. Gypsum Board and Joint Treatment: ASTM C 840 and GA-214.
 - 3. Gypsum panel manufacturer's published recommendations.
- C. Finishing: Tape, fill, sand and finish joints in accordance with ASTM C 840 and GA-214.
 - 1. Level 2: Water resistant gypsum backing board indicated to receive tile.
 - 2. Level 4: Gypsum board indicated to receive light textured coatings and light-grade wall coverings.
 - 3. Level 5: All other gypsum board.

END OF SECTION

SECTION 09 30 00

TILING

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. Section Includes:
 - 1. Floor and Wall Tile.
 - 2. Trims.
 - 3. Tile Setting Materials.
 - 4. Related Accessories.

1.3 REFERENCES

- A. American National Standards Institute (ANSI/ASSE).
- B. ASTM International (ASTM).
- C. Occupational Safety and Health Administration (OSHA).
- D. Underwriters Laboratories (UL).
- E. Tile Council of North America (TCNA).

1.4 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 33 00 "Submittal Procedures".
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.
- D. Selection Samples: At MCA's request submit a complete set of tile samples that represent the full range of manufacturer's products, colors and patterns available.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging until ready for installation.
- B. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.
- C. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.
- D. Store liquid materials in unopened containers and protect from freezing.
- E. Environmental limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
 - 1. American Olean Tile Co.
 - 2. Daltile Corporation.
 - 3. Interceramic Inc.
 - 4. Merola Tile.
- B. Substitutions: or equal.
- C. Requests for substitutions will be considered in accordance with Section 01 25 00 "Substitution Procedures".
 - 1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 TILE, GENERAL

- A. Tile shall also be provided in accordance with the following:
 - 1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
 - 2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
 - 3. Factory Applied Temporary Protective Coatings: Where existing, to match, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.
- B. Source Limitations for Tile: Obtain tile of each type and color and finish from single source or producer.

2.3 FLOOR TILE

- A. Product: Ceramic Tile with composition of impervious natural clay or porcelain.
- B. Face Size and Shape: Square in dimension of 11-3/16 by 11-3/16 inches.
- C. Glaze: Coordinate selection with owner from manufacturer's full range.
- D. Tile Color and Pattern: Coordinate selection with owner from manufacturer's full range.
- E. Grout Color: Coordinate selection with owner from manufacturer's full range.
- F. Trim Units: Matching bullnose, bullnose corner, cove/inside finger cove, radius cap, sink rail, sink rail incorner/outcorner, cove base, outside cove corner, Cement Bullnose, Cove Base, Cove Base Corner, Fabric Bullnose, Groover Bullnose shapes in sizes coordinated with field tile shapes.

2.4 WALL TILE

- A. Product: Ceramic Tile with composition of impervious natural clay or porcelain.
- B. Face Size and Shape: Plain with modified square edges or cushion edges. Square in dimension of 4 by 4 inches.
- C. Finish/Glaze: Coordinate selection with owner from manufacturer's full range.
- D. Tile Color and Pattern: Coordinate selection with owner from manufacturer's full range.
- E. Grout Color: Coordinate selection with owner from manufacturer's full range.
- F. Trim Units: Matching bullnose, bullnose corner, cove/inside finger cove, radius cap, sink rail, sink rail incorner/outcorner, cove base, outside cove corner, Cement Bullnose, Cove Base, Cove Base Corner, Fabric Bullnose, Groover Bullnose shapes in sizes coordinated with field tile shapes.

2.5 THRESHOLDS

- A. General: Fabricate to sizes and profiles required to provide transition between adjacent floor finishes.
- B. Stone Thresholds: Provide stone thresholds uniform in color and finish and fabricated to match existing material type, size and finish.
 - 1. Provide to provide transition between tile surface and adjoining finishes where required.

2.6 TRIM AND ACCESSORIES

- A. Ceramic Accessories: Match existing finish, same color and finish as adjacent field tile; same manufacturer as tile.
 - 1. Soap Dish: With wash cloth holder, clam shell design, surface mounted or recessed; cast strength sufficient to resist lateral pull force of 75 lbs (34 Kg).

2. Toilet Tissue Holder: Surface mounted or recessed, for single roll, with spring loaded holder.
 3. Towel Bars: Standard design, surface mounted with extensions for casting into small wall openings; cast strength sufficient to resist lateral pull force of 30 lbs (14 Kg).
 4. Corner Shelf.
- B. Non-Ceramic Trim: Match material, finish, style and dimensions as existing and to suit application, for setting using tile mortar or adhesive; use in the following locations:
1. Open edges of floor tile.
 2. Transition between floor finishes of different heights.
 3. Thresholds at door openings.
 4. Expansion and control joints, floor and wall.

2.7 SETTING MATERIALS

- A. Epoxy Adhesive: ANSI 118.3, as required for setting tile as specified by ANSI A108.6, per Manufacturer requirements.
- B. Mortar Bed Materials: Dryset Portland Cement Mortar ANSI A118.1, Per Manufacturer requirements.
1. For wall applications provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.
- C. Mortar Bond Coat Materials: Per Manufacturer requirements.
- D. Standard Grout: ANSI A118.6, Cement grout, sanded grout for joints 1/8 inch to 1/2 inch or unsanded grout for joints up to 1/8 inch, as specified by Manufacturer; color selected by owner.
- E. Polymer modified cement grout: ANSI A118.6, Cement grout, sanded grout for joints 1/8 inch to 1/2 inch or unsanded grout for joints up to 1/8 inch, as specified by Manufacturer; color selected by owner.
- F. Epoxy Grout: ANSI A118.3, Chemical resistant water-cleanable epoxy grout. As specified by Manufacturer; color selected by owner.
- G. Silicone Sealant: 100 percent Silicone sealant, moisture and mildew resistant type, as specified by Manufacturer:
1. Elastomeric Joint Caulk: ANSI A108.01.3.7 at all joints between floors and walls and at joints between tile and dissimilar materials.
- H. Waterproofing membranes: Manufacturers standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated.
1. Fluid Applied Membrane: Liquid-latex rubber or elastomeric polymer
 2. Latex-Portland Cement Waterproof Mortar: Flexible, waterproof mortar consisting of cement-based mix and latex additive.
 3. Waterproofing and Tile-Setting Adhesive: One-part, fluid applied product intended for use as both waterproofing and tile setting adhesive in two-step process.
- I. Cementitious Backer Board: Match existing materials or per Manufacturer requirements.

2.8 MISCELLANEOUS MATERIALS

- A. Vapor Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils (0.1 mm) thick
- B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; nickel silver or half-hard brass exposed-edge material as selected by owner.
- C. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
- B. Verify that wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified by Manufacturer, and are ready to receive tile.
- C. Verify that sub-floor surfaces are dust-free, free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified by Manufacturer.
- D. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed

3.2 PREPARATION

- A. Fill cracks holes and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated: prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 WATERPROOFING INSTALLATION

- A.. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.4 INSTALLATION

- A. Preparation: Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.
 - 1. Remove any curing compounds or other contaminants.
 - 2. Vacuum clean surfaces and damp clean.
 - 3. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
 - 4. Install cementitious backer board in accordance with Manufacturer requirements and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.
- B. Install tile, grout and setting materials in accordance with applicable requirements of manufacturer's instructions, and TCA Handbook recommendations.
- C. Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.
- D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Install thresholds where required.
- H. Sound tile after setting. Replace hollow sounding units.
- I. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- J. Allow tile to set for a minimum of 48 hours prior to grouting.
- K. Grout tile joints. Use standard grout unless otherwise indicated.
- L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
- M. Comply with the manufacturer's instructions, specified industry standards and recommendations for cleaning, traffic, furnishings installation and equipment installation.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION

SECTION 09 90 00

PAINTS AND COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior Paint and Coatings Systems Including Surface Preparation.
- B. Exterior Paint and Coatings Systems Including Surface Preparation.

1.2 REFERENCES

- A. American National Standards Institute (ANSI/ASSE).
- B. ASTM International (ASTM).
- C. Master Painters Institute (MPI)
- D. Occupational Safety and Health Administration (OSHA).
- E. Painting and Decorating Contractors of America (PDCA).
- F. The Society for Protective Coatings (SSPC).
- G. Underwriters Laboratories (UL).

1.3 SUBMITTALS

- A. Product Data: For each paint system indicated, including.
 - 1. Product characteristics.
 - 2. Surface preparation instructions and recommendations.
 - 3. Primer requirements and finish specification.
 - 4. Storage and handling requirements and recommendations.
 - 5. Application methods.
 - 6. Cautions for storage, handling and installation.
- B. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.
- C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.
- D. Coating Maintenance Manual: upon conclusion of the project, the Contractor or paint manufacture/supplier shall furnish a coating maintenance manual. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

- E. Field Coating of Vinyl Siding Methods and Procedures:
 - 1. Manufacturer Guarantee: Submit letter from Manufacturer with acceptable product and application methods for coatings used on vinyl siding systems.
 - 2. Quality Assurance Plan: Submit methods and procedure plan for protection of adjacent environmental items, equipment, vehicles, adjacent structures, etc.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.
 - 1. Product name, and type (description).
 - 2. Application and use instructions.
 - 3. Surface preparation.
 - 4. VOC content.
 - 5. Environmental handling.
 - 6. Batch date.
 - 7. Color number.
- B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

1.5 EXTRA MATERIALS

- A. Furnish Owner with any unused materials. Properly seal canisters and label with finish and finish location for proper Owner storage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
 - 1. BEHR Process Corporation.
 - 2. Benjamin Moore & Co.
 - 3. The Sherwin-Williams Company.
- B. Substitutions: or equal.
- C. Requests for substitutions will be considered in accordance with Section 01 60 00 – Product Requirements.
 - 1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 PAINT MATERIALS - GENERAL

- A. Paints and Coatings.
 - 1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix

coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
 - C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.
 - D. Application to Materials: Apply paints and coatings manufacturer's specifications for application to Wood, Drywall, Plaster, Metals, etc.
 - E. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
 - F. Color: Refer to existing finishes or as selected by Owner.

2.3 INTERIOR PAINT SYSTEMS

- A. Interior Painting:
 1. Finish: Gloss, Semi-Gloss, Satin or Flat to match existing. If matching is not required, finish per Manufacturer or industry requirements for interior applications.
 2. Coats: Apply quantity of coats to match existing. If matching is not required, finish per Manufacturer or industry requirements for interior applications.
- B. Interior Primers/Sealers:
 1. Interior primers/sealers to be latex or as per Manufacturer/Industry requirements for interior applications.
- C. Interior Wood Sealers:
 1. Wood primers to be latex or as per Manufacturer/Industry requirements for interior applications.

2.4 EXTERIOR PAINT SYSTEMS

- A. Exterior Painting:
 1. Finish: Gloss, Semi-Gloss, Satin or flat to match existing. If matching is not required, finish per Manufacturer or industry requirements for exterior applications.
 2. Coats: Apply quantity of coats to match existing. If matching is not required, finish per Manufacturer or industry requirements for exterior applications.
- B. Exterior Primers/Sealers:
 1. Water based primers/sealers to be alkali resistant and/or bonding or as per Manufacturer or industry requirements for exterior applications.
- C. Exterior Wood Sealers:

1. Wood primers to be alkyd and/or latex or as per Manufacturer or industry requirements for exterior applications.
- D. Vinyl Siding:
 1. Primers and finishes as per manufacturer or industry requirements for vinyl application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared; notify MCA of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify MCA of unsatisfactory preparation before proceeding.
- B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.
 1. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify MCA immediately if lead based paints are encountered.

3.2 SURFACE PREPARATION

- A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
 1. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry a minimum of 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
 2. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
 3. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.
- B. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.
- C. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting, unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft,

porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

- D. Vinyl Siding, Architectural Plastics, EIFS and Fiberglass: Clean vinyl siding thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly. Do not paint vinyl siding with any color darker than the original color unless approved by Manufacturer.
- E. Wood: Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.3 INSTALLATION

- A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.
- B. Apply primer to all materials receiving a finish coat of paint.
- C. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.
- D. Apply coatings using methods recommended by manufacturer and uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.
- E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.
- F. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.
- G. Comply with the manufacturer's instructions, specified industry standards and recommendations for cleaning, traffic, furnishings installation and equipment installation.

END OF SECTION

SECTION 09 93 00

STAINING AND TRANSPARENT FINISHING

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. Section includes surface preparation and application of wood stains and transparent finishes on the following substrates:
 - 1. Exterior Substrates:
 - a. Exposed framing.
 - b. Dressed lumber (finish carpentry or woodwork).
 - c. Siding and Wood Trim
- B. Related Requirements:
 - 1. Section 099123 "Interior Painting" for stains and transparent finishes on concrete floors.

1.3 DEFINITIONS

- A. MPI Gloss Levels.
 - 1. MPI Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
 - 2. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
 - 3. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
 - 4. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
 - 5. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.

- B. Samples for Verification: For any alternate stain product other than those listed in this section, for each type of finish system and in each color and gloss of finish required.
 - 1. Submit Samples on representative samples of actual wood substrates, 8 inches (200 mm) square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 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. Stains and Transparent Finishes: Not less than 1 gal. (3.8 L) of each material and color applied.

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.
- B. Protect factory finished materials from elements and maintain finish integrity until and through installation.

1.7 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply finishes 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.
- C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product listed in wood finish systems schedules for the product category indicated.

2.2 MATERIALS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be 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, products shall be recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. Stain Colors:
 - 1. Owner selected color: Olympic #712 – Back Oak

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 Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with finish application only after unsatisfactory conditions have been corrected.
 - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- D. Exterior Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Prime edges, ends, faces, undersides, and backsides of wood.
 - a. For solid hide stained wood, stain edges and ends after priming.
 - b. For varnish-coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.
 - 3. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for finish and substrate indicated.
 - 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
 - 3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.
- C. Evenly apply two coats to field cut ends of factory finished dimension lumber, trim, siding, and paneling to substantially match factory finish.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage 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 finished wood surfaces.

3.5 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood Substrates: Exposed framing.
 - 1. Semitransparent Acrylic Oil Stain System – MPI EXT 6.2/6.3D:
 - a. Prime Coat: Stain, exterior, water based, semitransparent, matching topcoat.
 - b. Intermediate Coat: Stain, exterior, water based, semitransparent, matching topcoat.
 - c. Topcoat: Stain, exterior, water based, semitransparent. MPI #156.
 - 1) Olympic Maximum Sealant and Stain In one; Color #712 Black Oak.
- B. Wood Substrates: Wood trim and wood board siding.
 - 1. Semitransparent Acrylic Oil Stain System - MPI EXT 6.3D/6.4D:
 - a. Prime Coat: Stain, exterior, solvent based, semitransparent, matching topcoat.
 - b. Topcoat: Stain, exterior, solvent based, semitransparent, MPI #156.
 - 1) Olympic Maximum Sealant and Stain In one; Color #712 Black Oak.

END OF SECTION

SECTION 22 05 17

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

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. Section Includes:
 - 1. Sleeves.
 - 2. Stack-sleeve fittings.
 - 3. Grout.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Provide data on sleeves, fittings, and accessories. Provide manufacturer's catalog information.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Smith, Jay R. Mfg. Co.
 - 2. Zurn Industries, LLC.
- B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with setscrews.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Where required for project work Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 - 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- C. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves that are large enough to provide adequate annular clear space between sleeve and pipe or pipe insulation for installation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07 92 00 "Joint Sealants."
- D. Fire-Barrier Penetrations: Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07 84 13 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing.
 3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 5. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Maintain fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07 84 13 "Penetration Firestopping."

END OF SECTION

SECTION 22 05 18

ESCUTCHEONS FOR PLUMBING PIPING

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. Section Includes:

- 1. Escutcheons.
- 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- 1. Provide data on escutcheons and floor plates. Provide manufacturer's catalog information.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.
- E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
 - g. Bare Piping in Equipment Rooms: One-piece, stamped steel type.
 - 2. Escutcheons for Existing Piping:
 - a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
 - e. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
 - f. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
- C. Install floor plates for piping penetrations of equipment-room floors.

- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. New Piping: One-piece, floor-plate type.
 - 2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 22 05 23

VALVES FOR PLUMBING PIPING

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. Section Includes:
 - 1. Bronze angle valves.
 - 2. Bronze globe valves.
 - 3. Bronze ball valves.
 - 4. Bronze lift check valves.
 - 5. Bronze swing check valves.
 - 6. Bronze gate valves.
 - 7. Lubricated plug valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and soldered ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Apollo Valves; Conbraco Industries, Inc.
 - b. Crane; Crane Energy Flow Solutions.
 - c. Homestead Valve, A Division of Olson Technologies Inc.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Watts; a Watts Water Technologies company.
 - g. Zurn Industries, LLC
- C. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.5 for flanges on steel valves.
 - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 5. ASME B16.18 for solder-joint connections.
 - 6. ASME B31.9 for building services piping valves.
- D. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- G. Valve Sizes: Same as upstream piping unless otherwise indicated.
- H. Valve Actuator Types:
 - 1. Handlever: For quarter-turn valves smaller than NPS 4 (DN 100).
- I. Valves in Insulated Piping:
 - 1. Include 2-inch (50-mm) stem extensions.
 - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.
- J. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE ANGLE VALVES

A. Class 125 Bronze Angle Valves:

1. Description: Standard MSS SP-80 Type 1, CWP Rated 200 psig (1380 kPa).
 - a. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - b. Ends: Threaded.
 - c. Stem and Disc: PTFE.
 - d. Packing: Asbestos free.
 - e. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 150 Bronze Angle Valves:

1. Description: Standard MSS SP-80 Type 1, CWP Rated 300 psig (2070 kPa).
 - a. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
 - b. Ends: Threaded.
 - c. Stem and Disc: PTFE.
 - d. Packing: Asbestos free.
 - e. Handwheel: Malleable iron, bronze, or aluminum.

2.3 BRONZE GLOBE VALVES

A. Class 125 Bronze Globe Valves:

1. Description: Standard MSS SP-80 Type 1 with CWP Rating of 200 psig (1380 kPa). ASTM B62, bronze body with integral seat and screw in bonnet.
 - a. Ends: Threaded.
 - b. Stem and Disc: Bronze.
 - c. Packing: Asbestos free.
 - d. Handwheel: Malleable iron, bronze, or aluminum.

2.4 BRONZE BALL VALVES

A. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:

1. Description: Standard MSS SP-110 with CWP Rating of 600 psig (4140 kPa). Two piece body of bronze material
 - a. Ends: Threaded and soldered.
 - b. Seats: PTFE.
 - c. Stem: Bronze or brass.
 - d. Ball: Chrome-plated brass.
 - e. Port: Full.

2.5 BRONZE CHECK VALVES

A. Class 125, Lift Check Valves with Nonmetallic Disc:

1. Description: Standard MSS SP-80, Type 2 with CWP Rating of 200 psig (1380 kPa).
 - a. Body Design: Vertical flow.
 - b. Body Material: ASTM B 61 or ASTM B 62, bronze.
 - c. Ends: Threaded or soldered. See valve schedule articles.

- d. Disc: NBR, PTFE.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

- 1. Description: Standard MSS SP-80, Type 4 with CWP Rating of 200 psig (1380 kPa).
 - a. Body Design: Horizontal flow.
 - b. Body Material: ASTM B 62, bronze.
 - c. Ends: Threaded or soldered. See valve schedule articles.
 - d. Disc: PTFE.

2.6 BRONZE GATE VALVES

A. Class 125, NRS, Bronze Gate Valves:

- 1. Description: Standard MSS SP-80, Type 1 with CWP Rating of 200 psig (1380 kPa)
 - a. Body Material: Bronze with integral seat and screw-in bonnet.
 - b. Ends: Threaded or solder joint.
 - c. Stem: Bronze.
 - d. Disc: Solid wedge; bronze.
 - e. Packing: Asbestos free.
 - f. Handwheel: Malleable iron, bronze, or aluminum.

2.7 LUBRICATED PLUG VALVES

A. Class 125, Lubricated Plug Valves with Threaded or Flanged Ends:

- 1. Description: Standard MSS SP-78, Type I single gland
 - a. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), CWP Rating: 200 psig (1380 kPa).
 - b. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
 - c. Pattern: Regular or short venturi.
 - d. Plug: Cast iron or bronze with sealant groove.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.

- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Lift Check Valves: With stem upright and plumb.
- F. Install valve tags.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. Use gate valves for shutoff service only.
- B. If valve applications are not indicated, use the following:
 - 1. Throttling Service except Steam: Globe valves.
- C. Pump-Discharge Check Valves: If valve applications are not indicated, use the following:
 - 1. NPS 2 (DN 50) and Smaller: Bronze swing check valves with nonmetallic disc.
- D. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- E. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.

2. Two-piece, bronze ball valves with full port and bronze or brass trim.

B. Pipe NPS 2 (DN 50) and Smaller: Bronze gate valves, Class 125, NRS with soldered or threaded ends.

3.5 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller: Bronze globe valves, Class 125, bronze disc, with threaded ends.

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING & EQUIPMENT

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. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Fiberglass pipe hangers.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.
 - 5. Pipe positioning systems.
 - 6. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Show fabrication and installation details for the following; include Product Data for the components:

1. Hangers.
2. Equipment supports.
3. Guides

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

- B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

- C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1, steel pipe hanger except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of stainless steel.

B. Strap-Type, Fiberglass Pipe Hangers:

1. Shall not be used.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. National Pipe Hanger Corporation.
2. Pipe Shields Inc.
3. Piping Technology & Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1 inch.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

- F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 - 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 14. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 15. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 - 16. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 - 17. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

18. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 10. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 11. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 12. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

13. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- P. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.
- Q. Maximum hanger spacing as indicated:

Piping Material	Maximum Horizontal Spacing (ft)	Maximum Vertical Spacing (ft)
Cast iron	5	15
Copper or copper alloy	12	10
PEX	2.5	10
CPVC (1 inch and smaller)	3	10
PVC	4	10

END OF SECTION

SECTION 22 05 33

HEAT TRACING FOR PLUMBING PIPING

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. Section includes plumbing piping heat tracing for freeze prevention on the house's water service riser and the house's sanitary service riser. The plumbing piping heat tracing system shall be a self-regulating parallel resistance type

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
 - 2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.
- B. Shop Drawings: For electric heating cable.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Chromalox, Inc.
 - 2. Delta-Therm Corporation.
 - 3. Nelson Heat Trace.
 - 4. Raychem; Tyco Thermal Controls.
 - 5. Thermon Americas Inc.
 - 6. Trasor Corp.
- B. Comply with IEEE 515.1.
- C. Heating Element: Pair of parallel No. 16 AWG, tinned or nickel-coated, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating. Self-regulating heating cable shall be designed for a useful life of 20 years or more with "power on" continuously
- D. Electrical Insulating Jacket: Flame-retardant polyolefin.
- E. Cable Cover: Tinned-copper braid and polyolefin outer jacket with ultraviolet inhibitor.
- F. Maximum Operating Temperature (Power On): 150 deg F.
- G. Maximum Exposure Temperature (Power Off): 185 deg F.
- H. 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.
- I. Capacities and Characteristics for Water Service:
 - 1. Maximum Heat Output: 10 W/ft.
 - 2. Piping Diameter: Copper Water Service Piping
 - 3. Number of Parallel Cables: 2.
 - 4. Spiral Wrap Pitch: Pitch sufficient to encase one revolution of pipe per one vertical/linear foot rise/run.

5. Electrical Characteristics for Single-Circuit Connection:

- a. Volts: 120.
- b. Phase: Single.
- c. Hertz: 60.

J. Capacities and Characteristics for Sanitary Service:

- 1. Maximum Heat Output: 10 W/ft.
- 2. Piping Diameter: Sanitary Service Piping
- 3. Number of Parallel Cables: 2.
- 4. Spiral Wrap Pitch: Pitch sufficient to encase one revolution of pipe per one vertical/linear foot rise/run.
- 5. Electrical Characteristics for Single-Circuit Connection:
 - a. Volts: 120.
 - b. Phase: Single.
 - c. Hertz: 60.

2.2 CONTROLS

A. Pipe-Mounted Thermostats for Freeze Protection:

- 1. Remote bulb unit with adjustable temperature range from 30 to 50 deg F.
- 2. Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.
- 3. Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.
- 4. Corrosion-resistant, waterproof control enclosure.

B. Programmable Timer for Domestic Hot-Water-Temperature Maintenance:

- 1. Microprocessor based.
- 2. Minimum of four separate schedules.
- 3. Minimum 24-hour battery carryover.
- 4. On-off-auto switch.
- 5. 365-day calendar with 20 programmable holidays.
- 6. Relays with contacts to indicate operational status, on or off, and for interface with central HVAC control-system workstation.

2.3 ACCESSORIES

- A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

- B. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.
 - 1. Width for Markers on Pipes with OD, including insulation, less than 6 inches: 3/4 inch minimum.
 - 2. Width for Markers on Pipes with OD, including insulation, 6 inches or larger: 1-1/2 inches minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Install the following types of electric heating cable for the applications described:
 - 1. Freeze Protection for Piping: Self-regulating, parallel-resistance heating cable.
 - 2. Temperature Maintenance for Domestic Hot Water: Self-regulating, parallel-resistance heating cable.

3.3 INSTALLATION

- A. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.
- B. Electric Heating-Cable Installation for Freeze Protection for Piping:
 - 1. Install electric heating cables after piping has been tested and before insulation is installed.
 - 2. Install electric heating cables according to IEEE 515.1.
 - 3. Install insulation over piping with electric cables according to Section 22 07 19 "Plumbing Piping Insulation."
 - 4. Install warning tape on piping insulation where piping is equipped with electric heating cables.
- C. Electric Heating-Cable Installation for Temperature Maintenance for Domestic Hot Water:

1. Install electric heating cables after piping has been tested and before insulation is installed.
2. Install insulation over piping with electric heating cables according to Section 22 07 19 "Plumbing Piping Insulation."
3. Install warning tape on piping insulation where piping is equipped with electric heating cables.

- D. Set field-adjustable switches and circuit-breaker trip ranges.

3.4 CONNECTIONS

- A. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:
1. Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.
 2. Test cables for electrical continuity and insulation integrity before energizing.
 3. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.
- D. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.
- E. Cables will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.6 PROTECTION

- A. Protect installed heating cables, including nonheating leads, from damage during construction.
- B. Remove and replace damaged heat-tracing cables.

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

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. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Sanitary waste piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 2. Detail attachment and covering of heat tracing inside insulation.
 3. Detail application of field-applied jackets.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Pittsburgh Corning Corporation.
 - 2. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Aeroflex USA, Inc.
 - b. Armacell LLC.
 - c. K-Flex USA.
- H. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Knauf Insulation.
 - b. Manson Insulation Inc.
 - c. Owens Corning.
 - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
 - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- E. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
- F. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- G. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: 60 percent by volume and 66 percent by weight.
 - 4. Color: White.

2.5 SEALANTS

- A. Sealant Manufacturers

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Eagle Bridges - Marathon Industries.
 - c. Foster Brand; H. B. Fuller Construction Products.
 - d. Mon-Eco Industries, Inc.
 - e. Pittsburgh Corning Corporation.
- B. Joint Sealants:
 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Permanently flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 100 to plus 300 deg F.
 4. Color: White or gray.
 5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. FSK and Metal Jacket Flashing Sealants:
 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 4. Color: Aluminum.
 5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 4. Color: White.
 5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. P.I.C. Plastics, Inc.
 - c. Proto Corporation.
 - d. Speedline Corporation.
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: White.
 - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pittsburgh Corning Corporation.
 - b. Polyguard Products, Inc.

2.9 TAPES

- A. Manufacturers of tapes may include the following
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division.
 - b. Compac Corporation.
 - c. Ideal Tape Co., Inc.; an American Biltrite company.
 - d. Knauf Insulation.
 - e. Venture Tape.
- B. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- C. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Width: 3 inches.
 2. Thickness: 6.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- D. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Width: 2 inches.
 2. Thickness: 6 mils.
 3. Adhesion: 64 ounces force/inch in width.
 4. Elongation: 500 percent.
 5. Tensile Strength: 18 lbf/inch in width.
- E. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Width: 2 inches.
 2. Thickness: 3.7 mils.
 3. Adhesion: 100 ounces force/inch in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

- A. Bands:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. ITW Insulation Systems; Illinois Tool Works, Inc.
 - b. RPR Products, Inc.
 2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
 3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, galvanized steel.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. C & F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges, Fittings, Elbows, Valves and Pipe Specialties:

1. Install preformed pipe insulation to outer diameter of pipe flange, as straight segments of pipe insulation when available over pipe fittings and elbows, and preformed sections to valve bodies. Use mitered sections of insulation if preformed sections are not available. Secure according to manufacturer's written instructions.
2. Make width of insulation section same as overall width of flange and bolts, fittings, elbows, valves and pipe specialties, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
5. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges, Pipe Fittings, Elbows, Valves, and Pipe Specialties:
 1. Install pipe insulation to outer diameter of piping component where appropriate.
 2. Install mitered sections of pipe insulation where preformed sections are not available.
 3. Where preformed sections are not available for valves; Install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 4. Make width of insulation section same as overall width of flange and bolts, fittings, elbows, valves and pipe specialties, plus twice the thickness of pipe insulation.
 5. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 6. Secure insulation to flanges, fittings, elbows, valves, and pipe specialties. Seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges, Pipe Fittings, Elbows, Valves, and Pipe Specialties:

1. Install preformed pipe insulation to outer diameter of pipe flange, as straight segments of pipe insulation when available over pipe fittings and elbows, and preformed sections to valve bodies.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
5. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
6. When preformed insulation for elbows, fittings, valves, and pipe specialties are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.10 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by MCA. Vary first and second coats to allow visual inspection of the completed Work.

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by MCA, by removing field-applied jacket and insulation in layers in reverse order of their installation.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.

3.13 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Flexible Elastomeric: 1 inch thick.

- c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

- 1. All Pipe Sizes: Insulation shall be one of the following:

- a. Cellular Glass: 1-1/2 inches thick.
- b. Flexible Elastomeric: 1 inch thick.
- c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Sanitary Waste Piping Where Heat Tracing Is Not Installed:

- 1. All Pipe Sizes: Insulation shall be one of the following:

- a. Cellular Glass: 2 inches thick.
- b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Domestic Water Piping Where Heat Tracing Is or Is not Installed:

- 1. All Pipe Sizes: Insulation shall be one of the following:

- a. Cellular Glass: 2 inches thick.
- b. Flexible Elastomeric: 2 inches thick.
- c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

B. Sanitary Waste Piping Where Heat Tracing Is or Is not Installed:

- 1. All Pipe Sizes: Insulation shall be one of the following:

- a. Cellular Glass: 2 inches thick.
- b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.15 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Sanitary Waste Piping, All Sizes, Where Heat Tracing Is Installed:

- 1. All Pipe Sizes:

- a. Cellular glass, 2 inches thick.
- b. Flexible Elastomeric: 2 inches thick.

3.16 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. No Jacket Required.
- D. Piping, Exposed:
 - 1. PVC: 20 mils thick.

3.17 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. PVC: 30 mils thick.
 - 2. Other Jacket Type acceptable to MCA.
- D. Piping, Exposed:
 - 1. PVC: 30 mils thick.
 - 2. Other Jacket Type acceptable to MCA.

3.18 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

- A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION

SECTION 22 11 13

FACILITY WATER DISTRIBUTION PIPING

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.
- B. Regional Water Authority 'Rules and Regulations for Water Service' latest edition.

1.2 SUMMARY

- A. This Section includes water-distribution piping and related components outside the building for water service, fire service mains, and combined water service/fire service mains. The Regional Water Authority (hereinafter referred to as "Water Company") has authority for the water service for this site and will provide water meters if needed. The Water Company will issue final approval on any water main design prior to construction.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation. Contractor is required to coordinate installation by utility company.
- C. If the size of the existing service pipe or its location or characteristics going to be changed, then the Contractor needs to apply for a new or modified service must be filed with the Water Company. The Contractor is responsible for obtaining a new or modified service with the Water Company. All costs for the service change are the responsibility of the Contractor including the Water Company's portion of the service and disconnection of the old service.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Shop Drawings shall be submitted for the following:
 - 1. Pipe and Fittings
 - 2. Valves
 - 3. Vaults
 - 4. Pits
 - 5. Enclosures

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- B. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Water valves and specialties to include in an emergency, operation, and maintenance manuals.
- B. As Built Drawings: Upon completion and acceptance of work,

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
 - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
 - 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. 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.
- D. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- F. NSF Compliance:
 - 1. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.

2. Protect valves against damage to threaded ends and flange faces.
 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
1. Notify MCA no fewer than 3 days in advance of proposed interruption of service.
 2. Do not proceed with interruption of water-distribution service without MCA's written permission.

1.9 COORDINATION

- A. Coordinate connection to water main with utility company.
- B. The size shall be approved by the Water Company.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Service pipes need to be minimum of 1 inch in diameter and must be of Type L hard drawn copper tubing. The material must conform to the latest revision standard specification for seamless copper water tube, ASTM B88.
- B. Fittings for underground copper service pipe should be flared or Iron Pipe Size (I.P.S.) thread connections only, and conform to the latest revision of AWWA Standard C800.
- C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- D. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.2 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8, BCuP Series copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.3 PIPING SPECIALTIES

- A. Nonfreeze Wall Hydrants
 - 1. Standard: ASME A112.21.3M for exposed outlet, self-draining wall hydrants.
 - 2. Pressure Rating: 125 psig (860 kPa).
 - 3. Operation: Loose key.
 - 4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
 - 5. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25) or match existing.
 - 6. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
 - 7. Nozzle and Wall-Plate Finish: Match Existing
- B. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- C. Tubular-Sleeve Pipe Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products approved by the Authorizing water utility company.
 - 2. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined approved by the Authorizing water utility company.
- D. Split-Sleeve Pipe Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products approved by the Authorizing water utility company.
 2. Description: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners approved by the Authorizing water utility company.
- E. Flexible Connectors:
1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
 2. Ferrous-Metal Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.
- F. Dielectric Fittings: Combination of copper alloy and ferrous; threaded, solder, or plain end types; and matching piping system materials.
1. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material that isolates dissimilar metals and ends with inside threads according to ASME B1.20.1.
 2. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure to suit system pressures.
 3. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.
 4. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F.
 5. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types, and 300-psig minimum working pressure at 225 deg F.

2.4 CORROSION-PROTECTION PIPING ENCASEMENT

- A. Encasement for Underground Metal Piping:
1. Standards: ASTM A 674 or AWWA C105.
 2. Form: Tube.
 3. Material shall be one of the following:
 - a. LLDPE film of 0.008-inch (0.20-mm) minimum thickness.
 - b. LLDPE film of 0.008-inch (0.20-mm) minimum thickness, or high-density, crosslaminated PE film of 0.004-inch (0.10-mm) minimum thickness.
 - c. High-density, crosslaminated PE film of 0.004-inch (0.10-mm) minimum thickness.
 4. Color: Natural.

2.5 VALVES

A. Curb Valves

1. Curb valves 2 inches and smaller should be Teflon (PTFE) coated ball type without drain and 90° stops. Brass components should conform to the latest revision of AWWA Standard C800/ASTM B-62 (85-5-5-5).
2. Curb valves 4 inches and larger should be resilient seated, fusion bond-ed, epoxy coated M.J. gate valves and should open right (clockwise). Valves should conform to the latest revision of AWWA Standard C-509. Interior and exterior fusion bonded epoxy coating should conform to the latest revision of AWWA Standard C-550.
3. Buried valves must have a 2 inch square operating nut.

B. Service Valves

1. Service valves 2 inches and smaller should be PTFE coated ball type, without drain, furnished with locking provision and integral meter saddles as approved by the Authorizing water utility company. Brass components should conform to the latest revision of AWWA Standard C800/ASTM B62 (85-5-5-5). The use of gate valves is prohibited.
2. Service valves 4 inches and larger should be resilient seated, fusion bonded, epoxy coated flanged gate valves and should open right (clockwise). Valves should conform to the latest revision of AWWA Standard C-509. Interior and exterior fusion bonded epoxy coating should conform to the latest revision of AWWA Standard C-550. Non-buried service valves will have an operating wheel.
3. Outside stem and yoke (OS & Y) valves are required on fire services 4 inches and larger.

C. Curb Boxes

1. Curb boxes for 1 inch and 1-1/4 inch curb valves must be of the Buffalo Screw Type with 3 inch diameter shaft. Whenever a curb box is exposed to vehicular traffic, it must be of the Roadway Type.
2. Curb boxes for 1-1/2 inch through 2-1/2 inch curb valves should be of the Roadway Screw Type with 4-1/4 inch diameter shaft.
3. Curb boxes for larger than 2-1/2 inch curb valves should be of the Buffalo Type with 5-1/4 inch diameter shaft.
4. All curb boxes should be of cast iron and fitted with a cast iron cover marked with the word "WATER" and installed with the cover flush with the finished grade.
5. Plastic curb boxes and curb box covers are prohibited.

2.6 GATE VALVES

A. Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Crane; Crane Energy Flow Solutions.
 - b. Zurn Industries, LLC.
2. OS&Y, Rising-Stem Gate Valves:
 - a. Description: Bronze body and bonnet and bronze stem.

- 1) Standards: UL 262 and FMG approved.
 - 2) Minimum Pressure Rating: 175 psig (1207 kPa).
 - 3) End Connections: Threaded.
3. Nonrising-Stem Gate Valves:
 - a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.
 - 1) Standard: MSS SP-80.

2.7 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Description: Sleeve and valve compatible with drilling machine.
 - a. Standard: MSS SP-60.
 - b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
 - c. Valve: AWWA, cast-iron, nonrising-stem, metal-seated gate valve with one raised face flange mating tapping-sleeve flange.
2. Manufacturers: Subject to compliance with requirements approved by the authorizing local water utility company.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches (125 mm) in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.8 CHECK VALVES

A. AWWA Check Valves:

1. Description: Swing-check type with resilient seat. Include interior coating according to AWWA C550 and ends to match piping.
 - a. Standard: AWWA C508.
 - b. Pressure Rating: 175 psig (1207 kPa).

B. UL/FMG, Check Valves:

1. Manufacturers: Subject to compliance with requirements approved by the Authorizing water utility company.
2. Description: Swing-check type with pressure rating; rubber-face checks, unless otherwise indicated; and ends matching piping.
 - a. Standards: UL 312 and FMG approved.

3. Pressure Rating: 175 psig.

2.9 DETECTOR CHECK VALVES

A. Detector Check Valves:

1. Description: Galvanized cast-iron body, bolted cover with air-bleed device for access to internal parts, and flanged ends. Include one-piece bronze disc with bronze bushings, pivot, and replaceable seat. Include threaded bypass taps in inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when major water flow is required.
 - a. Standards: UL 312 and FMG approved.
 - b. Pressure Rating: 175 psig (1207 kPa).
 - c. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.
2. Description: Iron body, corrosion-resistant clapper ring and seat ring material, flanged ends, with connections for bypass and installation of water meter.
 - a. Standards: UL 312 and FMG approved.
 - b. Pressure Rating: 175 psig (1207 kPa).

2.10 BUTTERFLY VALVES

A. AWWA Butterfly Valves:

1. Description: Rubber seated.
 - a. Standard: AWWA C504.
 - b. Body: Ductile iron.
 - c. Body Type: Flanged.
 - d. Pressure Rating: 150 psig (1035 kPa).

B. UL Butterfly Valves:

1. Description: Metal on resilient material seating.
 - a. Standards: UL 1091 and FMG approved.
 - b. Body: Ductile iron.
 - c. Body Type: Flanged.
 - d. Pressure Rating: 175 psig (1207 kPa).

2.11 PLUG VALVES

A. Plug Valves:

1. Description: Resilient-seated eccentric.

- a. Standard: MSS SP-108.
- b. Body: Cast iron.
- c. Pressure Rating: 175-psig (1207-kPa) minimum CWP.
- d. Seat Material: Suitable for potable-water service.

2.12 WATER METERS

- A. Coordinate with the Water Company on the water meter requirements. Meters one and one-half inch and larger shall be provided with a valve bypass to allow for repair or removal of the meter without interruption of service.
- B. Valves shall be installed on both sides of every water meter. The valves shall be ball valves with iron pipe threaded connections or the meter system shall be installed in a department approved meter setter.

2.13 PRESSURE-REDUCING VALVES

- A. Water Regulators:
 1. Standard: ASSE 1003.
 2. Pressure Rating: Initial pressure of 150 psig (1035 kPa).
 3. Body: Bronze with chrome-plated finish for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).
 4. Valves for Booster Heater Water Supply: Include integral bypass.
 5. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).
- B. Water Control Valves:
 1. Description: Pilot-operation, diaphragm-type, single-seated main water control valve with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot control valve, restrictor device, specialty fittings, and sensor piping.
 - a. Pressure Rating: Initial pressure of 150 psig (1035 kPa) minimum.
 - b. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.
 - 1) Pattern: Globe-valve design.
 - 2) Trim: Stainless steel.
 - c. Design Flow Rate: As appropriate for the application
 - d. Design Inlet Pressure: As appropriate for the application
 - e. Design Outlet Pressure Setting: As appropriate for the application
 - f. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.

2.14 RELIEF VALVES & VACUUM BREAKERS

- A. Coordinate with local utility company and authorities having jurisdiction for installation and/or modification of any relief valves

2.15 BACKFLOW PREVENTERS

- A. Backflow preventers shall be used on all potable and fire services.
- B. Coordinate with Water Company and authorities having jurisdiction for installation and/or modification of any backflow preventers
- C. Backflow prevention device (BFP) shall be type approved by the State Health Department.

2.16 WATER METER PIT

- A. Description: Polymer-concrete body with lettering "WATER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Meet loading requirement of water company or H-20 rating.

2.17 ALARM DEVICES

- A. Alarm Devices, General: UL 753 and FMG approved, of types and sizes to mate and match piping and equipment.
- B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psig (1725-kPa) working pressure; designed for horizontal or vertical installation; with 2 single-pole, double-throw circuit switches to provide isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal when cover is removed.
- C. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.
- D. Pressure Switches: Single pole, double throw; designed to signal increase in pressure.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping shall be Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- F. Water Meter Box Water-Service Piping NPS 3/4 to NPS 2 (DN 20 to DN 50) shall be same as underground water-service piping.
- G. Aboveground and Vault Water-Service Piping shall be Hard copper tube, ASTM B 88, Type L; wrought copper, solder-joint fittings; and brazed joints.

3.3 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.
- B. Additional requirements:
 - 1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, nonrising-stem, metal-seated gate valves with valve box.
 - 2. Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
 - 3. Use the following for valves in vaults and aboveground:
 - a. Gate Valves, NPS 2 (DN 50) and Smaller: PTFE coated ball type, without drain, furnished with locking provision and integral meter saddles as approved by the Authorizing water utility company.
 - b. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, OS&Y rising stem, metal seated AWWA, cast iron, OS&Y rising stem, resilient seated UL/FMG, cast iron, OS&Y rising stem.
 - c. Check Valves: AWWA C508 or UL/FMG, swing type.
 - 4. Pressure-Reducing Valves: Use for water-service piping in vaults and aboveground to control water pressure.
 - 5. Relief Valves: Use for water-service piping in vaults and aboveground.
 - a. Air-Release Valves: To release accumulated air.
 - b. Air/Vacuum Valves: To release or admit large volume of air during filling of piping.
 - c. Combination Air Valves: To release or admit air.
 - 6. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

3.4 PIPING INSTALLATION

- A. Bury piping with depth of cover over top at least 48 inches (1220 mm), with top at least 12 inches (300 mm) below level of maximum frost penetration, and according to the following:
 - 1. Under Driveways: With at least 48 inches (1220 mm) cover over top.
 - 2. Under Railroad Tracks: With at least 48 inches (1220 mm) cover over top.
 - 3. In Loose Gravelly Soil and Rock: With at least 12 inches (300 mm) additional cover.
- B. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- C. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations to match existing service entrances.
- D. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- E. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- F. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.5 JOINT CONSTRUCTION

- A. Install copper piping with wrought-copper, solder-joint fittings; and brazed joints.
- B. Make pipe joints according to the following:
 - 1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
 - a. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.

3.6 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 - 1. Concrete thrust blocks.
- B. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

- C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.
- E. MSS Valves: Install as component of connected piping system.
- F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
- G. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves. Install full-size valved bypass.
- H. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.

3.8 DETECTOR-CHECK VALVE INSTALLATION

- A. Install in vault or aboveground.
- B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.
- C. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers.

3.9 WATER METER INSTALLATION

- A. Install water meters, piping, and specialties according to utility company's written instructions.
- B. Meet AWWA requirements.

3.10 ROUGHING-IN FOR WATER METERS

- A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.11 VACUUM BREAKER ASSEMBLY INSTALLATION

- A. Install pressure vacuum breaker assemblies of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install pressure vacuum breaker assemblies in vault or other space subject to flooding.

3.12 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support NPS 2-1/2 (DN 65) and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.13 WATER METER BOX INSTALLATION

- A. Install water meter boxes in paved areas flush with surface.
- B. Install water meter boxes in grass or earth areas with top 2 inches (50 mm) above surface.

3.14 ALARM DEVICE INSTALLATION

- A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.
- B. Supervisory Switches: Supervise valves in open position.
 - 1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
 - 2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.
- C. Locking and Sealing: Secure unsupervised valves as follows:
 - 1. Valves: Install chain and padlock on open OS&Y gate valve.
 - 2. Post Indicators: Install padlock on wrench on indicator post.
- D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.
- E. Water-Flow Indicators: Install in water-service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.

3.15 CONNECTIONS

- A. Make connections for copper water service piping with wrought-copper, solder-joint fittings; and brazed joints

- B. Connect water-distribution piping to existing water service lateral. Use service clamp and corporation valve.
- C. Connect water-distribution piping to interior domestic water piping.
- D. Ground equipment in accordance with local utility company requirements and as required by authorities having jurisdiction.

3.16 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
 - 1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.17 IDENTIFICATION

- A. Warning tape will be metalized plastic, blue in color, a minimum of 4 inches in width and have the words "CAUTION - WATER LINE BURIED BELOW" imprinted on it in black letters.
- B. Trace wire will be made of Copper 18 gauge.

3.18 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

- a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
- b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
- c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
- d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING

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. Section Includes:

- 1. Aboveground domestic water pipes, tubes, and fittings inside buildings.
 - 2. Encasement for piping.

- B. Related Requirements:

- 1. Section 22 11 13 "Facility Water Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Shop Drawings shall be submitted for the following:
 - 1. Pipe and Fittings
 - 2. Valves
 - 3. Piping Layouts

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify MCA no fewer than 3 days in advance of proposed interruption of service.

1.6 COORDINATION

- A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

2.3 PEX TUBE AND FITTINGS

- A. PEX Distribution System: ASTM F 877, SDR 9 tubing.
- B. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.
- C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

2.4 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 - 2. Full-face or ring type unless otherwise indicated.

- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- F. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.5 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Standard: ASSE 1079.
 - 2. Pressure Rating: 125 psig minimum at 180 deg F .
 - 3. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 - 1. Standard: ASSE 1079.
 - 2. Factory-fabricated, bolted, companion-flange assembly.
 - 3. Pressure Rating: 125 psig minimum at 180 deg F.
 - 4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
 - 1. Nonconducting materials for field assembly of companion flanges.
 - 2. Pressure Rating: 150 psig.
 - 3. Gasket: Neoprene or phenolic.
 - 4. Bolt Sleeves: Phenolic or polyethylene.

- 5. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
 - 1. Standard: IAPMO PS 66.
 - 2. Electroplated steel nipple complying with ASTM F 1545.
 - 3. Pressure Rating and Temperature: 300 psig at 225 deg F.
 - 4. End Connections: Male threaded or grooved.
 - 5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Prior to installation the contractor shall supply drawing plans, schematics, and diagrams to indicate the general location and arrangement of domestic water piping. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."
- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."
- F. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- H. Install seismic restraints on piping if required.
- I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

- J. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- L. Install piping to permit valve servicing.
- M. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- N. Install piping free of sags and bends.
- O. Install fittings for changes in direction and branch connections.
- P. Install PEX piping with loop at each change of direction of more than 90 degrees.
- Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump.
- S. Install sleeves for piping penetrations of walls, ceilings, floors, concrete walls, and slabs. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.
- H. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- I. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- J. Joints for PEX Piping: Join according to ASTM F 1807.
- K. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 - 6. NPS 6: 10 feet with 5/8-inch rod.
 - 7. NPS 8: 10 feet with 3/4-inch rod.
- E. Install supports for vertical copper tubing every 10 feet.
- F. Install supports for vertical stainless-steel piping every 15 feet.
- G. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.
- H. Install hangers for vertical PEX piping every 48 inches.
- I. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
 - 2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

- A. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. Complete testing with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves and hose bibbs.
2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Under-building-slab, domestic water, building-service piping, Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- B. Aboveground domestic water piping, NPS 1 and smaller, shall be one of the following:
 1. PEX tube, NPS 1 (DN 25) and smaller; fittings for PEX tube; and crimped joints.

3.13 VALVE SCHEDULE

- A. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
- C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

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. Section Includes:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Water pressure-reducing valves.
 - 4. Balancing valves.
 - 5. Temperature-actuated, water mixing valves.
 - 6. Strainers.
 - 7. Outlet boxes.
 - 8. Hose bibbs.
 - 9. Wall hydrants.
 - 10. Drain valves.
 - 11. Water-hammer arresters.
 - 12. Air vents.
 - 13. Flexible connectors.
 - 14. Water meters.
- B. Related Requirements:
 - 1. Section 22 11 16 "Domestic Water Piping".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.
- B. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa unless otherwise indicated).

2.2 BACKFLOW PREVENTERS

- A. General: ASSE standard backflow preventer and vacuum breaker of size, design flow rate, pressure loss at design flow rate and maximum pressure appropriate for installed application.
 - 1. Size NPS 2 (DN50) and smaller: Bronze Body with threaded ends
 - 2. Size NPS 2-1/2 (DN65) and larger: Bronze, cast iron, steel, or stainless steel body with flanged ends.
 - 3. Interior Components: Corrosion resistant materials
 - a. Interior lining: AWWA C550 or FDA approved coating.
 - 4. Exterior finish: Rough Bronze
- B. Pipe Applied, Atmospheric-Type Vacuum Breaker: ASSE 1001, with floating disc and atmospheric vent.
- C. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet.
- D. Pressure Vacuum Breakers: ASSE 1020 suitable for continuous pressure applications with ball valve on inlet and outlet.
- E. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and 2 independent check valves.
- F. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application.
 - 1. Pressure Loss: 12 psig (83 kPa) maximum, through middle third of flow range.
 - 2. Configuration: Designed for horizontal, straight-through, vertical-inlet, horizontal-center-section, and vertical-outlet, or vertical flow.
 - 3. Accessories:
 - a. Valves Ball type with threaded ends on inlet and outlet.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

- G. Double-Check, Backflow-Prevention Assemblies: ASSE 1015, suitable for continuous pressure application with ball valve and inlet and outlet.
 - 1. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.
 - 2. Configuration: Designed for horizontal, straight-through flow.
- H. Dual-Check-Valve Backflow Preventers: ASSE 1024, suitable for continuous pressure application with ball valve and inlet and outlet..
- I. Double-Check, Detector-Assembly Backflow Preventers: ASSE 1048 and FM Global approved or UL Listed, suitable for continuous pressure application with outside-screw and yoke-gate type valves with flanged ends on inlet and outlet.
 - 1. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.
 - 2. Configuration: Designed for horizontal, straight-through flow.
 - 3. Accessories:
 - a. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.
- J. Hose-Connection Backflow Preventers ASSE 1052, suitable for operation up to 10-foot head of water (30-kPa) back pressure and at least 3-gpm (0.19-L/s) flow.
 - 1. Inlet Size: NPS 1/2 or NPS 3/4 (DN 15 or DN 20).
 - 2. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
- K. Backflow-Preventer Test Kits:
 - 1. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.3 DISHWASHER AIR GAP FITTINGS

- A. ASSE 1021, fitting for use with domestic dishwashers with capacity of at least 5 gpm (0.32-L/s); inlet pressure of at least 5 psi g (35-kPa); temperature rating of at least 140 deg F (60 deg C)

2.4 WATER PRESSURE-REDUCING VALVES

- A. Water Regulators : ASSE 1003 with initial working pressure of 150 psig (1035 kPa)
 - 1. Body: Bronze
 - 2. Valves for Booster Heater Water Supply: Include integral bypass.
 - 3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

2.5 BALANCING VALVES

- A. Copper-Alloy Calibrated Balancing Valves <Insert drawing designation if any>:
 - 1. Type: Ball valve with two readout ports and memory-setting indicator.
 - 2. Body: Brass or bronze.
 - 3. Size: Same as connected piping, but not larger than NPS 2 (DN 50).

4. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

- B. Memory-Stop Balancing Valves NPS 2 (DN 50) and smaller MSS SP110 two piece copper-allow ball valves rated for 400-psig (2760-kpa) minimum cold water pressure.

1. Body: Copper alloy.
2. Port: Standard or full port.
3. Ball: Chrome-plated brass.
4. Seats and Seals: Replaceable.
5. End Connections: Solder joint or threaded.
6. Handle: Vinyl-covered steel with memory-setting device.

2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

- A. General: ASSE 1017, manually adjustable, thermostatic water mixing valve with bronze body with pressure rating of 125 psig (860 kPa).

- B. Water-Temperature Limiting Devices:

1. Type: Thermostatically controlled, water mixing valve.
2. Material: Bronze body with corrosion-resistant interior components.
3. Connections: Threaded union inlets and outlet.
4. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
5. Valve Finish: Rough bronze.

- C. Individual-Fixture, Water Tempering Valves: ASSE 1016, thermostatically controlled, water tempering valve with bronze body and corrosion-resistant interior components.

1. Temperature Control: Adjustable.
2. Inlets and Outlet: Threaded.
3. Finish: Rough or chrome-plated bronze.

- D. Primary Water Tempering Valves :ASSE 1017, thermostatically controlled, water tempering valve, listed as tempering valve with bronze body.

1. Temperature Control: Manual.
2. Inlets and Outlet: Threaded.
3. Valve Finish: Rough bronze.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

- A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
2. Body: Bronze.
3. End Connections: Threaded.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size: .02 inch (0.51 mm)

2.8 OUTLET BOXES

- A. Clothes Washer Outlet Boxes: Recessed enameled-steel or epoxy-painted-steel box and faceplate
 - 1. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
 - 2. Supply Shutoff Fittings: NPS 1/2 (DN 15) gate, globe, or ball valves and NPS 1/2 (DN 15) copper, water tubing.
 - 3. Drain: NPS 1-1/2 (DN 40) standpipe and P-trap for direct waste connection to drainage piping.
 - 4. Inlet Hoses: Two 60-inch- (1500-mm-) long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
 - 5. Drain Hose: One 48-inch- (1200-mm-) long, rubber household clothes washer drain hose with hooked end.

2.9 HOSE BIBBS

- A. Hose Bibbs: ASME 112.18.1 for sediment faucets, bronze body with rough bronze finish, with pressure rating of 125 psig (860 kPa)
 - 1. Seat: Bronze, replaceable.
 - 2. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
 - 3. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
 - 4. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
 - 5. Operation: Wheel handle or operating key.

2.10 WALL HYDRANTS

- A. Nonfreeze Wall Hydrants: ASME 112.21.3M for exposed-outlet, self-draining wall hydrants.
 - 1. Pressure Rating: 125 psig (860 kPa).
 - 2. Operation: Loose key.
 - 3. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
 - 4. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
 - 5. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
 - 6. Nozzle and Wall-Plate Finish: Rough bronze.

2.11 DRAIN VALVES

- A. Ball-Valve-Type, Hose-End Drain Valves: MSS SP-110 for standard-port, two-piece ball valves
 - 1. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
 - 2. Size: NPS 3/4 (DN 20).
 - 3. Body: Copper alloy.

4. Ball: Chrome-plated brass.
5. Seats and Seals: Replaceable.
6. Handle: Vinyl-covered steel.
7. Inlet: Threaded or solder joint.
8. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves: MSS SP-80 for gate valves

1. Pressure Rating: Class 125.
2. Size: NPS 3/4 (DN 20).
3. Body: ASTM B 62 bronze.
4. Inlet: NPS 3/4 (DN 20) threaded or solder joint.
5. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves: MSS SP-110 for ball valves or MSS SP-80 for gate valves

1. Pressure Rating: 200-psig (1380-kPa) minimum CWP or Class 125.
2. Size: NPS 3/4 (DN 20).
3. Body: Copper alloy or ASTM B 62 bronze.
4. Drain: NPS 1/8 (DN 6) side outlet with cap.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Metal bellows or Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig (860-kPa) minimum pressure rating at 140 deg F (60 deg C).
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 1/2 (DN 15) minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.14 FLEXIBLE CONNECTORS

A. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig (1380 kPa).
2. End Connections NPS 2 (DN 50) and Smaller: Threaded copper pipe or plain-end copper tube.

- B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
 - 1. Working-Pressure Rating: Minimum 200 psig (1380 kPa).
 - 2. End Connections NPS 2 (DN 50) and Smaller: Threaded steel-pipe nipple.

2.15 WATER METERS

- A. Comply with Utility provider requirements.
- B. Remote Registration System: Comply with Utility provider requirements

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 - 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.
- C. Install water-control valves with inlet and outlet shutoff valves and bypass with globe valve. Install pressure gages on inlet and outlet.
- D. Install balancing valves in locations where they can easily be adjusted.
- E. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 - 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- F. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, and pump.
- G. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch (38-by-89-mm) fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."

- H. Install water-hammer arresters in water piping according to PDI-WH 201.
- I. Install air vents at high points of water piping. Install drain piping and discharge to building drain.

3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Pressure vacuum breakers.
 - 2. Intermediate atmospheric-vent backflow preventers.
 - 3. Reduced-pressure-principle backflow preventers.
 - 4. Double-check, backflow-prevention assemblies.
 - 5. Carbonated-beverage-machine backflow preventers.
 - 6. Dual-check-valve backflow preventers.
 - 7. Reduced-pressure-detector, fire-protection, backflow-preventer assemblies.
 - 8. Double-check, detector-assembly backflow preventers.
 - 9. Water pressure-reducing valves.
 - 10. Calibrated balancing valves.
 - 11. Primary, thermostatic, water mixing valves.
 - 12. Manifold, thermostatic, water mixing-valve assemblies.
 - 13. Photographic-process, thermostatic, water mixing-valve assemblies.
 - 14. Primary water tempering valves.
 - 15. Outlet boxes.
 - 16. Hose stations.
 - 17. Supply-type, trap-seal primer valves.
 - 18. Trap-seal primer systems.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer, double-check, backflow-prevention assembly, and double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 22 13 13

FACILITY SANITARY SEWERS

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. Section Includes:
 - 1. Pipe and fittings.
 - 2. Nonpressure couplings.
 - 3. Expansion joints and deflection fittings.
 - 4. Backwater valves.
 - 5. Cleanouts.
 - 6. Encasement for piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Expansion joints and deflection fittings.
 - 2. Backwater valves.
- B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- B. Product Certificates: For each type of sanitary pipe and fitting, from manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify MCA no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without MCA's written permission.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

- A. Pipe: ASTM A 746, for push-on joints.
- B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153, ductile iron, for push-on joints.
- D. Gaskets: AWWA C111, rubber.

2.2 PVC PIPE AND FITTINGS

- A. PVC Piping:
 - 1. Pipe: AWWA C900, Class 150 PVC pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: AWWA C900, Class 150 PVC pipe with bell ends.
 - 3. Gaskets: ASTM F 477, elastomeric seals.

2.3 NONPRESSURE-TYPE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:

1. Shall not be used.

D. Shielded, Flexible Couplings:

1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

F. Nonpressure-Type, Rigid Couplings:

1. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling, molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.4 EXPANSION JOINTS AND DEFLECTION FITTING

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following,

1. EBAA Iron, Inc.
2. Romac Industries, Inc.
3. Start Pipe Products

B. Ductile-Iron, Flexible Expansion Joints:

1. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

C. Ductile-Iron Expansion Joints:

1. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated.

D. Ductile-Iron Deflection Fittings:

1. Description: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees of deflection.

2.5 BACKWATER VALVES

A. PVC Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. IPS Corporation.
 - b. NDS Inc.
 - c. Zurn Industries, LLC.
2. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.6 CLEANOUTS

- A. PVC Cleanouts:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Canplas LLC.
 - b. IPS Corporation.
 - c. NDS Inc.
 - d. Sioux Chief Manufacturing Company, Inc.
 - e. Zurn Industries, LLC.
 2. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.7 ENCASEMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105.
- B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.
- C. Form: Sheet or tube.
- D. Color: Black or natural.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Vertical soil piping shall be Ductile Iron and adequately secured to building structural elements with hangers indicated in Section 22 05 29 Hangers and Supports for Plumbing Piping. Horizontal gravity sewer piping shall be AWWA C900. Install piping to connect to existing building sanitary sewer lateral, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow, non-pressure, drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow, at minimum slope of 2 percent unless otherwise indicated.
 - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
 - 3. Install piping with 48-inch minimum cover.
 - 4. Install ductile-iron, gravity sewer piping according to ASTM A 746.
 - 5. Install AWWA C900 according to AWWA M23 or ASTM D 2772 and ASTM F 1668.
- F. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
 - 1. Ductile-iron pipe and fittings.
 - 2. Expansion joints and deflection fittings.
- G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, non-pressure, drainage piping according to the following:
 - 1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
 - 2. Join AWWA C900 sewer piping according to AWWA M23 for gasketed joints.
 - 3. Join dissimilar pipe materials with non-pressure-type, flexible or rigid couplings.
- B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 - 1. Use non-pressure flexible couplings where required to join gravity-flow, non-pressure sewer piping unless otherwise indicated.
 - a. Shielded flexible or rigid couplings for pipes of same or slightly different OD.
 - b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.4 BACKWATER VALVE INSTALLATION

- A. Install combination horizontal and manual gate valves at the existing sanitary service lateral if required by the City or the reviewing sanitary utility or where indicated on drawings.

3.5 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
 - 2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
 - 3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
- B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.6 CONNECTIONS

- A. Connect non-pressure, gravity-flow drainage piping to building's sanitary building drains at the existing soil stack building underside envelope.
- B. Make connections to existing piping.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi minimum.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi minimum.
 - 3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.7 CLOSING ABANDONED SANITARY SEWER SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:

1. Remove manhole and close open ends of remaining piping.
2. Remove top of manhole down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Section 31 20 00 "Earth Moving."

3.8 IDENTIFICATION

A. Comply with requirements in Section 31 20 00 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.9 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.

3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
 - a. Fill sewer piping with water. Test with pressure of at least 20-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
 - b. Close openings in system and fill with water.
 - c. Purge air and refill with water.
 - d. Disconnect water supply.
 - e. Test and inspect joints for leaks.
6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
 - a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
- G. Leaks and loss in test pressure constitute defects that must be repaired.
- H. Replace leaking piping using new materials, and repeat testing until leakage is within the allowances specified.

3.10 CLEANING

- A. Clean dirt and superfluous material from interior of piping. Flush with potable water.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

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. Section Includes:

- 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.

- B. Related Sections:

- 1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify MCA no fewer than two days in advance of proposed interruption of sanitary waste service.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
 - 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Solvent Cement: ASTM D 2564.
 - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 ROOF FLASHING ASSEMBLIES

- A. Roof Flashing Assemblies:
 - 1. Description: Manufactured assembly made of 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch-(2.4-mm-) thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
 - a. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting. Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
3. Unshielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install aboveground PVC piping according to ASTM D 2665.
- N. Install underground PVC piping according to ASTM D 2321.
- O. Install engineered soil and waste drainage and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 - 2. Solvent Drainage System: Comply with ASSE 1043 and solvent fitting manufacturer's written installation instructions.
 - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- P. Plumbing Specialties:

1. Install backwater valves in sanitary waster gravity-flow piping. Comply with requirements for backwater valves specified in Section 221313 "Facility Sanitary Sewers."
2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 221313 "Facility Sanitary Sewers."

- Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- R. Install sleeves for piping penetrations of walls, ceilings, floors, concrete walls, and slabs. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
1. Install transition couplings at joints of piping with small differences in OD's.
 2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 VALVE INSTALLATION

- A. Backwater Valves: Install backwater valves in piping subject to backflow.
1. Horizontal Piping: Horizontal backwater valves.
 2. Install backwater valves in accessible locations.
 3. Comply with requirements for backwater valve specified in Section 221313 "Facility Sanitary Sewers."

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting, valve, and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
 - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
 - 4. NPS 6 and NPS 8 (DN 150 and DN 200): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
- E. Install supports for vertical PVC piping every 48 inches (1200 mm).
- F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Install horizontal backwater valves with cleanout cover flush with grade/surface in location specified.
 - 6. Comply with requirements for backwater valves and cleanouts specified in Section 221313 "Facility Sanitary Sewers."

- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.

- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping shall be the following:
 - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, vent piping shall be the following:
 - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- D. Underground, soil and waste piping shall be:
 - 1. AWWA C900 PVC pipe; socket fittings; and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION

SECTION 22 33 00

ELECTRIC, DOMESTIC-WATER HEATERS

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. Section Includes:
 - 1. Residential, electric, storage, domestic-water heaters.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. LEED Submittals:
 - 1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1, Section 7, "Service Water Heating."
- C. Shop Drawings:
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of residential, electric, domestic-water heater, from manufacturer.
- B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Warranty: Sample of special warranty.

- A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. 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.
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.7 COORDINATION

- A. Coordinate sizes and locations of bases with actual equipment provided.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - d. Residential, Electric, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: 9 Year Limited Tank Warranty.
 - 2) Controls and Other Components: 9 Year Limited Warranty on Component Parts.
 - e. Compression Tanks: Five years.

2.1 RESIDENTIAL, ELECTRIC, DOMESTIC-WATER HEATERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Rheem Water Heating Products
- B. Residential, Electric, Storage, Domestic-Water Heaters:
1. Rheem Performance Platinum Series Model: XE50M12ST45U1
 2. Standard: UL 174.
 3. Storage-Tank Construction: Steel.
 - a. Tappings: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig (1035 kPa).
 - c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.
 4. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: ASSE 1005.
 - d. Insulation: Comply with ASHRAE 90.2.
 - e. Jacket: Steel, cylindrical, with enameled finish.
 - f. Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
 - g. Heating Elements: Two; electric, screw-in immersion type; wired for non-simultaneous operation unless otherwise indicated. Limited to 12 kW total.
 - h. Temperature Control: Adjustable thermostat.
 - i. Safety Control: High-temperature-limit cutoff device or system.
 - j. Relief Valve: ASME rated and stamped for combination temperature-and-pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
- C. Capacity and Characteristics:
1. Capacity: 50 gal..
 2. Recovery: 20-25 gph at 90 deg F temperature rise.
 3. Temperature Setting: 125 deg F (52 deg C).
 4. Power Demand: **<Insert kilowatts>**.
 5. Heating Elements: Twin 4500 Watt.
 6. Electrical Characteristics:
 - a. Volts: 240.
 - b. Phases: Single.
 - c. Hertz: 60.
 - d. Full-Load Amperes:.
 - e. Minimum Circuit Ampacity: 25 Amps.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

- A. Domestic-Water Compression Tanks:
1. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
 2. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
 3. Capacity and Characteristics:
 - a. Working-Pressure Rating: 150 psig (1035 kPa).
 - b. Capacity Acceptable: 2 gal. (7.6 L) minimum.
 - c. Air Precharge Pressure: 150 psig (1035 kPa) minimum.
- B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 (DN 20) with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- D. Heat-Trap Fittings: ASHRAE 90.2.
- E. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig- (172.5-kPa-) maximum outlet pressure unless otherwise indicated.
- F. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- G. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.
- H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- I. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.
- J. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 18 inches (457 mm) above the floor.

- K. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Residential, Electric, Domestic-Water Heater Mounting: Install residential, electric, domestic-water heaters on water-heater stand with drain pane on floor.
 - 1. Maintain manufacturer's recommended clearances.
 - 2. Arrange units so controls and devices that require servicing are accessible.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Anchor domestic-water heaters to substrate.
- B. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
- C. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

- D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install combination temperature-and pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- G. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with manufacturer requirements for thermometers.
- H. Install thermometers on inlet and outlet piping of residential, solar, electric, domestic-water heaters. Comply with manufacturer requirements for thermometers.
- I. Install pressure-reducing valve with integral bypass relief valve in electric, domestic-water booster-heater inlet piping and water hammer arrester in booster-heater outlet piping. Set pressure-reducing valve for outlet pressure of 25 psig (172 kPa). Comply with requirements for pressure-reducing valves and water hammer arresters specified in Section 221119 "Domestic Water Piping Specialties."
- J. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.
- K. Fill electric, domestic-water heaters with water.
- L. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified by authorities having jurisdiction.

- A. Perform tests and inspections.
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and re-inspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- C. Prepare test and inspection reports.

3.5 DEMONSTRATION

- A. Train Owner on adjustment, operation, and maintenance of electric, domestic-water heaters.

END OF SECTION

SECTION 224100

RESIDENTIAL PLUMBING FIXTURES

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. Section Includes:

1. Bathtubs.
2. Faucets.
3. Lavatories.
4. Showers.
5. Kitchen sinks.
6. Dishwasher air-gap fittings.
7. Disposers.
8. Water closets.
9. Toilet seats.
10. Supply fittings.
11. Waste fittings.

- B. Related Requirements:

1. Section 221116 "Domestic Water Piping"
2. Section 221119 "Domestic Water Piping Specialties"

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 lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For plumbing fixtures and faucets to include in emergency, operation, and operation and maintenance manuals.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of baths that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 BATHTUBS

- A. Bath with shower.
1. American Standard Americast Princeton Recess Bath with Integral Overflow
 2. Fixture:
 - a. Standard: ANSI Z124.1.2 for plastic bathtubs.
 - b. Bathing Surface: Slip resistant according to ASTM F 462.
 - c. Size: 60 by 30 inches (1525 by 762 mm).
 - d. Color: Owner selected from manufacturer range.
 - e. Drain Location: Right end.
 - f. Drain: NPS 1-1/2 (DN 40); chrome-plated brass, pop-up waste and overflow.
 3. Faucet: Delta Tub and Shower Faucet Trim T13420 Series
 4. Supply Fittings: Included in faucet.
 5. Tub Filler: Chrome-plated-brass diverter spout.
 6. Waste Fittings:
 - a. Standard: ASME A112.18.2/CSA B45.125.2.
 - b. Drain: Stainless steel or chrome-plated brass, removable strainer.
 - c. Overflow: Chrome-plated-brass escutcheon with toggle drain-plug device.
 - d. Drain Piping: NPS 1-1/2 (DN 40) cast-brass overflow, P-trap, and waste.

2.2 BATHTUB FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Bathtub Faucets Rear Bath: Single handle thermostatic.
1. Model: Delta Tub and Shower Faucet Trim T13420 Series
 2. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
 3. Faucet:
 - a. Body Material: Solid brass.

- b. Finish: Polished chrome plate.
- c. Maximum Flow Rate: 2.0 gpm unless otherwise indicated.
- d. Mounting: Exposed.
- e. Operation: Single handle, twist or rotate control, with hot- and cold-water indicators.
- f. Antiscald Device: Integral with mixing valve.
- g. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
- h. Diverter: In-tub filler spout.
- i. Supply Connections: NPS 1/2 (DN 15).
- 4. Shower Head:
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Type: Ball joint and head integral with mounting flange.
 - c. Backflow-Prevention Device: ASSE 1014.
 - d. Shower Head Material: Metallic with chrome-plated finish.
 - e. Spray Pattern: Adjustable.
- 5. Bathtub Filler Spout: Chrome-plated brass.

C. Bathtub Faucets Front Bath: Single handle thermostatic.

- 1. Thermostatic Faucets: Delta Linden Tub/Shower Faucet Set
- 2. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
- 3. Faucet: Delta Linden T11894
 - a. Body Material: Solid brass.
 - b. Finish: Polished chrome plate.
 - c. Maximum Flow Rate: 2.5 gpm (9.5 L/min.) unless otherwise indicated.
 - d. Mounting: Exposed.
 - e. Operation: Single handle, twist or rotate control, with hot- and cold-water indicators.
 - f. Antiscald Device: Integral with mixing valve.
 - g. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
 - h. Diverter: In-tub filler spout.
 - i. Supply Connections: NPS 1/2 (DN 15).
- 4. Shower Head: Delta Model 51400 with wall elbow.
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Type: Hand shower. Include wall-mounting device.
 - c. Backflow-Prevention Device: ASSE 1014.
 - d. Shower Head Material: Metallic with chrome-plated finish.
 - e. Spray Pattern: Adjustable.
- 5. Bathtub Filler Spout: Chrome-plated brass – Delta U1011-PK or equal.

2.3 LAVATORIES

A. Lavatories: Oval, solid surface, counter mounted.

- 1. Solid-Surface Lavatories:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) American Standard America.
 - 2) Bradley Corporation.
 - 3) DuPont.
 - 4) Formica Corporation.
 - 5) Franke Consumer Products, Inc.
 - 6) InPro Corporation (IPC).
 - 7) Meganite Inc.
 - 8) Rynone Manufacturing Corp.
 - 9) Sloan Valve Company.
 - 10) Swan Corporation (The).
2. Fixture:
- a. Standard: ANSI Z124.3 and ANSI/ICPA SS-1 for solid-surface lavatories.
 - b. Type: Flat rim with ledge.
 - c. Oval Nominal Size: 19 by 16 inches (483 by 406 mm).
 - d. Faucet-Hole Punching: Three holes, 4-inch (102-mm) centers.
 - e. Faucet-Hole Location: Rim.
 - f. Color: White.
3. Faucet: Delta Larhara Collection 2538-TP-DST .
4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
5. Waste Fittings: Comply with requirements in "Waste Fittings" Article.

2.4 LAVATORY FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Lavatory Faucets: Delta Larhara Collection 2538-TP-DST, Two Handle Thermostatic.
1. General-Duty, Copper- or Brass-Underbody Faucets:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) American Standard America.
 - 2) Delta Faucet Company.
 - 3) Moen Incorporated.
 2. Standard: ASME A112.18.1/CSA B125.1.
 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
 4. Body Material: General-duty, copper or brass underbody with brass cover plate.
 5. Finish: Polished chrome plate.
 6. Maximum Flow Rate: 1.2 gpm at 60 psi..
 7. Centers: 4 inches (102 mm).
 8. Mounting: Deck, exposed.
 9. Valve Handle(s): Lever.
 10. Inlet(s): NPS 3/8 (DN 10) tubing, with NPS 1/2 (DN 15) male adaptor.
 11. Spout: Rigid.
 12. Spout Outlet: Aerator.
 13. Operation: Compression, manual or Noncompression, manual.
 14. Drain: Pop up.

2.5 KITCHEN SINKS

- A. Kitchen Sinks: One bowl stainless steel.
 - 1. Stainless-Steel Kitchen Sinks:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Houzer, Inc.
 - 2) Kohler Co.
 - 2. Fixture:
 - a. Standard: ASME A112.19.3/CSA B45.4 for stainless-steel kitchen sinks.
 - b. Overall Dimensions: 25" by 22"
 - c. Metal Thickness: 0.038 inch (1.0 mm).
 - d. Bowl:
 - 1) Dimensions: 21" x 15-3/4"
 - 2) Drain: 3-1/2-inch (89-mm) outlet for disposer.
 - a) Location: Centered in bowl.
 - 3. Faucet: Delta Linden 4453-DST
 - 4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
 - 5. Waste Fittings: Comply with requirements in "Waste Fittings" Article, except include continuous waste for multibowl sinks.
 - a. Disposer: Coordinate with owner.
 - b. Dishwasher Air-Gap Fitting: Comply with requirements in "Dishwasher Air-Gap Fittings" Article.

2.6 SINK FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Sink Faucets: Kitchen sink – Delta Linden 4453-DST or approved equal.
 - 1. General-Duty, Copper-Underbody Faucets:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) American Standard America.
 - 2) Delta Faucet Company.
 - 3) Moen Incorporated.
 - 2. Standard: ASME A112.18.1/CSA B125.1.
 - 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
 - 4. Kitchen Sink Option: Separate hand spray complying with ASSE 1025.
 - 5. Finish: Polished chrome plate.
 - 6. Maximum Flow Rate: 1.8 gpm unless otherwise indicated.
 - 7. Mixing Valve: Single control.
 - 8. Backflow-Prevention Device for Hand Spray: Required.
 - 9. Centers: 8 inches (203 mm).
 - 10. Mounting: Deck, exposed.
 - 11. Handle(s): Lever.
 - 12. Spout Type: Swing, shaped tube.

13. Spout Outlet: Aerator.
14. Drain: Grid.

2.7 WATER CLOSETS

- A. Water Closets: Floor mounted, floor outlet, vitreous china.
 1. Model: American Standard Optum Vormax 707AA.101
 2. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1, ASME A112.19.5, and ASSE 1037.
 - b. Bowl Type: Siphon jet VorMax Flushing System.
 - c. Height: Standard.
 - d. Rim Contour: Elongated.
 - e. Water Consumption: High Efficiency 1.28 gpf.
 - f. Color: White.
 3. Toilet Seat: Slow Close EverClean telescoping cover
 4. Supply Fittings:
 - a. Standard: ASME A112.18.1/CSA B125.1.
 - b. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
 - c. Stop: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
 - 1) Operation: Wheel handle.
 - d. Riser:
 - 1) Size: NPS 1/2 (DN 15).
 - 2) Material: ASME A112.18.6, braided- or corrugated-stainless-steel flexible hose riser.

2.8 TOILET SEATS

- A. Toilet Seats :
 1. Standard: IAPMO/ANSI Z124.5.
 2. Material: Plastic.
 3. Type: Residential.
 4. Shape: Elongated rim (Closed front).
 5. Configuration: Closed front with cover.
 6. Size: Elongated.
 7. Hinge Type: Self-sustaining.
 8. Hinge Material: Plastic.
 9. Seat Cover: Required.
 10. Color: White.

2.9 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Lavatory and Kitchen Sink Supply Fittings:
 - 1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
 - 2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
 - a. Operation: Wheel handle.
 - 3. Risers:
 - a. Size: NPS 3/8 (DN 10) for lavatories.
 - b. Size: NPS 3/8 (DN 10) for kitchen sinks.
 - c. Material: Chrome-plated, soft-copper flexible tube or ASME A112.18.6, braided-or corrugated-stainless-steel flexible hose riser.

2.10 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Pop-up type with NPS 1-1/4 (DN 32) straight tailpiece as part of faucet for standard lavatories.
- C. Drain: Grid type with NPS 1-1/2 (DN 40) straight tailpiece for standard bar sinks and.
- D. Trap:
 - 1. Size: NPS 1-1/2 (DN 40) for lavatories.
 - 2. Size: NPS 1-1/2 (DN 40) for kitchen sinks.
 - 3. Material: ASTM F 409 PVC two-piece trap and waste to wall and wall flange for kitchen sinks and lavatories.

2.11 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing-fixture installation.
- B. Examine walls, floors, cabinets, and counters for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install plumbing fixtures level and plumb according to roughing-in drawings.
- B. Install floor-mounted water closets on closet flange attachments to drainage piping.
- C. Install counter-mounting fixtures in and attached to casework.
- D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.
- E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - 1. Exception: Use ball or gate valves if supply stops are not specified with fixture.
- F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- G. Install toilet seats on water closets.
- H. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- I. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- J. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes unless otherwise indicated.
- K. Install disposer in outlet of each sink indicated to have a disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- L. Install dishwasher air-gap fitting at kitchen sink indicated to have air-gap fitting. Connect inlet hose to dishwasher and outlet hose to disposer.

- M. Set bathtubs and baths in leveling bed of cement grout.
- N. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- O. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 11 23

FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Sleeve, Pipe and fittings for site utility natural gas distribution.

1.2 REFERENCES

- A. AASHTO T180 – Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18- in. Drop.
- B. ANSI B16.3 – Malleable Iron Threaded Fittings.
- C. ANSI B16.11 – Forged Steel Fittings, Socket Welding and Threaded.
- D. ANSI B31.2 – Fuel Gas Piping.
- E. ANSI B31.8 – Gas Transmission and Distribution Piping Systems.
- F. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings.
- G. ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- H. ASME B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes.
- I. ASME BPVC SEC. VIII – Pressure Vessels.
- J. ASME BPVC SEC. IX – Welding and Brazing Qualifications.
- K. ASTM A 53 – Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- L. ASTM A 234 – Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- M. ASTM B 32 – Solder Metal.
- N. ASTM B 75 – Seamless Copper Tube.
- O. ASTM B 88 – Seamless Copper Water Tube.
- P. ASTM D 698 – Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 pound Rammer and 12 inch Drop.
- Q. ASTM D 1557 – Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 pound Rammer and 18 inch Drop.
- R. ASTM D 2513 – Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.
- S. ASTM D 2517 – Reinforced Epoxy Resin Gas Pressure Pipe Fittings.
- T. ASTM D 2683 – Socket Type Polyethylene Fittings For Outside Diameter Controlled Polyethylene Pipe and Tubing.
- U. ASTM D 2922 – Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- V. ASTM D 3017 – Moisture Content of Soil and Soil-Aggregate Mixtures.
- W. AWS A5.8 – Brazing Filler Metal.

- X. AWWA C105 – Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- Y. NFPA 54 – National Fuel Gas Code.
- Z. NFPA 58 – National Fuel Propane Code.

1.3 SUBMITTALS

- A. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Project Record Documents: Record actual locations of pipe mains, sleeves, valves, connections, and invert elevations.
- D. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.4 PROJECT CONDITIONS

- A. Call "CALL BEFORE YOU DIG" (1-800-922-4455) At least 72 hours prior to any excavation.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the Southern Connecticut Gas Company requirements.
- B. Welding Materials and Procedures: Conform to ASME Boiler and Pressure Vessel Code and applicable state regulations.
- C. Welders Certification: In accordance with ASME SEC IX.
- D. Conform to NFPA 54.
- E. Maintain one copy of each document on site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 PIPE

- A. Pipes are subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.
- B. Steel Pipe Above Ground: ASTM A 53, Schedule 40 black:
 - 1. Fittings: ANSI B16.3, malleable iron, ANSI B16.11, forged steel, or ASTM A 234, forged steel welding type.
 - 2. Joints: Threaded.

- C. Polyvinyl chloride plastic: ASTM D 1785, 2 inch and 4 inch. PVC Schedule 40 PVC, approved by the Southern Connecticut Gas Company.
 - 1. Fittings: ASTM D 2466, Schedule 40 PVC, approved by the Southern Connecticut Gas Company.
 - 2. Joints: Fusion Welded, approved by the Southern Connecticut Gas Company.
 - 3. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Natural Gas Service" in large letters.

2.2 GAS COCKS

- A. Gas cocks are subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.
- B. Up to 2 Inches: 150 pounds per square inch-gage WOG, bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends with cast iron curb box, cover, and key.
- C. Over 2 Inches: 125 pounds per square inch-gage WOG, steel body and tapered plug, non-lubricated, Teflon packing, threaded ends, with cast iron curb box, cover, and key.
- D. Gas Cock and Pressure Regulating Valves: Manufacturer's name and pressure rating marked on valve body.

2.3 PRESSURE REGULATING VALVES

- A. Gas Pressure Regulating Valves are subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.
- B. Valves: Single stage, malleable iron body, corrosion-resistant, pressure regulator with atmospheric vent, elevation compensator; with threaded ends for 2 inch and smaller, flanged ends larger than 2 inch.
- C. Capacity: For inlet and outlet gas pressures, specify gravity, and flow rate indicated.

2.4 PIPING SPECIALITIES

- A. Appliance Flexible Connectors:
 - 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
 - 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
 - 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
 - 4. Corrugated stainless-steel tubing with polymer coating.
 - 5. Operating-Pressure Rating: 0.5 psig.
 - 6. End Fittings: Zinc-coated steel.
 - 7. Threaded Ends: Comply with ASME B1.20.1.
 - 8. Maximum Length: 72 inches
- B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
 - 1. Copper-alloy convenience outlet and matching plug connector.
 - 2. Nitrile seals.
 - 3. Hand operated with automatic shutoff when disconnected.
 - 4. For indoor or outdoor applications.
 - 5. Adjustable, retractable restraining cable.

2.5 BEDDING AND COVER MATERIALS

- A. Bedding: Fill is subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.
- B. Cover: Minimum cover 2 feet over the top of the pipe. Fill is subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations. Call the Southern Connecticut Gas Company for inspection before filling the pipe.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that building service connection and utility gas main size, location and invert are as indicated.

3.2 PREPARATION

Preparation for Gas service installation is subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Thread ferrous pipe 2 inches diameter and under.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections with threading and unions.

3.3 BEDDING

Bedding installation for Gas service is subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.

- A. Excavate pipe trench in accordance with Section 31 20 00 and Plans and Details for Work in this Section. Hand trim excavation for accurate placement of pipe to elevations indicate.
- B. Place bedding material at trench bottom, level fill materials in on continuous layer not exceeding 6 inches compacted depth, compact to 95 percent.
- C. Backfill around sides and to top of pipe with minimum 2 feet cover fill, tamped in place and compacted to 95 percent.
- D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION – PIPING

- A. Gas pipe installation is subject to the Southern Connecticut Gas Company requirements.
- B. Maintain separation of gas line from sewer and water piping in accordance with the Southern Connecticut Gas Company code.
- C. Route piping in straight line as practically possible.
- D. Install piping to conserve space and not interfere with use of site space.

- E. Install piping to allow for expansion and contraction without stressing pipe or joints.
- F. Install cocks and other fittings.
- G. Establish elevations of buried piping to ensure not less than 24 inches of cover in driveways and parking areas.
- H. Lay pipe on bedding.
- I. Wrap couplings and fittings of steel pipe with polyethylene tape and heat shrink over pipe.
- J. Install trace wire continuous over top of pipe above pipe line if required by utility company;
- K. Backfill trench in accordance with appropriate backfill specification.
- L. Center and plumb valve box over valve. Set box cover flush with finished ground surface. Prevent shock or stress from being transmitted through valve box to valve.
- M. Wrap valve and valve box with polyethylene tape and heat shrink.

3.5 SERVICE CONNECTIONS

- A. A gas service connection is subject to the Southern Connecticut Gas Company requirements.
- B. Provide sleeve in foundation wall for gas service main. Seal enlarged sleeve watertight.
- C. Anchor service main to exterior surface of foundation wall.
- D. Install service regulator adjacent to building wall in specified location.
- E. Install pressure regulating valve and riser pipe to prevent undue stress upon service pipe. For plastic service pipe, use steel pipe riser from below ground to regulator.
- F. Provide regulator vent with rain and insect proof opening, terminating away from building openings.
- G. A gas service connection is subject to the Southern Connecticut Gas Company requirements.
- H. Provide sleeve in foundation wall for gas service main. Seal enlarged sleeve watertight.
- I. Anchor service main to exterior surface of foundation wall.
- J. Install service regulator adjacent to building wall in specified location.
- K. Install pressure regulating valve and riser pipe to prevent undue stress upon service pipe. For plastic service pipe, use steel pipe riser from below ground to regulator.
- L. Provide regulator vent with rain and insect proof opening, terminating away from building openings.

3.6 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.7 CONNECTIONS

- A. Install natural gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

- B. Install piping adjacent to appliances to allow service and maintenance of appliances.
- C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within of 72 inches of each gas fired appliance and equipment. Install union between valve and appliances or equipment.
- D. Install tee fitting with capped nipple in bottom to form drip as close as practical to inlet of each appliance for sediment trap.

3.8 FIELD QUALITY CONTROL

- A. Field quality control is subject to the Southern Connecticut Gas Company requirements. Contractor shall engage the Southern Connecticut Gas Company to inspect trench, bedding, pipe, and fill at no cost to the owner.
- B. Compaction testing will be performed in accordance with ASTM D 698.
- C. Gas lines will be pressure tested to 150 pounds per square inch.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION

SECTION 23 31 13

METAL DUCTS

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. Section Includes:
 - 1. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Sheet metal materials.
 - 4. Sealants and gaskets.
 - 5. Hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Liners and adhesives.
 - 2. Sealants and gaskets.
- B. Delegated-Design Submittal:
 - 1. Sheet metal thicknesses.
 - 2. Joint and seam construction and sealing.
 - 3. Reinforcement details and spacing.
 - 4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
- B. Welding certificates.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60 (Z180).
- C. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.

3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
 6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- E. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- F. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations.

Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Use appropriate fasteners for construction materials to which hangers are being attached.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 3. Test for leaks before applying external insulation.
 - 4. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
- C. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
- D. Mechanical Cleaning Methodology:
 - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.

3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
5. Provide drainage and cleanup for wash-down procedures.

3.7 START UP

- A. Air Balance: Comply with manufacturer requirements and industry standards.

3.8 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
- B. Supply Ducts and Return Ducts:
 1. Minimum sizes are indicated on drawings.
- C. Intermediate Reinforcement:
 1. Galvanized-Steel Ducts: Galvanized steel.
- D. Elbow Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam.
- E. Branch Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
 - c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

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. Section Includes:
 - 1. Manual volume dampers.
 - 2. Flange connectors.
 - 3. Turning vanes.
 - 4. Flexible connectors.
 - 5. Flexible ducts.
 - 6. Duct accessory hardware.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60 (Z180).
- B. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- C. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.
- D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 MANUAL VOLUME DAMPERS

- A. Low-Leakage, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. McGill AirFlow LLC.
 - b. Trox USA Inc.
 - c. Vent Products Co., Inc.
 - 2. Comply with AMCA 500-D testing for damper rating.
 - 3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
 - 4. Suitable for horizontal or vertical applications.
 - 5. Frames:
 - a. 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 6. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized, roll-formed steel, 0.064 inch (1.62 mm) thick.
 - 7. Blade Axles: Galvanized steel.

8. Bearings:
 - a. Oil-impregnated stainless-steel sleeve or Stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
9. Blade Seals: Vinyl or Neoprene.
10. Jamb Seals: Cambered stainless steel.
11. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
 1. Size: 0.5-inch (13-mm) diameter.
 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
- C. Damper Hardware:
 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
 2. Include center hole to suit damper operating-rod size.
 3. Include elevated platform for insulated duct mounting.

2.4 FLANGE CONNECTORS, TURNING VANES, AND FLEXIBLE CONNECTORS MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. CL WARD & Family Inc.
 2. Ductmate Industries, Inc.
 3. Hardcast, Inc.
 4. Nexus PDQ.
 5. Ward Industries; a brand of Hart & Cooley, Inc.
 6. Aero-Dyne Sound Control Co.
 7. Duro Dyne Inc.
 8. Elgen Manufacturing.
 9. METALAIRE, Inc.
 10. SEMCO LLC.
 11. JP Lamborn Co.
 12. Ventfabrics, Inc.

2.5 FLANGE CONNECTORS

- A. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- B. Material: Galvanized steel.
- C. Gage and Shape: Match connecting ductwork.

2.6 TURNING VANES

- A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

- B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vaness and Vane Runners," and 4-4, "Vane Support in Elbows."
- C. Vane Construction: Single wall.

2.7 FLEXIBLE CONNECTORS

- A. Materials: Flame-retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
 - 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

2.8 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. JP Lamborn Co.
- B. Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate or aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
 - 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 - 3. Temperature Range: Minus 20 to plus 210 deg F (Minus 29 to plus 99 deg C).
 - 4. Insulation R-value: 6.
- C. Flexible Duct Connectors:
 - 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.
 - 2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.9 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 2. Control devices requiring inspection.
 - 3. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
- K. Install flexible connectors to connect ducts to equipment.
- L. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- M. Connect terminal units to supply ducts directly or with maximum 12-inch (300-mm) lengths of flexible duct. Do not use flexible ducts to change directions.
- N. Connect diffusers or light troffer boots to ducts directly or with maximum 24-inch (600-mm) lengths of flexible duct clamped or strapped in place.
- O. Connect flexible ducts to metal ducts with liquid adhesive plus sheet metal screws.
- P. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.

5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

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. Section Includes:
 - 1. Louver face diffusers.
 - 2. Fixed face registers.
- B. Related Sections:
 - 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

- A. Louver Face Diffuser: See drawing designation.
 - 1. Devices shall be specifically designed for variable-air-volume flows.
 - 2. Material: Aluminum.
 - 3. Finish: Baked enamel, white.
 - 4. Face Size: See Drawings.
 - 5. Mounting: Surface with beveled frame.
 - 6. Pattern: As indicated on drawings core style.
 - 7. Accessories:
 - a. Square to round neck adaptor.
 - b. Adjustable pattern vanes.
 - c. Throw reducing vanes.
 - d. Equalizing grid.

- e. Plaster ring.
- f. Wire guard.
- g. Sectorizing baffles.

2.2 REGISTERS AND GRILLES

- A. Fixed Face Register:
 - 1. Material: Aluminum.
 - 2. Finish: Baked enamel, white.
 - 3. Face Arrangement: 1/2-by-1/2-by-1/2-inch (13-by-13-by-13-mm) grid core.
 - 4. Core Construction: Integral.
 - 5. Frame: 1 inch (25 mm) wide.
 - 6. Mounting Frame: Filter.
 - 7. Mounting: Countersunk screw.
 - 8. Damper Type: Adjustable opposed blade.
 - 9. Accessory: Filter.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify MCA for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:
 - 1. 2013 Connecticut State Building Code
 - 2. 2011 NFPA 70 National Electrical Code
 - 3. 2009 International Residential Code

1.3 ACTION SUBMITTALS

- A. Submit under provisions of "Section 01 33 00 – Submittal Procedures".
- B. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Alpha Wire Company.
 2. Belden Inc.
 3. Cerro Wire LLC.
 4. Encore Wire Corporation.
 5. General Cable Technologies Corporation.
 6. General Cable; General Cable Corporation.
 7. Senator Wire & Cable Company.
 8. Service Wire Co.
 9. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2. Wire of higher temperature ratings shall be used where required by NFPA 70 National Electric Code, 2011.
- D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for nonmetallic-sheathed cable, Type NM with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. 3M.
 2. Gardner Bender.
 3. Hubbell Power Systems, Inc.
 4. Ideal Industries, Inc.
 5. ILSCO.
 6. NSi Industries LLC.
 7. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. 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.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type SE with individual conductors rated Type XHHW-2, single conductors in raceway.
- B. Exposed Branch Circuits, Including in Crawlspace: Nonmetallic-sheathed cable, Type NM.
- C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Nonmetallic-sheathed cable, Type NM.
- D. Branch Circuits in Cable Tray: Nonmetallic-sheathed cable, Type NM.
- E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Adequately support cables under provisions of the National Electric Code, NFPA 70, 2011 edition.

3.4 CONNECTIONS

- A. 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-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according NFPA 70.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
- C. Test and Inspection Reports: Prepare a written report to record the following:
 - 1. Procedures used.

2. Results that comply with requirements.
 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in Section 01 78 39 – Project Record Documents Article, including the following:
 - 1. Ground rods.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- 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.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. 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.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches (600 mm) below grade.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical panel board
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except as otherwise indicated.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from

panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

- E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install 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; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- G. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet (6.0 m) long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- D. Grounding system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Report measured ground resistances that exceed the following values specified by NFPA 70.
- G. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify MCA promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Boxes and enclosures.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. FMC: Flexible metal conduit.
- C. GRC: Galvanized rigid steel conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems; a part of Atkore International.
 - 2. Allied Tube & Conduit; a part of Atkore International.
 - 3. Anamet Electrical, Inc.
 - 4. Calconduit.
 - 5. Electri-Flex Company.
 - 6. FSR Inc.

7. Korkap.
8. Opti-Com Manufacturing Network, Inc (OMNI).
9. O-Z/Gedney; a brand of Emerson Industrial Automation.
10. Perma-Cote.
11. Picoma Industries, Inc.
12. Plasti-Bond.
13. Republic Conduit.
14. Southwire Company.
15. Thomas & Betts Corporation; A Member of the ABB Group.
16. Western Tube and Conduit Corporation.
17. Wheatland Tube Company.

- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. EMT: Comply with ANSI C80.3 and UL 797.
- G. FMC: Comply with UL 1; zinc-coated steel.
- H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 2. Fittings for EMT: Steel compression type fitting.
 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
- J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 BOXES AND ENCLOSURES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Crouse-Hinds, an Eaton business.
 2. Hubbell Incorporated.
 3. Hubbell Incorporated; Wiring Device-Kellems.
 4. MonoSystems, Inc.
 5. RACO; Hubbell.

6. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet, Device, Pull, and Junction Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.
- G. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).
1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
- J. Gangable boxes are allowed.
- K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4X with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Galvanized Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC, IMC, or EMT.
3. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X.
- B. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
 - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support conduit and boxes adequately and per NFPA 70 and NECA-1.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- F. Install conduits parallel or perpendicular to building lines.
- G. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- K. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

1. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path
 - L. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
 - M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
 - N. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
 - O. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where an underground service raceway enters a building or structure.
 3. Where otherwise required by NFPA 70.
 - P. Flexible Conduit Connections: Comply with NEMA RV 3.
 - Q. Mount boxes at heights indicated on Drawings, where not specified in drawings follow NECA-1. Install boxes with height measured to center of box unless otherwise indicated.
 - R. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
 - S. Locate boxes so that cover or plate will not span different building finishes.
 - T. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
 - U. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- 3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS
- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.4 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

SECTION 26 08 00

ELECTRICAL SYSTEMS COMMISSIONING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

- A. The purpose of this Section is to define Contractor responsibilities in the commissioning process, which are being directed by the Contractor. Other electrical system testing is required under other Division 26 Specification Sections. National Electrical Installation Standards (NEIS) NECA 90-2004, "Recommended Practice for Commissioning Building Electrical Systems", 27th Volume of the NEIS Series, provides additional guidance for the commissioning of electrical systems.
- B. Commissioning requires the participation of the Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. General Commissioning requirements and coordination are detailed in Division 01. Division 26 shall be familiar with all parts of Division 01 and the Commissioning Plan issued by the Contractor and shall execute all Commissioning responsibilities assigned to them in the Contract Documents and include the cost of Commissioning in the Contract price.
- C. Electrical systems to be commissioned include the following:
 - 1. Distribution and Branch Circuit Panelboards.
 - 2. Lighting Fixtures and Controls.
 - 3. Emergency Generators and Distribution System.
 - 4. Uninterruptible Power Systems.

1.3 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards.

1.4 SUBMITTALS

- A. Contractor shall prepare Prefunctional Checklists and Functional Performance Test (FPT) procedures and execute and document results. All Prefunctional Checklists and tests must be documented using specific, procedural forms in Microsoft Word or Excel software developed for that purpose. Prior to testing, Contractor shall submit those forms to the MCA for review and approval.
- B. Contractor shall provide MCA with documentation required for Commissioning work. At minimum, documentation shall include: Detailed Start-up procedures, Full sequences of operation, Operating and Maintenance data, Performance data, Functional Performance Test Procedures, Control Drawings, and details of MCA-Contracted tests.
- C. Contractor shall submit to MCA installation and checkout materials actually shipped inside equipment and actual field checkout sheet forms used by factory or field technicians.
- D. Contractor shall review and approve other relative documentation for impact on FPT's of the systems:
 - 1. Shop Drawings and product submittal data related to systems or equipment to be commissioned. The Subcontractor responsible for the FPT shall review and incorporate comments from the MCA and MCA via the Contractor.
 - 2. Incorporate manufacturer's Start-up procedures with Prefunctional checklists.
 - 3. Draft Electrical Testing Agency (ETA) Reports: Review and provide comments to MCA.
 - 4. Completed equipment Start-up certification forms along with the manufacturer's field or factory performance and Start-up test documentation: Subcontractor performing the test will review the documentation prior to commencing with the scheduled FPT's.
 - 5. Final ETA Reports: Subcontractor performing the test will review the documentation prior to commencing with the scheduled FPT's.
 - 6. Operating and Maintenance (O&M) information per requirements of the Technical Specifications and Division 01 requirements: To validate adequacy and completeness of the FPT, the Contractor shall ensure that the O&M manual content, marked-up record Drawings and Specifications, component submittal drawings, and other pertinent documents are available at the Project Site for review.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. Infrared Thermographic Scanner:
 - 1. Infrared scanning equipment shall be an AGA (or approved equal) thermovision set capable of viewing an entire bus or equipment assembly at one time and have a sensitivity of 0.2 degrees C with a liquid nitrogen reference.

2. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified.

PART 3 - EXECUTION

3.1 PREPARATION

A. Construction Phase:

1. Provide manufacturer's data sheets and shop drawing submittals of equipment.
2. Prepare the specific Functional Performance Test procedures specified in Section 26 08 16. Ensure that Functional Performance Test procedures address feasibility, safety, and equipment protection and provide necessary written alarm limits to be used during the tests.
3. Perform and clearly document all completed Prefunctional Checklists and Start-up procedures. Provide a copy to the MCA prior to the Functional Performance Test.
4. Compile all Commissioning records and documentation to be included in a Commissioning and Closeout Manual.
5. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
6. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

B. Electrical Testing Agency (ETA):

1. When requested by MCA, the Contractor shall retain an independent Electrical Testing Agency (ETA). This generally requires checking and testing of the electrical power distribution equipment per National Electrical Testing Association (NETA).
2. Attend Pre-Commissioning Meeting(s), Pre-Installation Meeting(s), and other Project meetings scheduled by the Contractor to facilitate the Commissioning process.
3. Obtain all required manufacturer's data to facilitate tests.
4. Generally ETA shall provide their standard forms to document the NETA tests to be incorporated into the Prefunctional Checklist and Functional Performance Tests record.
5. During related tests, execute and document the tests in the approved forms and/or test record.
6. Perform and clearly document all completed Start-up and system operational checkout procedures, providing a copy to the Contractor.

7. Clearly indicate any deficiencies identified during testing and add to an action list for resolution and tracking. The field technicians shall keep a running log of events and issues. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, Contract interpretation requests and lists of completed tests to the Contractor at least twice a week and provide technical assistance in the resolution of deficiencies.

3.2 TESTING

A. Prefunctional Checklists and Start-up:

1. Start-up and complete systems and sub-systems so they are fully functional, meeting the requirements of the Contract Documents.
2. Prefunctional Checklists shall be complete prior to commencement of a Functional Performance test.

B. Functional Performance Tests:

1. Functional Performance Tests are conducted after system Start-up and checkout is satisfactorily completed.

END OF SECTION

SECTION 26 08 16

ELECTRICAL SYSTEMS FUNCTIONAL PERFORMANCE TESTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

- A. This Section expands on and defines responsibilities of the Contractor in regards to Functional Performance Tests (FPT's) of the Commissioning process.
- B. Contractor shall oversee the Commissioning activities with the Contractor's Subcontractors and MCA.
- C. Prefunctional Checklists, tests and Start-ups are to be completed and documented for the record prior to commencing with FPT's. Refer to Section 26 08 00 for additional requirements.
- D. Completed FPT Forms for all pieces of equipment and systems shall be submitted to the Owner prior to Substantial Completion.

1.3 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with all applicable requirements and standards.

1.4 SUBMITTALS

- A. Maintain and use an action item tracking system, "Action Item List," that indicates as a minimum, required information, identified deficiencies, work required, etc.). Each item shall be tracked with the initiator, the parties responsible, due date, the date of closure, and a description of the resolution. Each item shall be categorized for sorting and tracking and for documentation on applicable forms. Action Item List shall be distributed and documented using Microsoft Excel or a database format approved by Owner.
- B. Disseminate this list as appropriate to keep all parties involved with the FPT informed.

C. Functional Performance Test procedure forms must include the following:

1. System and equipment or component name(s).
2. Equipment location and identification number as identified in the Equipment Matrix described in Division 01.
3. Unique test identification number and reference to unique Prefunctional Checklist and Start-up Documentation Identification Numbers for the equipment.
4. Date and time of test.
5. Project name.
6. Participating parties.
7. Specific sequence of operation or other specified parameters, including performance data being verified.
8. Instructions for setting up a Functional Performance Test.
9. Specific script-type, step-by-step procedures to perform a Functional Performance Test, in a clear, sequential and repeatable format that is customized for the system being tested.
10. A Yes/No checkbox (or data entry box as appropriate) for clearly indicating whether or not proper performance of each part of a Functional Performance Test was achieved with space for actual readings.
11. Section for comments.
12. Signatures and date block for participants and Owner approvals.

D. Refer to Division 01 and 26 08 00 for additional documentation requirements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 TEST EQUIPMENT

- A. Refer to Section 26 08 00 – Electrical Systems Commissioning.

PART 3 - EXECUTION

3.1 PREPARATION

- A. The objective of FPT's is to demonstrate that each system operates according to the Contract Documents through all specified modes of operation.
- B. Contractor shall operate each system through all modes of operation (occupied, unoccupied, warm-up, cool-down, etc.) where there is a specified system response. Verification of each sequence in the sequences of operation is required.
- C. All equipment, components and devices applicable to the FPT must be started and this Start-up must be documented.

3.2 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.

3.3 FUNCTIONAL PERFORMANCE TEST PROCEDURES

- A. The purpose of a Functional Performance Test is to verify and document compliance with the stated criteria of acceptance. Contractor shall develop specific script-type test procedures and associated test forms to verify and document proper operation of each piece of equipment and system.
- B. Contractor shall operate, or cause to be operated, each system, device, or equipment item, both intermittently and continuously, for duration a period as indicated in the Specification Section(s) for such item and/or in accordance with the manufacturer's written recommendations, the Contract Documents, and the Commissioning Plan.
- C. Contractor shall operate each component device and each building system to the full extent of its capability, from minimum to maximum, and under automatic control and manual control.
- D. Sampling: Some types of identical equipment (such as circuit breakers, receptacles etc.) will be tested using a sampling strategy.
- E. Failure Limit on Sample Tests: With the sampling percentages is listed a failure limit. This limit indicates the maximum percentage of the tested devices that may have any test that fails before an entirely new sample must be tested. When the maximum number of failures is reached, testing on that sample will be terminated and re-testing will be scheduled.
 - 1. Where sample tests involve multiple systems (ie: checking receptacles on different floors) the maximum failure limit will apply per system.
- F. Capacities and adjusted and balanced conditions as applicable will generally be checked.

3.4 SPECIFIC SYSTEM FUNCTIONAL TEST PROCEDURES

A. Panelboards and Associated Loads:

1. Participants shall include Contractor, Electrical Subcontractor,
2. Sample: 100 percent (of panel boards and loads/receptacles); Failure Limit 10 percent.
3. Review Start-up documentation.
4. Inspect the Panelboard for conformance to Contract Documents in concert with reviewing the ETA reports.
5. Contractor shall incorporate the ETA reports into the Microsoft Excel software.
6. Receptacle Polarity Test: Check all receptacles installed or reconnected under this Contract with a receptacle circuit tester. Tester shall test for open ground, reverse polarity, open hot, open neutral, hot and ground reversed, hot or neutral and hot open.
7. Check circuit labeling by de-energizing circuits while circuit tester is in the receptacle. Labeling shall be checked on the load/receptacle and at the breaker.

B. Ground-Fault Receptacle Circuit Interrupter Tests:

1. Participants shall include Contractor, Electrical Subcontractor, and Commissioning Team. (First ten (10) receptacles)
2. Sample: 100 percent; Failure Limit 10 percent.
3. Test each receptacle or branch circuit breaker having ground-fault circuit protection to assure that the ground-fault circuit interrupter will not operate when subjected to a ground-fault current of less than 4 milliamperes and will operate when subjected to a ground-fault current exceeding 6 milliamperes. Perform testing using an instrument specifically designed and manufactured for testing ground-fault circuit interrupters. "TEST" button operation will not be acceptable as a substitute for this test. Replace receptacles that do not shutoff power with 5/1000 of an ampere within 1/40th of a second and retest. Submit test report signed by Test Engineer who performed this test.

C. Lighting and Lighting Control System:

1. Participants shall include Contractor and Electrical Subcontractor.
2. Sample 100 percent, Failure Limit 10 percent.
3. Spot check the lighting systems Start-up and ensure that the all lamps are operational and fixtures are clean.
4. Check all occupancy sensor placement and test reliability of activation/deactivation.
5. Check all switches to ensure proper operation and circuiting.

6. Test operation of circuits by changing system Date and Time to cause various circuits to switch modes. For rooms with occupancy sensors, validate the circuit energizes with occupancy in the space after the lights have been swept off. Test warning flicker prior to off sweep. Test cleaning and shed features.
7. For exterior fixtures, simulate night mode to validate function.

3.5 PARTICIPATION

- A. Required participating parties are indicated with the individual tests. Typically, multiple parties are required for any given test, yet participation for any given party is only required for the respective portion of the test for which the party is responsible. In many cases, the maximum required time in hours is indicated in parenthesis for any given test. The time is typically per unit system unless indicated otherwise. If no time is indicated, participation is required throughout the entire test.
- B. Frequently, on multiple samples where a given party does not directly conduct the test, the participation of that party will only be required for an initial quantity of systems/equipment. It is required that the parties be available on-site throughout the testing of any given system for which they are required participants. Therefore time for which they are not directly involved can be spent performing other work (typically addressing identified punch list items or failed test).
- C. No party involved with the Project is prohibited from participation in or witnessing of any tests. Any Subcontractor may elect to witness all tests on their systems even if their involvement is not directly required.
- D. Coordinate effectively with the individual Subcontractors throughout the development and execution of FPT's and maximize Subcontractors' involvement.

3.6 ACCEPTANCE CRITERIA

- A. Acceptance criteria for tests are indicated in the Specification Sections applicable to the systems being tested. Generally, unless indicated otherwise, the criteria for acceptance will be that specified with the individual system, equipment, component, or device.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

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. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. SPD: Surge protective device.
- G. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
 - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
 - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Include evidence of NRTL listing for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Panelboard Schedules: For installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. Include the following:
 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Relocate existing panelboard to new location in house.
- B. Handle and prepare panelboards for installation according to NECA 407.

1.9 FIELD CONDITIONS

- A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify MCA no fewer than 3 days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager's written permission.
3. Comply with NFPA 70E.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

1. SPD Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- 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.

- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Surface-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 5.
 - 2. Height: 84 inches maximum.
 - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
 - 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
 - 5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
 - 6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
 - 7. Finishes:
 - a. Panels, Trim and Back Boxes: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
- F. Incoming Mains:
 - 1. Location: Top.
 - 2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
- G. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - a. Plating shall run entire length of bus.
 - b. Bus shall be fully rated the entire length.
 - 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
 - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 - 4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
 - 5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

6. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled by an NRTL acceptable to authority having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors shall be sized for double-sized or parallel conductors as indicated on Drawings. Do not mount neutral bus in gutter.
7. Split Bus: Vertical buses divided into individual vertical sections.

H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.

I. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

J. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: Five percent.

K. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.

1. Panelboards rated 240 V or less shall have short-circuit ratings but not less than 10,000 A rms symmetrical.

2.2 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD

2.3 POWER PANELBOARDS

- A. Panelboards: NEMA PB 1, distribution type.
- B. Doors: Secured with vault-type latch.
- C. Mains: Circuit breaker.

- D. Branch Overcurrent Protective Devices: Plug in circuit breakers where individual positive-locking device requires mechanical release for removal.
- E. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - 2. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
 - 3. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - 4. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
 - 5. Subfeed Circuit Breakers: Vertically mounted.
 - 6. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Compression or Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Ground-Fault Protection: Integrally mounted and/or remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - h. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
 - i. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
 - j. Auxiliary Contacts: One, SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
 - k. Multipole units enclosed in a factory assembled to operate as a single unit.

2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.

- C. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.
- D. Equipment Mounting:
 - 1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- E. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- F. Mount panelboard cabinet plumb and rigid without distortion of box.
- G. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- H. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.
- I. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- J. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- K. Install filler plates in unused spaces.
- L. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- M. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs.
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. 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.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

3.6 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

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. Section Includes:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Tamper-resistant receptacles.
 - 3. Weather-resistant receptacles.
 - 4. Wall-switch and exterior occupancy sensors.
 - 5. Residential Devices
 - 6. Wall box dimmers
 - 7. Wall Plates
 - 8. SPD receptacles

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. UTP: Unshielded twisted pair.
- E. SPD: Surge protective device.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.5 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 33 00
- B. Product Data: For each type of product.
- C. Shop Drawings: List of legends and description of materials.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
- B. Manufactures: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Pass & Seymour/Legrand (Pass & Seymour).

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Wiring Devices, Components, and Accessories: Compliant with all provisions of 2005 Connecticut State Building code and latest amendment.
- C. Comply with NFPA 70.
- D. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Manufacturers: Comply with Section 2.1.B of this division.
- B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Manufacturers: Comply with Section 2.1.B of this division.
 - 2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from

mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.4 GFCI RECEPTACLES

A. General Description:

1. Duplex GFCI Convenience Receptacles; 125 V, 20 A, straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

2.5 SPD RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1449, and FS W-C-596, with integral SPD in line to ground, line to neutral, and neutral to ground.

1. 125 V, 20 A, straight blade, type.
2. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
3. Active SPD Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

2.6 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

A. Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.

2.7 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole
2. Two Pole
3. Three Way
4. Four Way

2.8 RESIDENTIAL DEVICES

A. Residential-Grade, Tamper-Resistant Convenience Receptacles, 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- B. Weather-Resistant and Tamper-Resistant Convenience Receptacles, 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.
 1. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.
- C. Fan Speed Controls:
 1. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters.
 2. Comply with UL 1917.
 3. Continuously adjustable rotary knob, 1.5 A.
 4. Three-speed adjustable rotary knob, 1.5 A.
- D. Telephone Outlet:
 1. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.
- E. Combination TV and Telephone Outlet:
 1. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.

2.10 FINISHES

- A. Device Color:
 1. Wiring Devices Connected to Normal Power System: Almond unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: For plastic covers, match device color.

2.8 METAL BOXES

- A. Interior Outlet Boxes: Provide galvanized flat rolled sheet steel interior outlet wiring boxes of types, shapes, and sizes, including box depths to suit each respective location and installation. Construction with stamped knockouts on back and sides, and with threaded screw holes for securing box covers and wiring devices
- B. Box Accessories: Provide outlet box accessories as required for each installation.
- C. Manufacturer: Subject to compliance with requirements, provide products by one of the following
 1. Raco
 2. Hubbell Incorporated; Wiring Devices Kellems
 3. Thomas and Betts Corp.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1 and NFPA 70, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 8. Tighten unused terminal screws on the device.
 - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
 - 10. Fasten boxes rigidly to substrate or structural surfaces.
- E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Test Instruments: Use instruments that comply with UL 1436.
 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
 1. Line Voltage: Acceptable range is 105 to 132 V.
 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION

SECTION 26 51 19

INTERIOR LIGHTING

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. Section Includes:
 - 1. Interior solid-state luminaires that use LED technology.
 - 2. Interior fluorescent luminaires, lamps, and ballasts.
 - 3. Lighting fixture supports.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Submit under provisions of Section 01 33 00
- B. Product Data: For each type of product.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaires.
 - 4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
 - 5. Ballast, including BF.
- C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 QUALITY ASSURANCE

- A. Provide luminaires from a single manufacturer for each luminaire type.
- B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LED LUMINAIRE REQUIREMENTS

- A. 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.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Recessed Fixtures: Comply with NEMA LE 4.
- E. Bulb shape complying with ANSI C79.1.
- F. Lamp base complying with ANSI C81.61.
- G. CRI of minimum 70. CCT of 3000 K.
- H. Rated lamp life of 50,000 hours.
- I. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- J. Internal driver.
- K. Nominal Operating Voltage: 120 V ac.
 1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- L. Housings:
 1. Extruded-aluminum housing and heat sink.
 2. White painted finish.

2.2 BALLASTS FOR COMPACT FLUORESCENT LAMPS

- A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
1. Lamp end-of-life detection and shutdown circuit.
 2. Automatic lamp starting after lamp replacement.
 3. Sound Rating: Class A.
 4. THD Rating: Less than 20 percent.
 5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
 6. Operating Frequency: 20 kHz or higher.
 7. Lamp Current Crest Factor: 1.7 or less.
 8. BF: 0.95 or higher unless otherwise indicated.
 9. Power Factor: 0.95, except luminaires designated as "residential" may use low-power-factor electronic ballasts or higher.
 10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on EMI and RFI for nonconsumer equipment.

2.3 FLUORESCENT LAMPS

- A. Compact Fluorescent Lamps: Four-pin or medium screw, CRI of 80 (minimum), color temperature of 3500 K, average rated life of 10,000 hours at three hours of operation per start, and suitable for use with dimming ballasts unless otherwise indicated.
1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
 2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
 3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
 4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
 5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
 6. Reflector, Globe, A Shape, Spiral, EL/T, EL/O, or SLS bulbs with 900 initial lumens (minimum)

2.4 MATERIALS

- A. Metal Parts:
1. Free of burrs and sharp corners and edges.
 2. Sheet metal components shall be steel unless otherwise indicated.
 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
1. Tempered Fresnel, glass prismatic glass, diffuse glass, clear glass, prismatic acrylic, or clear UV-stabilized acrylic.
 2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 3. Glass: Annealed crystal glass unless otherwise indicated.

4. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
- D. Housings:
 1. Extruded-aluminum housing and heat sink.
 2. Clear or painted finish.
- E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.5 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.6 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Adequately support luminaire to wood framing members.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish shall match luminaire.
- C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1 and NFPA 70.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:

1. Sized and rated for luminaire weight.
 2. Able to maintain luminaire position after cleaning and relamping.
 3. Provide support for luminaire without causing deflection of ceiling or wall.
 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaire Support:
1. Secured to outlet box.
 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaire Support:
1. Attached to structural members in walls.
 2. Do not attach luminaires directly to gypsum board.
- G. Suspended Luminaire Support:
1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- H. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

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. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, site utilities.
8. Temporary erosion and sedimentation control.

- B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for temporary measures and controls.
2. Section 31 25 13 "Erosion Controls" for erosion and sedimentation measures

1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to reasonably able to be protected during construction.
- E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to reasonably able to be protected during construction.
- F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise to remain on Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Topsoil stripping and stockpiling program.
- C. Rock stockpiling program.
- D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 CLOSE OUT SUBMITTALS

- A. Prepare an accurate plan showing abandoned in place and new utilities

1.8 QUALITY ASSURANCE

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.9 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: No work is to take place on adjoining property.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises contractor located and identified storage area..
- D. Utility Locator Service: Notify Call Before You Dig for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.
- B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #23 (surface-tolerant, anticorrosive metal primer) or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed.

- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner and MCA.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site as directed by MCA and identified in the pre-construction conference.
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain and those that are damaged by construction operations.

3.4 EXISTING UTILITIES

- A. Contractor will arrange for location and disconnecting and sealing indicated utilities that serve existing structures before site clearing.
 - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities.
 - 1. Arrange with utility companies to shut off indicated utilities.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify MCA not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without MCA's written permission.
3. Prepare and accurate plan showing the location of existing utilities.

E. Excavate for and remove underground utilities necessary for project work as directed by MCA.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods or air spade for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.
2. Return to site three (3) seasons after substantial completion and repair depressions.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 STOCKPILING ROCK

- A. Remove from construction area naturally formed rocks that measure more than 1 foot across in least dimension. Do not include excavated or crushed rock.
 - 1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.
 - 1. Limit height of rock stockpiles to 36 inches.
 - 2. Do not stockpile rock within protection zones.
 - 3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.

3.8 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

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. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.

- B. Related Requirements:

1. Section 01 32 00 "Construction Progress Documentation" for recording pre-excavation and earth-moving progress.
2. Section 31 10 00 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
3. Section 31 23 19 "Dewatering" for lowering and disposing of ground water during construction.
4. Section 31 50 00 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
5. Section 32 92 00 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
- F. Fill: Soil materials used to raise existing grades.
- G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 1.5 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Unauthorized Excavation: Excavation Beyond indicated elevations, dimensions, and lines. Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by MCA. Unauthorized excavation, as well as remedial work directed by MCA, shall be without additional compensation.
- L. Unsatisfactory Soil: Soil determined not to meet the intent of the project needs.
- M. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at Project site.
 - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
 - a. Personnel and equipment needed to make progress and avoid delays.
 - b. Coordination of Work with utility locator service.
 - c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.

- d. Extent of trenching by hand or with air spade.
- e. Field quality control.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

- 1. Geotextiles.
- 2. Controlled low-strength material, including design mixture.
- 3. Geofoam.
- 4. Warning tapes.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

- 1. Classification according to ASTM D 2487.
- 2. Laboratory compaction curve according to ASTM D 1557.

C. Preexcavation Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.8 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

- 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
- 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Not Allowed

C. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before beginning earth-moving operations.

- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 01 50 00 "Temporary Facilities and Controls", Section 31 25 13 "Erosion Controls", and Section 31 10 00 "Site Clearing" are in place.
- E. Do not commence earth-moving operations until plant-protection measures are in place as specified in drawings and Section 31 1000 "Site Clearing".
- F. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

- F. Processed Aggregate (3/4" size): Material shall consist of sound, tough, durable particles of crushed or uncrushed gravel, free from soft, thin, elongated or laminated pieces and vegetable or other deleterious substances. It shall be hard and durable enough to resist weathering, traffic abrasion and crushing. Use materials conforming to the requirements of Articles M.02.02 and M.02.06 of CT-DOT Form 816. Grading "C" shall be used.

Grading "C" (in accordance w/ CT-DOT Form 816)	
Sieve Size	Percent Passing
1.5 inch	100
3/4"	45-80
1/4"	25-60
#10	15-45
#40	5-25
#100	0-10
#200	0-5

- G. Requirements for Offsite Soils: Offsite soils brought in for use as backfill shall be tested for TPH, BTEX and full TCLP including ignitability, corrosivity and reactivity. Backfill shall not be able to be described as polluted soil and must have no detectable level of total hydrocarbons (TPH), Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX). TPH concentrations shall be determined by using EPA 600/4-79/020 Method 418.1. BTEX concentrations shall be determined by using EPA SW-846.3-3a Method 5030/8020. TCLP shall be performed in accordance with EPA SW-846.3-3a Method 1311. Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site for a maximum of one sample for each 100 cubic yards.
- H. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- I. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- J. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

- K. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
- L. Sand: ASTM C 33/C 33M; fine aggregate.
- M. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

- A. The geotextile shall be non-woven, non-rotting, acid and alkali resistant and have sufficient strength and permeability for the purpose intended, including handling and backfilling operations. Fibers shall be low water absorbent. The fiber network must be dimensionally stable and resistant to delamination. The geotextile shall be free of any chemical treatment or coating that will reduce its permeability. The geotextile shall also be free of any flaws or defects, which will alter its physical properties. Torn or punctured geotextiles shall not be used. For each specific use, only geotextiles, which are already on the Connecticut Department of Transportation's "Qualified Products List" for the geotextile type, will be used. For Subsurface drainage, Class B shall be used. For Separation (including use in construction entrance), high survivalability shall be used. The Engineer reserves the right to reject any geotextile, which he deems unsatisfactory for a specific use. The brand name shall be labeled on the geotextile or the geotextile container. Geotextiles, which are susceptible to damage from sunlight or heat, shall be so identified by suitable warning information on the packaging material.

2.3 CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

- A. Controlled Low-Strength Material or Flowable Fill: Self-compacting, low-density, flowable concrete material produced from the following:
 - 1. Portland Cement: Type I/ Type II
 - 2. Fly Ash: None
 - 3. Normal-Weight Aggregate: ASTM C 33/C 33M, 3/8-inch nominal maximum aggregate size.
 - 4. Foaming Agent: ASTM C 869/C 869M.
 - 5. Water: ASTM C 94/C 94M.
 - 6. Air-Entraining Admixture: ASTM C 260/C 260M.
- B. Produce low-density, controlled low-strength material with the following physical properties:
 - 1. Unit Weight (wet): 70-110 lb/cf or as specified by MCA, at point of placement, when tested according to ASTM C 138/C 138M.
 - 2. Compressive Strength: 70-100 psi or as specified when necessary for project work, when tested according to ASTM C 495/C 495M.
 - 3. Air Entrainment: 15-30%

2.4 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation, unauthorized excavation, or removal of obstructions.
 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 16 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.
 - f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose

roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.6 EXCAVATION FOR PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 - 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
 - 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- E. Trenches in Tree- and Plant-Protection Zones:
 - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots.

3.8 SUBGRADE INSPECTION

- A. Notify MCA when excavations have reached required subgrade.
- B. If MCA determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade beneath pavements to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by MCA, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the work as set forth in other divisions. Unit Prices set forth in Section 01 22 00 "Unit Prices" shall be ineffect.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by MCA, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi may be used when approved by MCA.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by MCA at no additional compensation.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, damp proofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.
- D. Backfill voids with satisfactory soil while removing shoring and bracing.
- E. Initial Backfill: Shall be one of the following;
1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
 2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.
- F. Final Backfill: Shall be one of the following;
1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
 2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations to restore site substantially to the condition it existed prior to commencement of construction activity.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve restoration of site to conditions that existed prior to the commencement of construction, within the following subgrade tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch and as directed by MCA.
 - 2. Walks: Plus or minus 1 inch and as directed by MCA.
 - 3. Pavements: Plus or minus 1 inch and as directed by MCA.
- C. Grading inside Building Lines: As directed by MCA.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course if directed by MCA under pavements and walks as follows:
 - 1. Place base course material over subbase course under hot-mix asphalt pavement.
 - 2. Shape subbase course and base course to required crown elevations and cross-slope grades.
 - 3. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
 - 4. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 5. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 FIELD QUALITY CONTROL

- A. Special Inspections: Contractor will engage at their expense a qualified special inspector to perform the following special inspections:

1. Determine (prior to placement of fill) that site has been prepared in compliance with requirements.
 2. Determine that fill material classification and maximum lift thickness comply with requirements.
 3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Contractor will engage at their expense a qualified geotechnical engineering testing agency to perform tests and inspections. Coordinate with MCA.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by MCA.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 500 square feet or less of paved area or building slab but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 50 feet or less of wall length but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 75 feet or less of trench length but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by MCA; reshape and recompact.

- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 31 23 19

DEWATERING

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. Section includes technical provisions for construction dewatering that are not anticipated to be necessary for project work. Any construction dewatering and other provisions of this section shall be provided by the contractor at no additional cost
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
 - 3. Review geotechnical report.
 - 4. Review proposed site clearing and excavations.
 - 5. Review existing utilities and subsurface conditions.
 - 6. Review observation and monitoring of dewatering system.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.
 - 1. Include plans, elevations, sections, and details.
 - 2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.

3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor and professional engineer.
- B. Field quality-control reports.
- C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.
- D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.7 FIELD CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
 1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
 2. The geotechnical report is included elsewhere in Project Manual.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
 - 1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
 - 2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
 - 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 5. Remove dewatering system when no longer required for construction.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.

- D. Protect and maintain temporary erosion and sedimentation controls as directed by MCA and as specified in Section 015000 "Temporary Facilities and Controls," Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.
 - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.
- C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

- A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
 - 2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.
- C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.
- D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

- A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.
 - 1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
 - 2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
 - 3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.
- B. Survey-Work Benchmarks: Resurvey benchmarks biweekly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify MCA if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.
- C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.
- D. Prepare reports of observations.

3.5 PROTECTION

- A. Protect and maintain dewatering system during dewatering operations.
- B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION

SECTION 31 25 13

EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silt Fence.
 - 2. Silt Boom.
 - 3. Baled Hay.
 - 4. Seeding and Mulching.
 - 5. Construction Entrance.
- B. Related Sections:
 - 1. Section 31 10 00 - Site Clearing.
 - 2. Section 31 20 00 – Earth Moving.
 - 3. Section 32 92 00 – Turfs and Grasses

1.2 REFERENCES

- A. Connecticut Council on Soil and Water Conservation:
 - 1. “2002 Connecticut Guidelines for Soil Erosion and Sediment Control”

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on geotextiles and mulching.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with the State of Connecticut Department of Transportation (CT-DOT) Form 817, "Standard Specifications for Roads, Bridges and Incidental Construction 2004", including Supplemental Specifications.
- B. Perform Work in accordance with the most current edition of the Connecticut DEP Guidelines for Soil Erosion and Sediment Control.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

PART 2 PRODUCTS

2.1 BALED HAY MATERIALS

- A. 20" x 20" x 30" - 40 lbs/bale minimum. Wire or nylon bound bales, oriented around sides, rather than over and under.
 - 1. Bales shall be free from weed seeds and rough or woody materials.
 - 2. Stakes for bales shall be made of sound hardwood 2" x 2" in size or steel reinforcing bars of at least No. 4 size. Lengths shall be approximately three feet.

2.2 MATS AND NETTINGS

- A. Jute matting shall be of open weave, single jute yarn averaging 130 pounds per spindle of 14,400 yards. The yarn shall be of loosely twisted construction, not varying the thickness by more than ½ its normal diameter. The woven material shall be 48 inches wide, plus or minus one 1 inch, and with approximately 78 warp ends per width of cloth and 41 weft ends per linear yard. The woven material shall weigh 1.22 pounds per linear yard with a tolerance of plus or minus 5 percent.
- B. Excelsior matting shall be wood excelsior, at least 35 inches in width, and weighing 0.8 pounds per square yard plus or minus 5 percent. The excelsior material shall be covered with a netting on one side to facilitate handling and to increase strength.
- C. Staples shall be number 11 (or heavier) plain iron wire, made from lengths of at least 12 inches each or as specified by manufacturer.

2.3 SILT FENCE

- A. Fabricated or prefabricated unit consisting of the following filter fabric properties:

1. Grab Tensile Strength (lbs)	120	ASTM D4632
2. Elongation at Failure (%)	12.5	ASTM D4632
3. Mullen Burst Strength (psi)	285	ASTM D3786
4. Puncture Strength (lbs)	62	ASTM D4833
5. Trapezoidal Tear (lbs)	60	ASTM D4533
6. Permittivity (sec ⁻¹)	0.04	ASTM D-4491
7. UV Resistance @500 hours (%)	75	ASTM D-4355

2.4 SILT BOOM

- A. Prefabricated unit consisting of the following properties:
 - 1. Polypropylene
 - 2. Minimum 12 inch diameter
 - 3. Filtrexx Siltsoxx or equal

2.5 POLYETHYLENE SHEETING (POLY)

- A. All polyethylene sheeting used for covering stockpiled materials shall have a minimum thickness of 6 mils.
- B. Sandbags used to secure polyethylene sheeting covers shall have a minimum weight of 20 lbs.
- C. Silt fencing shall be located down gradient of any stockpiled materials. Silt fencing shall be appropriately maintained.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify gradients and elevations are correct.

3.2 SILT FENCE

- A. Excavate a 6 inch trench along the upstream side of the desired fence location.
- B. Drive fence posts a minimum of 12" into the ground. Install fence, well-staked at maximum eight foot intervals in locations as shown on Drawings. Secure fabric to fence and bury fabric end within the six inch deep trench cut.
- C. Lay lower 12 inches of silt fence into the trench, 6 inches deep and 6 inches wide. Backfill trench and compact.
- D. Overlap joints in fabric at post to prevent leakage of silt at seam.

3.3 SILT BOOM

- A. Secure in place using No. 4 steel rebar or 2 inch by 2 inch by 36 inch long wooden stakes at maximum distance of 10 foot on center.
- B. Do not drive over silt boom with construction vehicles or vehicles. Remove silt boom from the construction entrance in the morning prior to construction activities. Reinstall at end of the day immediately before fence is closed and secured.
- C. Remove sediment on upslope side once accumulation has reached 50% of effective height.

3.4 BALED HAY

- A. Excavation shall be to the width of the bale and the length of the proposed barrier to a minimum depth of 4 inches.

- B. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale.
- C. Staking shall be accomplished to securely anchor bales by driving at least two stakes or rebars through each bale to a minimum depth of 18 inches.
- D. The gaps between bales shall be filled by wedging straw in the gaps to prevent water from escaping between the bales.
- E. The excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4 inches on the uphill side. Loose straw shall then be scattered over the area immediately uphill from a straw barrier.
- F. Inspection shall be frequent and repair or replacement shall be made promptly as needed.

3.5 MULCHING, MATTING, AND SEEDING (TURF ESTABLISHMENT)

- A. Mulching:
 - 1. Mulching shall be done immediately after each area has been properly prepared.
 - 2. When seed for erosion control is sown prior to placing the mulch, the mulch shall be placed on the seeded areas within 24 hours after seeding. Hay that has been thoroughly fluffed shall be applied at approximately three tons per acre unless otherwise ordered or noted.
 - 3. Blowing chopped mulch will be permitted when authorized. Authorization will be given when it can be determined that the mulch fibers will be of such length and applied in such a manner that there will be a minimum amount of matting that would retard the growth of plants.
 - 4. Hay mulch should cover the ground enough to shade it, but the mulch should not be so thick that a person standing cannot see ground through the mulch. Matted mulch or bunches shall be removed or otherwise taken care of.
 - 5. In order to prevent the wind from displacing the mulch, after the mulch has been spread to the required depth, a light covering of loose branches, a system of pegs and strings, or other approved anchoring method shall be employed. Unless otherwise ordered, such means of control shall be removed prior to the acceptance of the project.
 - 6. All baling wire or rope, such as that used in the shipment of mulch shall be disposed of outside the limits of the project in approved areas
- B. Seeding: Seed any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
 - 1. During non-germinating periods, apply mulch at recommended rates.
 - 2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 00 at 75 percent of permanent application rate with no topsoil.
 - 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 00 permanent seeding specifications.
- C. Stabilize diversion channels, sediment traps, and stockpiles immediately. Stockpile and waste pile heights shall not exceed 10 feet. Slope stockpile sides at 2:1 or flatter

3.6 STABILIZED CONSTRUCTION ENTRANCE

- A. Install a stabilized construction entrance at the site to minimize tracking of site soil and sediment onto nearby roads.
- B. Ensure that the stabilized construction entrance is a minimum of 24 feet wide by 50 feet long and modify as necessary to accommodate site constraints. Place an adequate radius at the intersection with the road to prevent tracking of mud at the edge of the entrance.
- C. Remove all vegetation and any objectionable material from the foundation area. Divert all surface runoff and drainage from the stabilized construction entrance to a sediment trap or basin. Install a non-woven geotextile fabric on the CT Dot Qualified Product List before placing any stone. If necessary, install a culvert pipe across the entrance to provide positive drainage. Place the aggregate stone at a minimum depth of 6 inches uniform on top of the geotextile fabric.
- D. Inspect stabilized construction entrances every seven (7) days. Check for mud and sediment buildup and pad integrity. Wash, replace, or add stone whenever the entrance fails to perform effectively or as directed by the inspector. The stone in the entrance should be washed or replaced whenever the entrance fails to reduce mud being carried offsite by vehicles. Frequent washing will extend the useful life of the stone.
- E. Reshape stone pad as needed for drainage and runoff control. Brush or sweep up soil that has been tracked offsite immediately for proper disposal. Flushing should only be used when the water can be discharged to a sediment trap or basin. Maintain the stabilized construction entrance until the remainder of the construction site has been fully stabilized. Repair any broken pavement immediately.
- F. If the aggregate material is being tracked offsite, limit larger vehicles from the construction site or use a larger diameter stone. If excessive sediment is being tracked onto the roadway, increase the length of the stabilized construction entrance.

3.7 DUST CONTROL

- A. Throughout the project the Contractor shall carry on an active program for the control of fugitive dust within all site construction zones, or areas disturbed as a result of construction. Control methods shall include the following: Apply fine mist of water at a uniform rate in areas subject to blowing. For emergency control of dust apply water to affected areas. The source of supply and the method of application for water are the responsibility of the Contractor. The Contractor shall comply with all applicable requirements of the stormwater discharge permit for construction.
- B. The frequency and methods of application for fugitive dust control shall be as directed by MCA.

3.8 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

- B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

3.9 CLEANING

- A. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.
- B. Do not damage structure or device during cleaning operations.
- C. Do not permit sediment to erode into construction or site areas or natural waterways.
- D. Clean channels when depth of sediment reaches approximately one half channel depth.

END OF SECTION

SECTION 31 50 00

EXCAVATION SUPPORT AND PROTECTION

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. Section includes technical provisions for temporary excavation support and protection systems that are not anticipated to be necessary for project work. Any excavation support and protection systems and other provisions of this section shall be provided by the contractor at no additional cost
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for excavating and backfilling and for controlling surface-water runoff and ponding.
 - 2. Section 312319 "Dewatering" for dewatering excavations.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review geotechnical report.
 - 2. Review existing utilities and subsurface conditions.
 - 3. Review coordination for interruption, shutoff, capping, and continuation of utility services.
 - 4. Review proposed excavations.
 - 5. Review proposed equipment.
 - 6. Review monitoring of excavation support and protection system.
 - 7. Review coordination with waterproofing.
 - 8. Review abandonment or removal of excavation support and protection system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.

- B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.
 - 1. Include plans, elevations, sections, and details.
 - 2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
 - 3. Indicate type and location of waterproofing.
 - 4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor and professional engineer.
- B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Existing Conditions: Using photographs and video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.
- D. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.6 FIELD CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify MCA no fewer than three days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without MCA's written permission.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. MCA is not responsible for interpretations or conclusions drawn from the data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
 - 2. The geotechnical report is included elsewhere in Project Manual.

- C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. The contractor shall either be responsible for the design, monitoring, and maintenance of excavation support and protection system(s) as described under B. or delegate these services to a professional engineer as described under C.
- B. Be responsible for the design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads. The system shall:
 - 1. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 2. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 3. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.
- C. Delegate design services for the design of excavation support and protection systems including a comprehensive engineering analysis to a qualified professional engineer. The contractor shall then, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads to a qualified professional engineer. The contractor shall also;
 - 1. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 2. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
 - 3. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

2.2 MATERIALS

- A. General: Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.
- C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.
 - 1. Corners: Roll-formed corner shape with continuous interlock.

- D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.
- E. Shotcrete: Comply with American Concrete Institute (ACI) 506.2-13 – “Specification for Shotcrete”
- F. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- G. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- H. Tiebacks: Steel bars, ASTM A 722/A 722M.
- I. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
 - 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.2 FIELD QUALITY CONTROL

- A. Survey-Work Benchmarks: Resurvey benchmarks weekly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify MCA if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
- B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

- C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.3 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
 - 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
 - 2. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."
 - 3. Repair or replace, as approved by MCA, adjacent work damaged or displaced by removing excavation support and protection systems.
- B. Leave excavation support and protection systems permanently in place.

END OF SECTION

SECTION 31 62 20

MICROPILES

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 DESCRIPTION

- A. This work shall consist of constructing micropiles as shown on the contract plans and approved working drawings and as specified herein. The micropile specialty Contractor is responsible for furnishing of all design, materials, products, accessories, tools, equipment, services, transportation, labor and supervision, and manufacturing techniques required for design, installation and testing of micropiles and pile top attachments for this project.
- B. The selected micropile Contractor shall select the micropile type, size, pile top attachment, installation means and methods, estimate the ground-grout bond value and determine the required grout bond length and final micropile diameter. The micropile Contractor shall design and install micropiles that will develop the load capacities indicated on the contract plans. The micropile load capacities shall be verified by verification and proof load testing as required and must meet the test acceptance criteria specified herein.
- C. Where the imperative mood is used within this specification, "The Contractor shall" is implied.
- D. Related Requirements:
 - 1. Section 033000 "Cast In Place Concrete" For pile cap construction
 - 2. Section 312000 "Earth Moving" For excavation to pile cap elevation.
 - 3. Section 312329 "Dewatering" For control of water in excavation
 - 4. Section 315000 "Excavation Support and Protection" For temporary shoring required for work.
 - 5. Section 312313 "Erosion Controls" Maintenance of surface runoff during work.

1.3 MICROPILE CONTRACTOR'S EXPERIENCE REQUIREMENTS AND SUBMITTAL

- A. The micropile Contractor shall be experienced in the construction and load testing of micropiles and have successfully constructed at least 5 projects in the last 5 years involving construction totaling at least 100 micropiles of similar capacity to those required in these plans and specifications.
- B. The Contractor shall have previous micropile drilling and grouting experience in soil/rock similar to project conditions. The Contractor shall submit construction details, structural details and load

test results for at least three previous successful micropile load tests from different projects of similar scope to this project.

- C. The Contractor shall assign an Engineer to supervise the work with experience on at least 3 projects of similar scope to this project completed over the past 5 years. The Contractor shall not use consultants or manufacturers' representatives to satisfy the supervising Engineer requirements of this section. The on-site foremen and drill rig operators shall also have experience on at least 3 projects over the past 5 years installing micropiles of equal or greater capacity than required in these plans and specifications.
- D. The micropiles shall be designed by a Registered Professional Engineer with experience in the design of at least 3 successfully completed micropile projects over the past 5 years, with micropiles of similar capacity to those required in these plans and specifications. The micropile designer may be either an employee of the Contractor or a separate Consultant designer meeting the stated experience requirements.
- E. At least 45 calendar days before the planned start of micropile construction, the Contractor shall submit 5 copies of the completed project reference list and a personnel list. The project reference list shall include a brief project description with the owner's name and current phone number and load test reports. The personnel list shall identify the micropile system designer (if applicable), supervising project Engineer, drill rig operators, and on-site foremen to be assigned to the project. The personnel list shall contain a summary of each individual's experience and be complete enough for the Engineer to determine whether each individual satisfies the required qualifications. The Engineer will approve or reject the Contractor's qualifications within 15 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals will not be cause for time extension or impact or delay claims. All costs associated with incomplete or unacceptable submittals shall be borne by the Contractor.
- F. Work shall not be started, nor materials ordered, until the Engineer's written approval of the Contractor's experience qualifications is given. The Engineer may suspend the Work if the Contractor uses non-approved personnel. If work is suspended, the Contractor shall be fully liable for all resulting costs and no adjustment in contract time will result from the suspension.

1.4 DEFINITIONS

- A. Admixture: Substance added to the grout to control bleed and/or shrinkage, improve flowability, reduce water content, or retard setting time.
- B. Alignment Load (AL): A minimum initial load (5 percent DL maximum) applied to micropile during testing to keep the testing equipment correctly positioned.
- C. Allowable Geotechnical Bond Load: For Service Load Design (SLD), computed as the nominal grout-to-ground bond strength (α_{bond} nominal strength), divided by the geotechnical safety factor and then multiplied by the grouted bond surface area (bond length times drill hole circumference).
- D. Bonded Length: The length of the micropile that is bonded to the ground and conceptually used to transfer the applied axial loads to the surrounding soil or rock. Also known as the load transfer length.

- E. Bond-breaker: A sleeve placed over the steel reinforcement to prevent load transfer.
- F. Casing: Steel tube introduced during the drilling process in overburden soil to temporarily stabilize the drill hole. This is usually withdrawn as the pile is grouted, although in certain types of micropiles, some casing is permanently left in place to provide added pile reinforcement.
- G. Centralizer: A device to support and position the reinforcing steel in the drill hole and/or casing so that a minimum grout cover is provided.
- H. Contractor: The person/firm responsible for performing the micropile work.
- I. Coupler: The means by which load capacity can be transmitted from one partial length of reinforcement to another.
- J. Creep Movement: The movement that occurs during the creep test of a micropile under a constant load.
- K. Design Load (DL): The maximum unfactored load expected to be applied to the micropile during its service life.
- L. Encapsulation: A corrugated or deformed tube protecting the reinforcing steel against corrosion.
- M. Engineer: The Owner or Owner's authorized agent.
- N. Free (unbonded) length: The designed length of the micropile that is not bonded to the surrounding ground or grout.
- O. Geotechnical Bond Design Strength: For Load Factor Design (LFD), computed as the nominal grout-to-ground bond strength (α bond nominal strength), multiplied by a geotechnical resistance factor ϕ_G . Use $\phi_G = 0.6$ for typical designs and non-seismic load groups; use $\phi_G = 1.0$ for seismic loads groups
- P. Micropile: A small-diameter, bored, cast-in-place composite pile, in which the applied load is resisted by steel reinforcement, cement grout and frictional grout/ground bond.
- Q. Maximum Test Load: The maximum load to which the micropile is subjected during testing. Recommended as $2.5 \times DL$ for verification load tests and as $1.67 \times DL$ for proof load tests.
- R. Nominal Grout-to-Ground Bond Strength: The estimated ultimate geotechnical unit grout- to-ground bond strength selected for use in design. Same as α bond nominal strength (SLD and LFD)
- S. Obstruction: Manmade material encountered below grade requiring drilling through for completion of work.
- T. Overburden: Material, natural or placed, that may require cased drilling methods to provide an open borehole to underlying strata.
- U. Post-grouting: The injection of additional grout into the load transfer length of a micropile after the primary grout has set. Also known as regrouping or secondary grouting.

- V. Primary Grout: Portland-cement-based grout injected into the micropile hole prior to or after the installation of the reinforcement to direct the load transfer to the surrounding ground along the micropile.
- W. Proof Load Test: Incremental loading of a production micropile, recording the total movement at each increment.
- X. Reinforcement: The steel component of the micropile that accepts and/or resists applied loadings.
- Y. Sheathing: Smooth or corrugated piping or tubing that protects the reinforcing steel against corrosion.
- Z. Spacer: A device to separate elements of a multiple-element reinforcement.
- AA. Verification Load Test: Pile load test performed to verify the design of the pile system and the construction methods proposed, prior to installation of production piles.

1.5 REFERENCED CODES AND STANDARDS.

- A. The following publications form a part of this specification to the extent indicated by the references. The latest publication as of the issue date of this specification shall govern, unless indicated otherwise.
- B. American Society for Testing and Materials (ASTM) and American Association of State Highway and Transportation Officials (AASHTO)

ASTM	AASHTO	SPECIFICATION / TEST
A36/ A572	M183/ M223	Structural Steel
A82	M55	Cold-Drawn Steel Wire for Concrete Reinforcement
A252	–	Welded and Seamless Steel Pipe Piles
A615	M31	Deformed and Plain Billet Steel Bars for Concrete Reinforcement
A722	M275	Uncoated High-Strength Steel Bar for Prestressing Concrete
A775	–	Epoxy -Coated Reinforcing Steel Bars
A934	–	Epoxy-Coated Prefabricated Steel Reinforcing Bars
C 33	M80	Concrete Aggregates
C 109	T106	Compressive Strength of Hydraulic Cement Mortar
C 188	T133	Density of Hydraulic Cement
C 144	M45	Aggregate for Masonry Mortar
C 150	M 85	Portland Cement
C 494	M194	Chemical Admixtures for Concrete
D 1143	–	Method of Testing Piles Under Static Axial Compressive Load
D 1784	–	Polyvinyl Chloride (PVC) Pipe (Class 13464-B)
D 3350	M 252	Polyethylene Corrugated Tubing
D 3689	–	Method of Testing Individual Piles Under Static Axial Tensile Load
D 3966		Standard Test Method for Piles Under Lateral Load

- C. American Welding Society (AWS)
 - 1. D1.1 Structural Welding Code-Steel
 - 2. D1.2 Structural Welding Code-Reinforcing Steel
- D. American Petroleum Institute (API)
 - 1. 5CT (N-80) - Specification for casing and tubing
 - 2. RP 13B-1 - Recommended Practice – Standard Procedure for Field Testing Water Based Drilling Fluids

1.6 AVAILABLE INFORMATION.

- A. Available information developed by the Owner, or by the Owner's duly authorized representative include the following items:
 - 1. Plans prepared by Thomas A. Torrenti, P.C., dated December 17, 2018. The plans include the plan view, profile and typical cross sections for the proposed micropile locations.
 - 2. Plans prepared by Martinez Couch & Associates, LLC, dated December 17, 2018. The plans include the plan view, profile and typical cross sections for the proposed micropile locations.
 - 3. Geotechnical Report prepared by Welti Geotechnical, P.C. Titled: *Geotechnical Study for Proposed New Residence at 12 Jacob Street, Norwalk, CT*, dated: December 26, 2017, included or referenced in the bid documents, contains the results of test pits, exploratory borings and other site investigation data obtained in the vicinity of the proposed micropile locations.
 - 4. Soil Boring Report prepared by Soil Testing, Inc. Titled: *Heissan Residence, 12 Jacob Street, Norwalk, CT*, dated: February 23, 2015, included or referenced in the bid documents, contains the results of test pits, exploratory borings and other site investigation data obtained in the vicinity of the proposed micropile locations.

1.7 CONSTRUCTION SITE SURVEY

- A. Before bidding the Work, the Contractor shall review the available subsurface information and visit the site to assess the site geometry, equipment access conditions, and location of existing structures and above ground facilities.
- B. The Contractor is responsible for field locating and verifying the location of all utilities shown on the plans prior to starting the Work. Maintain uninterrupted service for those utilities designated to remain in service throughout the Work. Notify the Engineer of any utility locations different from shown on the plans that may require micropile relocations or structure design modification. Subject to the Engineer's approval, additional cost to the Contractor due to micropile relocations and/or structure design modification resulting from utility locations different from shown on the plans, will be paid as Extra Work.
- C. Prior to start of any micropile construction activity, the Contractor and Engineer shall jointly inspect the site to observe and document the pre-construction condition of the site, existing structures and facilities.

- A. The micropiles shall be designed to meet the specified loading conditions, as shown on the contract plans and approved working drawings. Design the micropiles and pile top to footing connections using the Service Load Design (SLD) procedures contained in the FHWA "Micropile Design and Construction Guidelines Manual", Report No. FHWA- SA-97-070.
 - B. The required geotechnical safety factors/strength factors (for SLD Design) or load and resistance factors (for LFD Design) shall be in accord with the FHWA manual, unless specified otherwise. Estimated soil/rock design shear strength parameters, unit weights, applied foundation loadings, slope and external surcharge loads, corrosion protection requirements, known utility locations, easements, rights-of-way and other applicable design criteria will be as shown on the plans or specified herein. Structural design of any individual micropile structure elements not covered in the FHWA manual shall be by the service load design method in conformance with appropriate articles of the most current Edition of the AASHTO Standard Specifications for Highway Bridges, including current interim specifications.
 - C. Where required as shown on the contract plans, corrosion protection of the internal steel reinforcing bars, consisting of either encapsulation, epoxy coating, or grout, shall be provided in accordance with Materials Section 2.0. Where permanent casing is used for a portion of the micropile, encapsulation shall extend at least 1.5 m into the casing.
- 1. Micropile Design Submittals.
 - a. At least 21 calendar days before the planned start of micropile structure construction, submit complete design calculations and working drawings to the Engineer for review and approval. Include all details, dimensions, quantities, ground profiles, and cross-sections necessary to construct the micropile structure. Verify the limits of the micropile structure and ground survey data before preparing the detailed working drawings.
 - b. The drawings and calculations shall be signed and sealed by the contractor's Professional Engineer or by the Consultant designer's Professional Engineer (if applicable), previously approved by the owner's Engineer. If the micropile contractor uses a consultant designer to prepare the design, the micropile contractor shall still have overall contract responsibility for both the design and the construction.
 - 2. Design Calculations.
 - a. Design calculations shall include, but not be limited to, the following items:
 - 1) A written summary report which describes the overall micropile design.
 - 2) Applicable code requirements and design references.
 - 3) Micropile structure critical design cross-section(s) geometry including soil/rock strata and piezometric levels and location, magnitude and direction of design applied loadings, including slope or external surcharge loads.
 - 4) Design criteria including, soil/rock shear strengths (friction angle and cohesion), unit weights, and ground-grout bond values and micropile drill hole diameter assumptions for each soil/rock strata.
 - 5) Safety factors/strength factors (for Service Load Design) or load and resistance factors (for Load Factor Design) used in the design on the ground-grout bond values, surcharges, soil/rock and material unit weights, steel, grout, and concrete materials.

- 6) Seismic design earthquake acceleration coefficient.
 - 7) Design calculation sheets (both static and seismic) with the project number, micropile structure location, designation, date of preparation, initials of designer and checker, and page number at the top of each page. Provide an index page with the design calculations.
 - 8) Design notes including an explanation of any symbols and computer programs used in the design.
 - 9) Pile to footing connection calculations.
 - 10) Calculations for footing reinforcement different from that on the Owner provided preliminary plans, if required to accommodate the Contractor designed pile layout.
 3. Working Drawings.
 - a. The working drawings shall include all information required for the construction and quality control of the piling. Working drawings shall include, but not be limited to, the following items unless provided in the contract plans:
 - 1) A plan view of the micropile structure(s) identifying:
 - a) A reference baseline and elevation datum to pier layout.
 - b) Subsurface exploration locations shown on a plan view of the proposed micropile structure alignment with appropriate reference base lines to fix the locations of the explorations relative to the micropile structure.
 - b. An elevation view of the micropile structure(s) identifying:
 - 1) Elevation view showing micropile locations and elevations; vertical and horizontal spacing; batter and alignment and the location of drainage elements (if applicable).
 - 2) Existing and finish grade profiles both behind and in front of the micropile structure.
 - c. Design parameters and applicable codes.
 - d. General notes for constructing the micropile structure including construction sequencing or other special construction requirements.
 - e. Micropile typical sections including micropile spacing and inclination; minimum drill hole diameter; pipe casing and reinforcing bar sizes and details; splice types and locations; centralizers and spacers; grout bond zone and casing plunge lengths (if used);
 - f. Corrosion protection details; and connection details to the substructure footing, anchorage, plates, etc.
 - g. Details, dimensions, and schedules for all micropiles, casing and reinforcing steel, including reinforcing bar bending details.
 - D. The working drawings and design calculations shall be signed and sealed by the Contractor's Professional Engineer. If the micropile Contractor uses a Consultant designer to prepare the design, the micropile Contractor shall still have overall contract responsibility for both the design and the construction.
 - E. Submit 3 sets of the working drawings with the initial submission. One set will be returned with any indicated corrections. The Engineer will approve or reject the Contractor's submittal within 15 calendar days after receipt of a complete submission. If revisions are necessary, make the necessary corrections and resubmit 5 revised sets. When the drawings are approved, furnish 3 sets and a digital PDF of the approved drawings. The Contractor will not be allowed to begin micropile structure construction or incorporate materials into the work until the submittal requirements are

satisfied and found acceptable to the Engineer. Changes or deviations from the approved submittals must be re-submitted for approval. No adjustments in contract time or delay or impact claims will be allowed due to incomplete submittals.

- F. Revise the drawings when plan dimensions are changed due to field conditions or for other reasons. Within 30 days after completion of the work, submit as-built drawings to the Engineer. Provide revised design calculations signed by the approved Registered Professional Engineer for all design changes made during the construction of the micropile structure.

1.9 CONSTRUCTION SUBMITTALS.

- A. The Contractor shall prepare and submit to the Engineer, for review of completeness, 3 copies of the following for the micropile system or systems to be constructed:
1. Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing and equipment to assure quality control. This step-by-step procedure shall be shown on the working drawings in sufficient detail to allow the Engineer to monitor the construction and quality of the micropiles.
 2. Proposed start date and time schedule and micropile installation schedule providing the following:
 - a. Micropile number
 - b. Micropile design load
 - c. Type and size of reinforcing steel
 - d. Minimum total bond length
 - e. Total micropile length
 - f. Micropile top footing attachment
 3. If welding of casing is proposed, submit the proposed welding procedure, certified by a qualified welding specialist.
 4. Information on headroom and space requirements for installation equipment that verify the proposed equipment can perform at the site.
 5. Plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed.
 6. Certified mill test reports for the reinforcing steel or coupon test results for permanent casing without mill certification. The ultimate strength, yield strength, elongation, and material properties composition shall be included. For API N-80 pipe casing, coupon test results may be submitted in lieu of mill certification.
 7. Proposed Grouting Plan. The grouting plan shall include complete descriptions, details, and supporting calculations for the following:
 - a. Grout mix design and type of materials to be used in the grout including certified test data and trial batch reports.
 - b. Methods and equipment for accurately monitoring and recording the grout depth, grout volume and grout pressure as the grout is being placed.
 - c. Grouting rate calculations, when requested by the Engineer. The calculations shall be based on the initial pump pressures or static head on the grout and losses throughout the placing system, including anticipated head of drilling fluid (if applicable) to be displaced.
 - d. Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one year of the start of grouting may be

submitted for initial verification and acceptance and start of production work. During production, grout shall be tested in accord with this specification.

- e. Procedure and equipment for Contractor monitoring of grout quality.

- B. Work other than test pile installation shall not begin until the construction submittals have been received, reviewed, and accepted in writing by the Engineer. Provide submittal items 5 at least 21 calendar days prior to initiating micropile construction or incorporation of the respective materials into the work. The Contractor shall allow the Engineer 7 calendar days to review the construction submittals after a complete set has been received. Additional time required due to incomplete or unacceptable submittals shall not be cause for delay or impact claims. All costs associated with incomplete or unacceptable Contractor submittals shall be the responsibility of the Contractor.

1.10 PRE-CONSTRUCTION MEETING.

- A. A pre-construction meeting will be scheduled by the Engineer and held prior to the start of micropile construction. The Engineer, prime Contractor, micropile specialty Contractor, micropile designer, excavation Contractor and geotechnical instrumentation specialist (if applicable) shall attend the meeting. Attendance is mandatory. The pre-construction meeting will be conducted to clarify the construction requirements for the work, to coordinate the construction schedule and activities, and to identify contractual relationships and delineation of responsibilities amongst the prime Contractor and the various Subcontractors - specifically those pertaining to excavation for micropile structures, anticipated subsurface conditions, micropile installation and testing, micropile structure survey control and site drainage control.

PART 2 - Materials

2.1 MATERIALS.

- A. Furnish materials new and without defects. Remove defective materials from the jobsite at no additional cost. Materials for micropiles shall consist of the following:
 - 1. Admixtures for Grout: Admixtures shall conform to the requirements of ASTM C 494/AASHTO M194. Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout, subject to the review and acceptance of the Engineer. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations. Expansive admixtures shall only be added to the grout used for filling sealed encapsulations and anchorage covers. Accelerators are not permitted.
 - 2. Admixtures containing chlorides are not permitted.
 - 3. Cement: All cement shall be Portland cement conforming to ASTM C 150/AASHTO M85, Types II, III or V.
 - 4. Centralizers and Spacers: Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material non-detrimental to the reinforcing steel. Wood shall not be used. Centralizers and spacers shall be securely attached to the reinforcement; sized to position the reinforcement within 10 mm of plan location from center of pile; sized to allow grout tremie pipe insertion to the bottom of the drill hole; and sized to allow grout to freely flow up the drill hole and casing and between adjacent reinforcing bars.

5. Encapsulation: Encapsulation (double corrosion protection) shall be shop fabricated using high-density, corrugated polyethylene tubing conforming to the requirements of ASTM D3350/AASHTO M252 with a nominal wall thickness of 0.8 mm. The inside annulus between the reinforcing bars and the encapsulating tube shall be a minimum of 5mm and be fully grouted with non-shrink grout conforming to Materials Section 2.0.
6. Epoxy Coating: The minimum thickness of coating applied electrostatically to the reinforcing steel shall be 0.3 mm. Epoxy coating shall be in accordance with ASTM A775 or ASTM
7. A934. Bend test requirements are waived. Bearing plates and nuts encased in the pile concrete footing need not be epoxy coated.
8. Fine Aggregate: If sand - cement grout is used, sand shall conform to ASTM C 144/AASHTO M45.
9. Grout: Neat cement or sand/cement mixture with a minimum 3-day compressive strength of 14 MPa and a 28-day compressive strength of 28 MPa per AASHTO T106/ASTM C109.
10. Grout Protection: Provide a minimum 25 mm grout cover over bare or epoxy coated bars (excluding bar couplers) or minimum 12 mm grout cover over the encapsulation of encapsulated bars.
11. Permanent Casing Pipe:
 - a. Permanent steel casing/pipe shall have the diameter and at least minimum wall thickness shown on the approved Working Drawings. The permanent steel casing/pipe:
 - 1) shall meet the Tensile Requirements of ASTM A252, Grade 3, except the yield strength shall be a minimum of 345 MPa to 552 MPa as used in the design submittal.
 - 2) may be new "Structural Grade" (a.k.a. "Mill Secondary") steel pipe meeting above but without Mill Certification, free from defects (dents, cracks, tears) and with two coupon tests per truckload delivered to the fabricator.
 - b. For permanent casing/pipe that will be welded, the following material conditions apply:
 - 1) the carbon equivalency (CE) as defined in AWS D1. 1, Section X15.1, shall not exceed 0.45, as demonstrated by mill certifications
 - 2) the sulfur content shall not exceed 0.05%, as demonstrated by mill certifications
 - c. For permanent casing/pipe that will be shop or field welded, the following fabrication or construction conditions apply:
 - 1) the steel pipe shall not be joined by welded lap splicing
 - 2) welded seams and splices shall be complete penetration welds
 - 3) partial penetration welds may be restored in conformance with AWS D1.1
 - 4) the proposed welding procedure certified by a welding specialist shall be submitted for approval
 - d. Threaded casing joints shall develop at least the required nominal resistance used in the design of the micropile.
12. Plates and Shapes: Structural steel plates and shapes for pile top attachments shall conform to ASTM A 36/AASHTO M183, or ASTM A 572/AASHTO M223, Grade 350.
13. Reinforcing Bars: Reinforcing steel shall be deformed bars in accordance with ASTM A 615/AASHTO M31, Grade 420 or Grade 520 or ASTM A 722/AASHTO M275, Grade 1035. When a bearing plate and nut are required to be threaded onto the top end of reinforcing bars for the pile top to footing anchorage, the threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g., Dywidag or Williams continuous threadbars) or may be cut into a reinforcing bar. If threads are cut into a

- reinforcing bar, the next larger bar number designation from that shown on the Plans shall be provided, at no additional cost.
- a. Bar tendon couplers, if required, shall develop the ultimate tensile strength of the bars without evidence of any failure.
14. Reinforcing Bar Corrosion Protection:
 - a. Resistivity – AASHTO T-288/ASTM G57 – Below 2,000 ohm-cm
 - b. pH – AASTHO T-289/ASTM G51 – Below 5
 - c. Sulfate – AASJTO T-290/ASTM D516M/ASTMD4327 – Above 200 ppm
 - d. Chloride AASHTO T-291/ASTM D512/D4327 – Above 100 ppm
 15. Sheathing: Smooth plastic sheathing, including joints, shall be watertight. Polyvinyl chloride (PVC) sheathing shall conform to ASTM D 1784, Class 13464-B.
 16. Water: Water used in the grout mix shall conform to AASHTO T 26 and shall be potable, clean, and free from substances that may be injurious to cement and steel.

PART 3 - Execution

3.1 CONSTRUCTION REQUIREMENTS

3.2 SITE DRAINAGE CONTROL.

- A. The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accord with the standard specifications and all applicable local codes and regulations.
- B. Provide positive control and discharge of all surface water that will affect construction of the micropile installation. Maintain all pipes or conduits used to control surface water during construction. Repair damage caused by surface water at no additional cost.
- C. Upon substantial completion of the Work, remove surface water control pipes or conduits from the site. Alternatively, with the approval of the Engineer, pipes or conduits that are left in place, may be fully grouted and abandoned or left in a way that protects the structure and all adjacent facilities from migration of fines through the pipe or conduit and potential ground loss.
- D. Immediately contact the Engineer if unanticipated existing subsurface drainage structures are discovered during excavation or drilling. Suspend work in these areas until remedial measures meeting the Engineer's approval are implemented. Cost of remedial measures or repair work resulting from encountering unanticipated subsurface drainage structures, will be paid for as Extra Work.

3.3 EXCAVATION

- A. Coordinate the work and the excavation so the micropile structures are safely constructed. Perform the micropile construction and related excavation in accordance with the Plans and approved submittals. No excavations steeper than those specified herein or shown on the Plans will be made above or below the micropile structure locations without written approval of the Engineer.

- A. Construction tolerances.
1. Centerline of piling shall not be more than 3 inches (75 mm) from indicated plan location.
 2. Pile shall be plumb within 2 percent of total-length plan alignment.
 3. Top elevation of pile shall be plus 1 inch (25) mm or minus 2 inches (50 mm) maximum from vertical elevation indicated.
 4. Centerline of reinforcing steel shall not be more than 1/2 inch (15 mm) from indicated location.
- B. The micropile Contractor shall select the drilling method, the grouting procedure, and the grouting pressure used for the installation of the micropiles. The micropile Contractor shall also determine the micropile casing size, final drill hole diameter and bond length, and central tendon reinforcement steel sizing necessary to develop the specified load capacities and load testing requirements. The micropile Contractor is also responsible for estimating the grout take. There will be no extra payment for grout overruns.
- C. Drilling
1. The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to any overlying or adjacent structures or services. The drill hole must be open along its full length to at least the design minimum drill hole diameter prior to placing grout and reinforcement.
 2. Temporary casing or other approved method of pile drill hole support will be required in caving or unstable ground to permit the pile shaft to be formed to the minimum design drill hole diameter. The Contractor's proposed method(s) to provide drill hole support and to prevent detrimental ground movements shall be reviewed by the Engineer. Detrimental ground movement is defined as movement which requires remedial repair measures. Use of drilling fluid containing bentonite is not allowed.
 3. Costs of removal or remedial measures due to encountering unanticipated subsurface obstructions will be paid for as Extra Work.
- D. Ground Heave or Subsidence.
1. During construction, the Contractor shall observe the conditions vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. Immediately notify the Engineer if signs of movements are observed. Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the Engineer determines that the movements require corrective action, the Contractor shall take corrective actions necessary to stop the movement or perform repairs.
 2. When due to the Contractor's methods or operations or failure to follow the specified/approved construction sequence, as determined by the Engineer, the costs of providing corrective actions will be borne by the Contractor. When due to differing site conditions, as determined by the Engineer, the costs of providing corrective actions will be paid as Extra Work.
- E. Pipe Casing and Reinforcing Bars Placement and Splicing.
1. Reinforcement may be placed either prior to grouting or placed into the grout - filled drill hole before temporary casing (if used) is withdrawn. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease or oil that might contaminate the grout or

- coat the reinforcement and impair bond. Pile cages and reinforcement groups, if used, shall be sufficiently robust to withstand the installation and grouting process and the withdrawal of the drill casings without damage or disturbance.
2. The Contractor shall check pile top elevations and adjust all installed micropiles to the planned elevations.
 3. Centralizers and spacers (if used) shall be provided at 3-m centers maximum spacing. The upper and lower most centralizer shall be located a maximum of 1.5 m from the top and bottom of the micropile. Centralizers and spacers shall permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. The central reinforcement bars with centralizers shall be lowered into the stabilized drill hole and set. The reinforcing steel shall be inserted into the drill hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. Contractor shall re-drill and reinsert reinforcing steel when necessary to facilitate insertion.
 4. Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two lengths to be spliced.
 5. Splices and threaded joints shall meet the requirements of Materials Section 2.0. Threaded pipe casing joints shall be located at least two casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 0.3 meters.

3.5 GROUTING.

- A. Micropiles shall be primary grouted the same day the load transfer bond length is drilled. The Contractor shall use a stable neat cement grout or a sand cement grout with a minimum 28-day unconfined compressive strength of 28 MPa. Admixtures, if used, shall be mixed in accordance with manufacturer's recommendations. The grouting equipment used shall produce a grout free of lumps and undispersed cement. The Contractor shall have means and methods of measuring the grout quantity and pumping pressure during the grouting operations. The grout pump shall be equipped with a pressure gauge to monitor grout pressures. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauges shall be capable of measuring pressures of at least 1 MPa or twice the actual grout pressures used, whichever is greater. The grout shall be kept in agitation prior to mixing. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation. The grout shall be injected from the lowest point of the drill hole and injection shall continue until uncontaminated grout flows from the top of the pile. The grout may be pumped through grout tubes, casing, hollow-stem augers, or drill rods.
- B. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed the grout level is brought back up to the ground level before the next length is removed. The tremie pipe or casing shall always extend below the level of the existing grout in the drill hole. The grout pressures and grout take shall be controlled to prevent excessive heave or fracturing of rock or soil formations. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.
- C. If the Contractor elects to use a post grouting system, Working Drawings and details shall be submitted to the Engineer for review in accordance with Section 1.8.

- A. Grout within the micropile verification and proof test piles shall attain the minimum required 3-day compressive strength of 14 MPa prior to load testing. Previous test results for the proposed grout mix completed within one year of the start of work may be submitted for initial verification of the required compressive strengths for installation of pre-production verification test piles and initial production piles. During production, micropile grout shall be tested by the Contractor for compressive strength in accordance with AASHTO T106/ASTM C109 at a frequency of no less than one set of three 50-mm grout cubes from each grout plant each day of operation or per every 10 piles, whichever occurs more frequently. The compressive strength shall be the average of the 3 cubes tested.
- B. Grout consistency as measured by grout density shall be determined by the Contractor per ASTM C 188/AASHTO T 133 or API RP-13B-1 at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout.
- C. Grout samples shall be taken directly from the grout plant. Provide grout cube compressive strength and grout density test results to the Engineer within 24 hours of testing.

3.7 MICROPILE INSTALLATION RECORDS.

- A. Contractor shall prepare and submit to the Engineer full-length installation records for each micropile installed. The records shall be submitted within one work shift after that pile installation is completed. The data shall be recorded on the micropile installation log included at the end of this specification. A separate log shall be provided for each micropile.)

PART 4 - Method of Measurement

4.1 MEASUREMENT WILL BE MADE AS FOLLOWS FOR THE QUANTITY, AS SPECIFIED OR DIRECTED BY THE ENGINEER:

- A. Mobilization will be measured on a lump-sum basis.
- B. Micropiles will be measured on a lump-sum basis.

4.2 THE FINAL PAY QUANTITIES WILL BE THE DESIGN QUANTITY INCREASED OR DECREASED BY ANY CHANGES AUTHORIZED BY THE ENGINEER.

PART 5 - Basis of Payment

5.1 THE QUANTITIES ACCEPTED FOR PAYMENT WILL BE PAID FOR AT THE CONTRACT UNIT PRICES FOR THE FOLLOWING ITEMS:

Pay Item	Unit
Mobilization and Demobilization	Lump Sum
Micropiles	Lump Sum
Micropiles Variations in Length to Top of Rock . . .	LF**
Obstruction Drilling	***

**Where piles are founded in rock, micropiles will be paid on a per each basis assuming Rock at Elevation -17.0' (NAVD88). Additional length or shorter length due to variations in the top of rock will be paid on a add or deduct lineal foot basis where the linear footage = [Elevation -17.0' (NAVD 88)] minus [Elevation of As-Built Rock].

*** Obstruction drilling to be included in lumpsum Mircropile price.

- A. The contract unit prices for the above items will be full and complete payment for providing all design, materials, labor, equipment, and incidentals to complete the work.
- B. The unit contract amount for "Micropiles" shall include the drilling, furnishing, and placing the reinforcing steel and casing, grouting, and pile top attachments. The micropile Contractor is also responsible for estimating the grout take. There will be no extra payment for grout overruns.

SECTION 32 31 13

CHAIN LINK FENCING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Erection, maintenance, and dismantling of temporary fencing around construction site and materials storage areas.
 - 2. Refer to Drawings for temporary fence type, layout, and location of gates.

1.2 SUBMITTALS

- A. Shop drawing indicating layout of temporary fencing, location and size of gates, existing pavement and other site specific conditions.

PART 2 PRODUCTS

2.1 TEMPORARY CHAIN LINK FENCING

- A. Unless otherwise indicated, type of temporary chain link fencing shall be Contractor's option. The following types are acceptable:
 - 1. New materials or previously used salvaged chain link fencing in good condition and at least 6 feet in height.
 - 2. Posts: Galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for setting in concrete footings, driving into ground, anchoring with base plates, or inserting in precast concrete blocks.
 - 3. Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.
- B. Gates: Provide personnel and vehicle gates of the quantity and size indicated on the Drawings or required for functional access to site.
 - 1. Fabricate of same material as used for fencing.
 - 2. Vehicle gates:
 - a. Minimum width: 20 feet to allow access for emergency vehicles.
 - b. Capable of manual operation by one person.

2.2 PERMANENT CHAIN LINK FENCING

- A. Fence Height: 7 feet nominal.
- B. Line Post Spacing: At intervals not exceeding 10 feet

- C. Fence Post and Rail Strength: Conform to ASTM F1043 Heavy Industrial Fence quality.

PART 3 EXECUTION

3.1 LAYOUT

- A. Installation of temporary fencing shall not deter or hinder access to existing and new hose connections and fire hydrants.
1. Maintain 3 feet diameter clear space around fire hydrants.
 2. Where fire hydrant or hose connection is blocked by fencing, provide access gate.
- B. Access: Provide gates for personnel, delivery of materials, and access by emergency vehicles.
- C. Field verify location with the Engineer.

3.2 INSTALLATION

- A. Chain link posts:
1. Space at 10 feet maximum.
 2. Drive posts, set in holes and backfill, or anchor in precast concrete blocks or other provide other suitable means of anchoring.
 3. For soft and unstable ground conditions, cast concrete plug around post.
 4. Posts over pavement: Use steel post plates or precast concrete blocks.
 5. Gate posts: Use bracing or concrete footings to provide rigidity for accommodating size of gate.
- B. Fabric: Securely attach to posts.
- C. Gates: Install with required hardware.
- D. Plastic mesh fencing: Space steel support posts to ensure mesh remains vertical and at proper height. Securely tie mesh to posts.

3.3 MAINTENANCE AND REMOVAL

- A. Maintain fencing in good condition. If damaged, immediately repair.
- B. Remove temporary fencing upon completion of Work or when no longer required for security or control. Backfill holes and compact. Holes in pavement shall be surfaced to match existing paving. Repair damage caused by installation of temporary fencing.

END OF SECTION

SECTION 32 92 00

TURF AND GRASSES

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. Section Includes:

- 1. Seeding.
- 2. Mulches
- 3. Topsoil

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and

percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

- C. Product Certificates: For fertilizers and seed, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
 - 1. Pesticide Applicator: CT licensed, commercial.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.

1. Spring Planting: Shall occur between April 1 to June 15 or as approved by MCA
2. Fall Planting: Shall occur between August 15 to October 15 or as approved by MCA

- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species:
1. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 - a. 35 percent Kentucky bluegrass (*Poa pratensis*).
 - b. 35 percent chewings red fescue (*Festuca rubra* variety).
 - c. 30 percent perennial ryegrass (*Lolium perenne*).

2.2 TOPSOIL.

- A. Topsoil: Topsoil shall meet requirements of CT DOT Form 817 Section M.13.01.
1. Topsoil: Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil. The Contractor shall notify MCA of the location of off-site topsoil source and get approval from MCA for its use.

2.3 FERTILIZERS

- A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 8 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Manufacturers: Milorganite or equal
 2. Composition: 5 percent nitrogen, 2 percent phosphorous, 1 percent potassium, and 4% iron, by weight based on manufacturer's data.

2.4 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Wood Fiber Mulch: wood fiber mulch shall meet requirements of CT DOT Form 817 Section M.13.05.

2.5 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.6 EROSION-CONTROL MATERIALS

- A. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Erosion-Control Mats: Cellular, nonbiodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Tenax Corporation - USA.
 - b. North American Green

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by MCA and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to industry accepted methods.
- B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade or Place manufactured planting soil over exposed subgrade.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- D. Before planting, obtain MCA's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, commercial fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
- B. Mix slurry with nonasphaltic or fiber-mulch manufacturer's recommended tackifier.
- C. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.5 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.6 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 2 lb/1000 sq. ft. or as recommended by the seed manufacturer..
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with erosion-control mats where directed by MCA; install and anchor according to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- G. Protect seeded areas from hot, dry weather or drying winds by applying planting soil within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.7 TURF RENOVATION

- A. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 - 2. Install new planting soil as required.
- B. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- C. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- D. Mow, dethatch, core aerate, and rake existing turf.

- E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- H. Apply initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
 - 1. Initial Fertilizer: Slow-release fertilizer applied according to manufacturer's recommendations.
- I. Apply seed and protect with straw mulch or sod as required for new turf.
- J. Water newly planted areas and keep moist until new turf is established.

3.8 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Maintain a system to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 - 1. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow grass to a height of 3 to 3.5 inches.
- D. Turf Post fertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.

3.9 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by MCA:
1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.10 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.11 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove non-degradable erosion-control measures after grass establishment period.

3.12 MAINTENANCE SERVICE

- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted.

END OF SECTION

SECTION 33 05 00

COMMON WORK RESULTS FOR UTILITIES

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 includes the following:
 - 1. Piping joining materials.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Sleeves.
 - 5. Identification devices.
 - 6. Piped utility demolition.
 - 7. Piping system common requirements.
 - 8. Equipment installation common requirements.
 - 9. Metal supports and anchorages.

1.3 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- C. CPVC: Chlorinated polyvinyl chloride plastic.
- D. PE: Polyethylene plastic.
- E. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Dielectric fittings.
2. Identification devices.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.8 COORDINATION

- A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.
- C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Section 03 30 00 – "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
 - 1. CPVC Piping: ASTM F 493.
 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 3. PVC to ABS Piping Transition: ASTM D 3138.
- H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 TRANSITION FITTINGS

- A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings NPS 1-1/2 and Smaller:
 - 1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
 - 2. Aboveground Piping: Specified piping system fitting.

- C. AWWA Transition Couplings NPS 2 and Larger:
 - 1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.
- D. Plastic-to-Metal Transition Fittings:
 - 1. Description: CPVC and PVC, one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.
- E. Plastic-to-Metal Transition Unions:
 - 1. Description: MSS SP-107, CPVC and PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.
- F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:
 - 1. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.3 DIELECTRIC FITTINGS

- A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.
- B. Dielectric Unions:
 - 1. Description: Factory fabricated, union, NPS 2 and smaller.
 - a. Pressure Rating: 150 psig minimum at 180 deg F.
 - b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.
- C. Dielectric Flanges:
 - 1. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 and larger.
 - a. Pressure Rating: 150 psig minimum.
 - b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Kits:
 - 1. Description: Nonconducting materials for field assembly of companion flanges, NPS 2-1/2 and larger.
 - a. Pressure Rating: 150 psig minimum.
 - b. Gasket: Neoprene or phenolic.
 - c. Bolt Sleeves: Phenolic or polyethylene.
 - d. Washers: Phenolic with steel backing washers.
- E. Dielectric Couplings:

1. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 and smaller.
 - a. Pressure Rating: 300 psig at 225 deg F.
 - b. End Connections: Threaded.

F. Dielectric Nipples:

1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.
 - a. Pressure Rating: 300 psig at 225 deg F.
 - b. End Connections: Threaded or grooved.

2.4 SLEEVES

- A. Mechanical sleeve seals for pipe penetrations are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.
- D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.
- G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.5 IDENTIFICATION DEVICES

- A. General: Products specified are for applications referenced in other utilities Sections. If more than single type is specified for listed applications, selection is Installer's option.
- B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.
 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
 2. Location: Accessible and visible.
- C. Stencils: Standard stencils prepared with letter sizes complying with recommendations in ASME A13.1. Minimum letter height is 1-1/4 inches for ducts, and 3/4 inch for access door signs and similar operational instructions.

1. Material: Fiberboard.
 2. Stencil Paint: Exterior, oil-based, alkyd-gloss black enamel, unless otherwise indicated. Paint may be in pressurized spray-can form.
 3. Identification Paint: Exterior, oil-based, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.
- D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semi rigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.
- E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.
- F. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.
- G. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.
- H. Lettering: Manufacturer's standard preprinted captions as selected by MCA.
- I. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
1. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.
- J. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.
1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.
 2. Color: Comply with ASME A13.1, unless otherwise indicated.
- K. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.
1. Material: 0.032-inch-thick, polished brass.
 2. Material: 0.0375-inch-thick stainless steel.
 3. Material: 3/32-inch-thick plastic laminate with 2 black surfaces and a white inner layer.
 4. Material: Valve manufacturer's standard solid plastic.
 5. Size: 1-1/2 inches in diameter, unless otherwise indicated.
 6. Shape: As indicated for each piping system.
- L. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.
- M. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
 2. Thickness: 1/8", unless otherwise indicated.
 3. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
 4. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.
- N. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:
1. Green: Cooling equipment and components.
 2. Yellow: Heating equipment and components.
 3. Brown: Energy reclamation equipment and components.
 4. Blue: Equipment and components that do not meet criteria above.
 5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
 6. Terminology: Match schedules as closely as possible. Include the following:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
 7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- O. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.
1. Size: 3-1/4 by 5-5/8 inches.
 2. Fasteners: Brass grommets and wire.
 3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
- P. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.
1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

2.6 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

- A. Refer to Section 02 41 19 "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 DIELECTRIC FITTING APPLICATIONS

- A. Dry Piping Systems: Connect piping of dissimilar metals with the following:
 1. NPS 2 and Smaller: Dielectric unions.
 2. NPS 2-1/2 to NPS 12: Dielectric flanges or dielectric flange kits.
- B. Wet Piping Systems: Connect piping of dissimilar metals with the following:
 1. NPS 2 and Smaller: Dielectric couplings or dielectric nipples.
 2. NPS 2-1/2 to NPS 4: Dielectric nipples.
 3. NPS 2-1/2 to NPS 8: Dielectric nipples or dielectric flange kits.
 4. NPS 10 and NPS 12: Dielectric flange kits.

3.3 PIPING INSTALLATION

- A. Install piping according to the following requirements and the sections of utility specifications pertaining to piping systems.

- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are not required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.
- K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.4 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.
- I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.
- K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
 - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

- N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End PE Pipe and Fittings: Use butt fusion.
 - 2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.
- O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.5 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Install dielectric fittings at connections of dissimilar metal pipes.

3.6 EQUIPMENT INSTALLATION

- A. Install equipment level and plumb, unless otherwise indicated.
- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- C. Install equipment to allow right of way to piping systems installed at required slope.

3.7 PAINTING

- A. Painting of piped utility systems, equipment, and components is specified in Section 099000 "Painting and Coatings".
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 IDENTIFICATION

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 - 1. Stenciled Markers: According to ASME A13.1.
 - 2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.

3. Locate pipe markers on exposed piping according to the following:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
 - c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
 - d. At manholes and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
 1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
 2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

END OF SECTION

SECTION 33 16 00

STORAGE TANKS

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. SECTION INCLUDES
 - 1. Underground Water Tanks for Onsite Wastewater Storage.
- B. Related Sections
 - 1. Section 31 20 00 – Earth Moving
 - 2. Section 03 30 00 – Cast in Place Concrete.

1.3 REFERENCES

- A. Underground Water Tanks in the United States:
 - 1. American Concrete Institute (ACI) standard ACI 318, Building Code Requirements for Structural Concrete.
 - 2. ANSI/AWWA D120 - Thermosetting Fiberglass-Reinforced Plastic Tanks.
 - 3. IAPMO/ANSI Z1000 - Prefabricated Septic Tanks.
 - 4. Tank manufacturer shall be recognized by Underwriters Laboratories as a manufacturer of tanks listed to the UL 1316 standard.

1.4 SUBMITTALS

- A. Submit under provisions of Section 013300 – Submittal Procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including, but not limited to, the following:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation manual and operating guidelines.
- C. Shop drawings: Tank manufacturer shall submit the following for review and approval prior to fabrication of the tanks:
 - 1. Detailed shop drawings of each tank complete with all accessories supplied by the manufacturer.
 - 2. Detailed shipping, handling and installation instructions.

1.5 QUALITY ASSURANCE

- A. Tank installations in the United States:
 - 1. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with tank manufacturer's Installation and Operating Guidelines recommendations for delivery, storage, and tank handling.

1.7 WARRANTY

- A. Warranty: Provide manufacturer's standard limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

- A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
 - 1. Infiltrator Water Technologies, 4 Business Park Road, Old Saybrook, CT 06475
 - 2. Xerxes Corporation, 7901 Xerxes Ave. S.; Minneapolis, MN USA 55431-1288
 - 3. United Concrete Products, 173 Church Street Yalesville, CT 06492.
- B. Product Basis of Design:
 - 1. Infiltrator Water Technologies IM-540
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 25 00 – Substitution Procedures.

2.2 UNDERGROUND WASTEWATER STORAGE TANKS

- A. Tank Design - Fiberglass reinforced plastic (FRP) and Injection Molded Polypropylene (PP) tanks:
 - 1. The tank size, fittings and accessories shall be as shown on the drawings.
 - 2. Tank shall be manufactured with structural ribs which are fabricated as in integral part of the tank wall.
 - 3. Tank shall be capable of handling liquids with specific gravity up to 1.1
 - 4. Tank shall be compatible with liquids identified in the manufacturer's standard limited warranty.
- B. Tank Design: Precast concrete
 - 1. Compliance with NCPA 'Septic Tank Manufacturing Best Practices
 - 2. ASTM C 1227 "Standard Specification for Precast Concrete Septic Tanks
- C. Loading Conditions - Tank shall meet the following design criteria:
 - 1. Internal Load - Tank shall be designed to withstand a 5-psig (35 kPa) air-pressure test with a 5:1 safety factor.
 - 2. External Hydrostatic Pressure - Tank shall be designed for 4 feet of overburden over the top of the tank, the hole fully flooded, and a safety factor of 5:1 against general buckling.
- D. Onsite Wastewater Storage Applications:
 - 1. Governing Standards, as applicable:
 - a. ANSI/AWWA D120 - Thermosetting Fiberglass-Reinforced Plastic Tanks.
 - b. American Concrete Institute (ACI) standard ACI 318, Building Code Requirements for Structural Concrete.

- c. IAPMO/ANSI Z1000 - Prefabricated Septic Tanks. Tank shall be IAPMO/ANSI Z1000 listed and labeled.
2. Tank Design: Single-Wall vessel as specified and shown on the drawings.
3. Tank Accessories - Onsite Wastewater Storage Applications:
 - a. Tank Anchoring Shall comply with one of the following:
 - 1) Anchor straps shall be as supplied by tank manufacturer and designed for a maximum load of 25,000 lbs (11340 kg).
 - 2) Galvanized turnbuckles shall be supplied by the tank manufacturer.
 - 3) Prefabricated concrete anchors shall be supplied by the tank manufacturer, designed to the ACI 318 standard, manufactured with 4,000 psi concrete and shall have adjustable anchor points.
 - 4) Other Manufacturer approved devices.
 - b. Access Openings:
 - 1) All access openings shall have a diameter of 24 inches or 30 inches (610 mm or 762 mm), complete with riser, lid and necessary hardware.
 - c. Attached Access Risers:
 - 1) Attached access risers shall be PVC or FRP as supplied by tank manufacturer.
 - 2) Attached access risers shall be 24 inches or 30 inches (610 mm or 762 mm) diameter
 - 3) Access risers shall be attached to access openings during installation utilizing adhesive or FRP bonding kits, or manufacturer approved methods as specified and as supplied by the tank manufacturer.
 - d. Piping and Fittings:
 - 1) Tank shall be equipped with factory-installed threaded fittings, or pipe stubs.
 - 2) PVC piping shall at a minimum meet the requirements of ANSI Schedule 40.
 - 3) All flanged nozzles shall be flanged and flat-faced, and conform to Class 150 bolting patterns as specified in ANSI/ASME/ B16.5.
 - 4) Carbon steel and stainless steel NPT fittings shall withstand a minimum of 150 foot-pounds (203 NM) of torque and 1,000 foot-pounds (1356 NM) of bending, both with a 2:1 safety factor.
 - e. Manway Openings:
 - 1) The standard manway shall be flanged, 22 inches (559 mm) I.D. and complete with gaskets, bolts and cover.
 - 2) Manway openings shall be designed to withstand 5-psig (35 kPa) test pressure with a 5:1 safety factor.
 - f. Ladders:
 - 1) Ladders shall be the standard FRP ladder as supplied by tank manufacturer.
 - g. Baffles and Partitions:
 - 1) Baffles and Partitions shall be capable of withstanding hydrostatic loads occurring when one compartment is empty and the remaining compartment(s) is full.

PART 3 EXECUTION

3.1 TESTING

- A. Tank shall be tested according to the tank manufacturer's Installation Manual and Operating Guidelines in effect at time of installation.

3.2 INSTALLATION

- A. Tank shall be installed according to the tank manufacturer's Installation Manual and Operating Guidelines in effect at time of installation.
- B. Inspect the tank for damage before installation.
- C. Drill holes using the drill points provided at the inlet ports according to the applicable Inlet and Outlet Hole Locations section of this document. The inlet may be drilled on either the sides or ends of the tank, as required based on applicable codes and site conditions.
- D. The gaskets to be compatible with Schedule 40 and SDR 35 pipe using 5-inch-diameter (125mm) hole saw.
- E. Install the rubber gaskets at the inlet and outlet.
- F. Using all four of the tank's integral lifting lugs, lower tank into excavation.
- G. Slide the inlet through the gaskets. Soapy lubricant may be used to slide the pipe in.
- H. Horizontally position the tee 1-1/2 inches (40mm) from the access port rim, allowing the tee to fit into the recess in the access port lid (see detail).
- I. Install lids and risers (see Installing Risers section) as necessary. Rotate lid over access opening until it indexes to tank and drops into position.

3.3 EXCAVATING AND PREPARING THE SITE

- A. Excavation width and length to be 18 to 36 inches (450 to 900 mm) larger than the tank on each side or sized necessary to ensure proper backfill compaction.
- B. Excavation depth shall account for the 55 inch (1,375 mm) tank height. Also account for 4 inches (100 mm) of bedding (if required) and cover depth (permissible cover depth is 0.5 to 4 feet (150 to 1,200 mm) of soil.).
- C. Inspect bottom of excavation to verify suitability of native soil for tank installation. Soils with large, protruding, or sharp stones or other similar objects that may damage the tank are not suitable.
- D. The tank may be installed either in suitable native soil (see Backfilling the Tank section) or a minimum 4-inch (100 mm) layer of well-graded granular soil having particles less than 3 inches (75 mm) in diameter, or the maximum 0.5-inch (13 mm) diameter crushed stone. \
- E. Create a uniform, compacted, level surface to ensure that the bottom of the tank is evenly supported. Verify that the installation surface is flat.

3.4 BACKFILLING THE TANK

- A. Backfill with suitable native soil (max. 3-inch (75 mm) stone diameter). If native soil is unsuitable, replace unsuitable fraction with suitable soil.

- B. Suitable soil shall include soil textural classes defined in the United States Department of Agriculture soil triangle.
- C. Back Fill should not have stones greater than 3 inches (75 mm) in diameter or excessive clods that do not break apart during placement and compaction. Backfill must be capable of occupying the spaces between the tank ribs and beneath the haunches.
 - 1. Rounded screened aggregate (eg., pea gravel) is not a suitable backfill.
- D. Place and compact soil by walking-in beneath the haunches of the tank.
- E. Place backfill around the four sidewalls in an alternating manner, so that the backfill height along the four sidewalls is maintained within a 12-inch (300-mm) tolerance.
- F. Do not backfill top of tank before sidewalls are completely backfilled.
- G. Continue to place backfill along the sidewalls in 12-inch (300-mm) lifts. Place backfill between the ribs on the sidewalls such that the space between the ribs is completely filled with soil.
- H. Compact backfill material either by walking-in, hand tamping or mechanical compaction (includes backhoe bucket). If mechanical compaction is used, such as a walk-behind tamper or backhoe bucket, a single pass is recommended. Compact each lift prior to placement of next lift. Compact backfill from tank walls to excavation sidewalls.
- I. Complete backfilling and grade the area.
- J. A minimum 6-inch (150 mm) depth of suitable soil must be place over the top of the tank. The balance of backfill placed to finish grade above the tank may be either suitable or unsuitable soil.
- K. Establish a strong stand of erosion-resistant vegetation over tank.
- L. Grade to prevent the backfilled excavation from filled with surface runoff. If uninterrupted saturated soil conditions are present from the tank bottom to a height exceeding that of the outlet pipe saddle, tank structural integrity may be compromised.

3.5 RISER INSTALLATION

- A. Compatible risers include 24-inch (600 mm) diameter products such as the Infiltrator TW-Riser EZset by Infiltrator, PolyLok®, Inc., and Tuf-Tite® Corporation, in addition to 24-inch (600 mm) diameter corrugated HDPE and IPEX Ultra Rib® PVC pipe. Follow Infiltrator's IM-Series Tank Riser Connection Guidance.

3.6 TANK BOUYANCY INSTALLATION

- A. As indicated on drawings.

END OF SECTION

SECTION 32 32 16.13

PACKAGED SEWAGE GRINDER PUMPING UNITS

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. Section Includes:
1. This work shall include all required excavation and backfill, the disposal of any excess excavated material, installation of the grinder pump assembly, installation of the electrical control/alarm panel, electrical connection between grinder pump and control panel, grinder pump connection to service pipe and stub out for house drain pipe.
 2. These specifications are intended to technically describe the nature of the materials, equipment, and workmanship required to complete the low pressure sewers and appurtenances shown on the plans.
 3. All labor, tools, and materials necessary to excavate, place, join, backfill, and finish the low pressure sewers and appurtenances to provide a complete and operative system shall be considered as part of the low pressure sewer system construction.
 4. Low pressure sewers shall be considered to mean pressure pipe as called for on the plans, complete with specials, fittings, valves, valve wells, valve boxes, and connections to existing sewer systems.
- B. RELATED REQUIREMENTS
1. Section 22 13 13 – “Facility Sanitary Sewers”
 2. Section 33 33 00 – “Low Pressure Utility Sewerage”

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 – “Submittal Procedures”
- B. Furnish shop drawings and guarantees covering the items included under this section of the work as specified herein and in accordance with the provisions for submittals in other sections of the contract documents.
- C. Preconstruction Submittals
1. Material, Equipment, and Fixtures List
- D. Shop Drawings

1. Fabrication Drawings
 - E. Operation and Maintenance Instructions
 1. The station manufacturer shall submit to the Engineer, through the Contractor, two copies of a manual giving operation and maintenance instructions.
 - F. Test Reports
 1. Pump Test
 2. Hydrostatic Pressure Test
 3. Pressure Sensor Test
 4. Float Test
 - G. Each equipment supplier's representative shall furnish to the Owner, through the Engineer, a written report certifying the following:
 1. The equipment has been properly installed.
 2. The equipment is in accurate alignment.
 3. The equipment is free from any undue stress imposed by connecting piping or anchor bolts.
 4. The equipment has been operated under full load condition and that it operated satisfactorily to the Engineer.
 5. The Owner's representative has been instructed in the proper maintenance and operation of the equipment.
 - H. Furnish the Owner a copy of all test data recorded during the installation check.
 - I. Closeout Submittals
 1. Warranty
- 1.4 DELIVERY, STORAGE, AND HANDLING
- A. Inspect materials delivered to site for damage.
 1. Unload and store with minimum handling.
 2. Store materials on site in enclosures or under protective covering.
 3. Do not store materials directly on the ground. Keep inside of pipes, fittings, valves, etc. free of dirt and debris.
 - B. Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.
- 1.5 WARRANTY
- A. Provide a manufactures' warranty for pumps, float switches, control panel. Create a list or reference all specific operation and maintenance procedures that are required to keep the warranty valid.

- B. The grinder pump manufacturer shall provide a part(s) and labor warranty on the complete station and accessories, including, but not limited to, the panel for a period of 24 months after notice of OWNER'S acceptance, but no greater than 27 months after receipt of shipment. Any manufacturing defects found during the warranty period will be reported to the manufacturer by the owner and will be corrected by the manufacturer at no cost to the owner.

PART 2 - PRODUCTS

2.1 PUMP STATION

- A. Furnish and install each lift station as a complete unit with necessary appurtenances, installed within a pump chamber and a sealing cover.
- B. The pump station shall be a factory built grinder pump station consisting of grinder pump(s), suitably mounted in a high density polyethylene basin, with integral watertight access way, pump removal system, inlet for 4 inch DWV pipe, remote alarm/control panel and all necessary internal wiring with Electrical Quick Disconnects.
- C. Pump station shall be as manufactured by Environment/One Corporation, Niskayuna, New York, Model DH071, DH151, or DH152 or approved equal dependent on the service application as approved by the Engineer.
- D. Operating Conditions: The pumps shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet (0 PSIG), 11 GPM against a rated total dynamic head of 92 feet (40 PSIG), and 7.8 GPM against a rated total dynamic head of 185 feet (80 PSIG). The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor(s). Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

2.2 PUMP:

- A. The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanical seal. Double radial O-ring seals are required at all casting joints to minimize corrosion and create a protective barrier.
- B. All pump castings shall be cast iron, fully epoxy coated to 8-10 mil Nominal dry thickness, wet applied. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. This material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance. Buna-N is not acceptable as a stator material because it does not exhibit the properties as outlined above and required for wastewater service.

2.3 GRINDER:

- A. The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller (cutter wheel) assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder impeller shall be a one-piece, 4140 cutter wheel of the rotating type with inductively hardened cutter teeth. The cutter teeth shall be inductively hardened to Rockwell 50 – 60c for abrasion resistance. The shredder ring shall be of the stationary type and the material shall be white cast iron. The teeth shall be ground into the material to achieve effective grinding. The shredder ring shall have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque. These materials have been chosen for their capacity to perform in the intended environment as they are materials with wear and corrosive resistant properties.
- B. This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to minimize clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:
 - 1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.
 - 2. The maximum flow rate through the cutting mechanism must not exceed 4 feet per second. This is a critical design element to minimize jamming and as such must be adhered to.
 - 3. The inlet shroud shall have a diameter of no less than 5 inches. Inlet shrouds that are less than 5 inches in diameter will not be accepted due to their inability to maintain the specified 4 feet per second maximum inlet velocity which by design prevents unnecessary jamming of the cutter mechanism and minimizes blinding of the pump by large objects that block the inlet shroud.
 - 4. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm.
- C. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of “foreign objects,” such as paper, wood, plastic, glass, wipes, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.

2.4 TANK AND INTEGRAL ACCESSWAY: (Model DH071) High Density Polyethylene Construction.

- A. The tank shall be a Wetwell/Drywell design made of high density polyethylene, with a grade selected to provide the necessary environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All seams created during tank construction are

to be thermally welded and factory tested for leak tightness. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.

- B. The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe. The tank capacities shall be as shown on the contract drawings.
- C. The Drywell accessway shall be an integral extension of the Wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The accessway design and construction shall enable field adjustment of the station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.
- D. The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations will be acceptable.
- E. All discharge piping shall be constructed of 304 stainless steel. The discharge shall terminate outside the accessway bulkhead with a stainless steel, 1-1/4" Female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 235 psi WOG; PVC ball valves or brass ball/gate will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.
- F. The accessway shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The EQD will be supplied with 32', 25' of useable Electrical Supply Cable (ESC) outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer. Field assembly of the ESC into the basin is not acceptable because of potential workmanship issues. The EQD shall require no tools for connecting, seal against water before the electrical connection is made, and include radial seals to assure a watertight seal regardless of tightening torque. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. A junction box shall not be permitted in the accessway due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required. The accessway shall also include an integral 2-inch vent to prevent sewage gases from accumulating in the tank.

2.5 ELECTRIC MOTOR:

- A. As a maximum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with Class F installation, low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. The motor shall be press-fit into the casting for better heat transfer and longer winding life. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished

grinding capability. The wet portion of the motor armature must be 300 Series stainless. To reduce the potential of environmental concerns, the expense of handling and disposing of oil, and the associated maintenance costs, oil-filled motors will not be accepted.

2.6 MECHANICAL SEAL:

- A. The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

2.7 CHECK VALVE:

- A. The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow.
- B. Moving parts will be made of a 300 Series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure.
- C. The valve body shall be an injection molded part made of an engineered thermoplastic resin. The valve shall be rated for continuous operating pressure of 235 psi.
- D. Ball-type check valves are unacceptable due to their limited sealing capacity in slurry applications.

2.8 ANTI-SIPHON VALVE:

- A. The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of 300 Series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from an engineered thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices due to their tendency to clog from the solids in the slurry being pumped. The anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.

2.9 CORE UNIT:

- A. The grinder pump station shall have a cartridge type, easily removable core assembly consisting of pump, motor, grinder, all motor controls, check valve, anti-siphon valve, level controls,

electrical quick disconnect and wiring. The core unit shall be installed in the basin by the manufacturer. Field assembly of the pump and controls into the basin is not acceptable because of potential workmanship issues and increased installation time. In some cases, stations taller than 96" may be shipped on their side without the cores assembled in the basin for freight purposes but this is the only exception. The core unit shall seal to the tank deck with a stainless steel latch assembly. The latch assembly must be actuated utilizing a single quick release mechanism requiring no more than a half turn of a wrench. The watertight integrity of each core unit shall be established by a 100 percent factory test at a minimum of 5 PSIG.

2.10 CONTROLS:

- A. All necessary motor starting controls shall be located in the cast iron enclosure of the core unit secured by stainless steel fasteners. Locating the motor starting controls in a plastic enclosure is not acceptable. The wastewater level sensing controls shall be housed in a separate enclosure from motor starting controls. The level sensor housing must be sealed via a radial type seal; solvents or glues are not acceptable. The level sensing control housing must be integrally attached to pump assembly so that it may be removed from the station with the pump and in such a way as to minimize the potential for the accumulation of grease and debris accumulation, etc. The level sensing housing must be a high-impact thermoplastic copolymer over-molded with a thermo plastic elastomer. The use of PVC for the level sensing housing is not acceptable.
- B. Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The air column shall be integrally molded from a thermoplastic elastomer suitable for use in wastewater and with excellent impact resistance. The air column shall have only a single connection between the water level being monitored and the pressure switch. Any connections are to be sealed radially with redundant O-rings. The level detection device shall have no moving parts in direct contact with the wastewater and shall be integral to the pump core assembly in a single, readily-exchanged unit. Depressing the push to run button must operate the pump even with the level sensor housing removed from the pump.
- C. All fasteners throughout the assembly shall be 300 Series stainless steel. High-level sensing will be accomplished in the manner detailed above by a separate air column sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices and their tendency to malfunction because of incorrect wiring, tangling, grease buildup, and mechanical cord fatigue. To assure reliable operation of the pressure switches, each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes. Tube or piping runs outside of the station tank or into tank-mounted junction boxes providing pressure switch equalization will not be permitted due to their susceptibility to condensation, kinking, pinching, and insect infestation. The grinder pump will be furnished with a 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a factory installed NEMA 6P EQD half attached to it.

2.11 ALARM PANEL:

- A. Each grinder pump station shall include a NEMA 4X, UL-listed alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic polyester to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. The enclosure shall not exceed 10.5" W x 14" H x 7" D, or 12.5" W x 16" H x 7.5" D if certain options are included.
- B. The alarm panel shall contain one 15-amp, double-pole circuit breaker for the pump core's power circuit and one 15-amp, single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.
- C. The alarm panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high level alarm capability. The alarm sequence is to be as follows when the pump and alarm breakers are on:
 - 1. When liquid level in the sewage wet-well rises above the alarm level, the contacts on the alarm pressure switch activate, audible and visual alarms are activated, and the redundant pump starting system is energized.
 - 2. The audible alarm may be silenced by means of the externally mounted, push-to-silence button.
 - 3. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.
- D. The visual alarm lamp shall be inside a red, oblong lens at least 3.75" L x 2.38" W x 1.5" H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).
- E. The entire alarm panel, as manufactured and including any of the following options shall be listed by Underwriters Laboratories, Inc.

2.12 ALARM/CONTROL PANELL CABLEING

- A. Provide grinder pump stations with electrical supply cable to connect the station to the alarm panel.
- B. Cable shall be supplied with a factory installed EQD half to connect to the mating EQD half on the core.

2.13 COMPONENTS

- A. Submit a material, equipment, and fixtures list of all major components including manufacturer's catalog numbers, specification and drawing reference number, warranty information, and fabrication site.

2.14 PIPING

- A. Comply with Section 333300 – “Low Pressure Utility Sewerage”
- B. Provide pump suction and discharge with flanged connections of the proper size for the pump type and capacity.
- C. Between pipes of dissimilar metals a rubber gasket or other approved type of insulating joint or dielectric coupling to effectively prevent metal-to-metal contact between adjacent sections of piping.
- D. Accessories - Provide flanges, connecting pieces, transition glands, transition sleeves, and other adapters as required.

PART 3 - EXECUTION

3.1 DELIVERY

- A. All grinder pump units will be delivered to the job site 100 percent completely assembled, including testing, ready for installation.
- B. Packaged sewage grinder pumping units may not be dropped, rolled or laid on sides for any reason.

3.2 INSTALLATION

- A. Install pump station as indicated, in accordance with drawings and the manufacturer's instructions.
- B. The pump station shall be installed in accordance with the manufacturer's recommendations, with the 4" DWV inlet aligned toward the planned house drain connection.
- C. Fill the pump basin with water prior to backfill and placement of concrete anchor.
- D. At the time of pump station installation, affix the electrical quick disconnects to the upper part of the pump station to prevent potential damage from water infiltration into the pump station.
- E. Handle ground water to provide a firm, dry subgrade for the structure, and shall guard against flotation or other damage resulting from general water or flooding.

- F. Installation packaged pump so that 1 inch to 4 inches of accessway, below the bottom of the lid, extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the excavated hole must be large enough to allow for the concrete anchor.
- G. A 6" inch (minimum) layer of naturally rounded aggregate, clean and free flowing, with particle size of not less than 1/8" or more than 3/4" shall be used as bedding material under each unit.

3.3 ALARM-CONTROL PANEL ELECTRICAL ENCLOSURE INSTALLATION

- A. The electrical enclosure shall be furnished, installed and wired to the grinder pump station by the contractor.
- B. Install alarm device in a conspicuous location, as per national and local codes. Connect alarm panel will be connected to the grinder pump station as shown on the contract drawings.
- C. Install power and alarm circuits on separate power circuits.
- D. Install the alarm panel on a structural pier inside of the storage area beneath the house as shown on the plan and as verified by the property owner.
- E. Control panel installation includes the electrical wiring and connections between the panel and the pump station. Wiring shall be run in 2" Schedule 40 PVC conduit. Wiring riser run to the control panel shall be in steel conduit. Riser run to pump station shall be protected with external cover placed along with the manufacturer's watertight seal at the wire penetration into pump station.

3.4 ANTI-FLOTATION INSTALLATION

- A. Poured in place concrete anti-flotation installation shall require;
 - 1. Packaged pumps installed leveled.
 - 2. Filled with water, to the bottom of the inlet to help prevent the unit from shifting while the concrete is being poured.
 - 3. Manually vibrated to ensure there are no voids.
- B. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8" sleeve is required over the inlet prior to the concrete being poured.

3.5 BACKFILL REQUIREMENTS:

- A. Backfill material shall be Class I or Class II backfill material as defined in ASTM 2321. Where frost heave is a concern use Class 1A and Class 1B.
- B. Backfill material may be Class II, naturally rounded stone if the native soil condition consists of clean compactible soil, with less than 12 percent fines, free of ice, rocks, roots and organic material, it may be an acceptable backfill. Soil must be compacted in lifts not to exceed one foot to reach a final Proctor Density of between 85 percent and 90 percent.

- C. Heavy, non-compactible clays and silts are *not* suitable backfill for this or any underground structure such as inlet or discharge lines.
- D. Backfill of clean native earth, free of rocks, roots, and foreign objects shall be thoroughly compacted in lifts not exceeding 12" to a Standard Proctor Density of not less than 85 percent. Improper backfilling may result in damaged accessways. The grinder pump station shall be installed at a minimum depth from grade to the top of the 1 1/4" discharge line, to assure maximum frost protection. The finish grade line shall be 1" to 4" below the bottom of the lid, and final grade shall slope away from the grinder pump station.

3.6 FIELD QUALITY CONTROL

- A. Tests
 - 1. Perform tests, including hydrostatic pressure test of piping, under a test pressure equal to 50 percent more than the pump discharge pressure or total dynamic head, whichever is greater. Perform a pump test, pressure sensor test or float test. Submit the test results to the Contracting Officer.
 - 2. Test all panels to the power requirements as shown on the plans to assure proper component operation. Activate each control function to check for proper operation and indication.
- B. An authorized representative of the manufacturer or supplier of each item of equipment shall visit the site of the work after installation to inspect, check, adjust if necessary, and approve the equipment's installation.

3.7 CLOSEOUT ACTIVITIES

- A. Operation and Maintenance
 - 1. Submit preventative maintenance and inspection procedure for package lift stations. Include in procedures the frequency of preventative maintenance, inspection, adjustment, lubrication, and cleaning necessary to minimize corrective maintenance and repair.

END OF SECTION

SECTION 31 20 00

LOW PRESSURE UTILITY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this specification.

1.2 SUMMARY

- A. Section Includes
 - 1. This section includes low pressure force main piping and specialties for municipal force mains and services outside of building structures.
- B. Related Requirements
 - 1. Division 01 Specifications.
 - 2. Section 31 20 00 "Earth Moving"
 - 3. City of Norwalk Water Pollution Control Authority Standard Details.

1.3 DEFINITIONS

- A. For the purposes of this specification, the following definitions refer to the low-pressure force main collection system that comes under the authority of the City of Norwalk, CT as specified within this section and other sections of this manual.
 - 1. Low Pressure Force Main: Exterior pressure sewersystem.
 - 2. Sanitary Sewer: Exterior gravity sanitary sewer system.
 - 3. Sewer Service: Exterior domestic sewer piping.

1.4 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
- B. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM D2122 (2016) Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
 - 2. ASTM D2657 (2007; R 2015) Heat Fusion Joining Polyolefin Pipe and Fittings
 - 3. ASTM D2774 (2012) Underground Installation of Thermoplastic Pressure Piping
 - 4. ASTM D3035 (2015) Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter

5. ASTM D3350 (2012) Polyethylene Plastics Pipe and Fittings Materials

1.5 PERFORMANCE

- A. Piping Pressure Rating: At least equal to system test pressure.

1.6 SUBMITTALS

- A. Submit product data and shop drawings for the following in accordance with Section 013000 – Submittal Procedures
 - 1. Pipe
 - 2. Fittings
 - 3. Piping Appurtenances
 - 4. Frame and Covers
- B. Product Certificates from manufacturer
- C. Field Quality Control Reports

1.7 QUALITY ASSURANCE

- A. Materials and operations shall comply with the latest revision of all applicable Codes and Standards including but not limited to CT Department of Public Health and City of Norwalk WPCA rules and regulations.
- B. Piping material shall be marked clearly and legibly.
 - 1. HDPE pipe shall be show identification marks, at intervals not to exceed 5 feet, as follows:
 - a. Nominal pipe diameter
 - b. Company, plant, shift, ASTM, SDR, and date designation
 - c. Service designation or legend.

1.8 STANDARD ABBREVIATIONS

- A. ASTM - American Society for Testing and Materials
- B. AWWA -American Water Works Association
- C. F - Fahrenheit
- D. HDPE - High Density Polyethylene Pipe
- E. PE - Polyethylene
- F. PPI - Plastic Pipe Institute

G. SDR - Standard Dimension Ratio

1.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Do not damage pipe, fittings and accessories, and pipe coatings during delivery, handling, and storage.
- B. New Pipe Inspection: Inspect material thoroughly upon arrival. Examine materials for damage. Remove damaged or rejected material from site. Pipe shall be protected during handling against impact shocks and free fall. Pipe shall be kept clean at all times, and no pipe shall be used in the work that does not conform to the appropriate ASTM Specifications. Check pipe closely for smoothness, roundness, chips, and cracks which may be a source of infiltration. Reject any pipe that will not provide watertight seal or is otherwise structurally deficient.
- C. Pre-Installation Inspections: Prior to being installed, each pipe shall be carefully examined for damage and conformity with these specifications. All pipe damaged or deemed not to conform to these specifications shall be rejected and removed from the site.
 - 1. Protect pipe coating during handling using methods recommended by the manufacturer. Use of bare cables, chains, hooks, metal bars, or narrow skids in contact with coated pipe is not permitted.
 - 2. Observe manufacturer's directions for delivery and storage of material and accessories.
 - 3. Protect stored piping from entry of water or dirt into pipe.
 - 4. Support pipe to prevent sagging or bending. Do not store plastic pipe, structures, and fittings in direct sunlight.
 - 5. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.10 PRODUCT CONDITIONS

- A. SEPARATION OF WATER AND SANITARY AND/OR COMBINED SEWERS
 - 1. Follow CT Department Public Health standards for separation of water mains and sanitary sewer lines.
 - 2. Parallel Installations
 - a. Normal conditions – Water lines shall be construction at least 10 feet horizontally from a sewer or sewer manhole. The distance shall be measured edge-edge.
 - b. Unusual Conditions – When local conditions prevent a horizontal separation of at least 10 feet, the water line may be laid closer to a sewer or sanitary sewer manhole provided that:
 - 1) The bottom (invert) of the water line is at least 18 inches above the top (crown) of the sewer.
 - 2) Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved Ductile Iron Pipe pressure tested in place without leakage prior to backfilling. The sewer manhole shall be of watertight construction and tested in place.
 - 3. Crossing

- a. Normal conditions – Water lines shall be construction at least 10 feet horizontally from a sewer or sewer manhole. The distance shall be measured edge-edge.
 - b. Unusual Conditions – When local conditions prevent a horizontal separation of at least 10 feet, the water line may be laid closer to a sewer or sanitary sewer manhole provided that:
 - 1) Sewers passing over or under water lines shall be constructed of the materials described in paragraph A, Parallel Installation, Unusual Conditions – subparagraph 2) b, above.
 - 2) Water lines passing under sewers shall, in addition, be protected by providing:
 - a) A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water line.
 - b) Adequate structural support the sewers to prevent excessive deflection of the joints, and the settling on and breaking of the water line.
 - c) That the length of the water line be centered at the point of the crossing so that joints shall be equal distant and as far as possible from the sewer.
4. Sanitary and/or Combined Sewers or Manholes - No water mains/pipes shall pass through or come in contact with any part of a sewer or sewer manhole.

1.11 COORDINATION

1. Coordinate tie-ins to municipal sewer mains with the City of Norwalk Department of Public Works.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. HDPE PIPE AND FITTINGS

1. HDPE Pipe: Less than 4 inches in diameter
 - a. Pipe shall be manufactured from a PE 3408 high density resin compound meeting the specifications of ASTM D3350 with a cell classification of PE:345434C and meeting Type III, Class C, Category 5, Grade P34 per ASTM D1238.
 - b. HDPE pipe shall comply with AWWA Specifications C901.
 - c. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
 - d. Pipe and accessories shall be 160 psi at 73.4 F degrees meeting requirements of Standard Dimension Ratio (SDR) 11 as a minimum strength.
2. Fittings
 - a. All fittings shall be fully pressure rated to match the pipe SDR pressure rating to which they are made. All fittings shall be molded or fabricated by the manufacturer. No contractor fabricated fittings are allowed.

- b. The HDPE pipe manufacturer shall supply all HDPE fittings, accessories, adapters, and/or special components required to perform the work.
 3. Butt Fusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured using a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.
 4. Electrofusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Electrofusion Fittings shall have a manufacturing standard of ASTM F-1055. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.
 5. Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D-3350. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D-3261. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.
- B. Engineered Thermoplastic Fittings – All plastic fitting components are to be in compliance with applicable ASTM standards.
 1. All pipe connections shall be made using compression fitting connections including a Buna-N O-ring for sealing to the outside diameter of the pipe. A split-collet locking device shall be integrated into all pipe connection fittings to securely restrain the pipe from hydraulic pressure and external loading caused by shifting and settling.

2.2 METALLIC LOCATING WIRE:

- A. See Section 33 05 00, Common Work Results for Utilities.

2.3 JOINTS

- A. PE Piping - Heat Fusion Joints ASTM D2657.

2.4 VALVE BOX

- A. Valve Boxes shall meet the following requirements:
 1. Constructed of non-corrosive materials, rigid plastic meeting ASTM D- 1788.
 2. Box shall be tubular in shape with an adjustable length with telescoping section.
 3. Lid shall be cast iron or ductile iron with aluminum locking bolt. Locking mechanism shall have a pentagon-shaped head bolt.
 4. Box shall be easily detected when buried by 4 inches of material.

2.5 CURB STOP/CHECK VALVE

- A. The curb stop shall be pressure-tight in both directions. The ball valve actuator shall include position stop features at the fully opened and closed positions. The curb stop/check valve assembly shall be designed to withstand a working pressure of 235 psi.
 - 1. The stainless steel, combination curb stop/check valve component shall be 100 percent hydrostatically tested to 150 psi in the factory
 - 2. The stainless-steel check valve shall be integral with the curb stop valve.
 - 3. Check valve shall provide a full-ported 1-1/4" passageway and shall introduce minimal friction loss at maximum rated flow. The flapper hinge design shall provide a maximum degree of freedom and ensure seating at low back pressure.

PART 3 - Execution

3.1 PIPE INSTALLATION – GENERAL

- A. Install pipe, pipe fittings, and appurtenances at the locations indicated. Perform excavation, trenching, and backfilling as specified in Section 31 20 00 – Earth Moving.
- B. Cutting
 - 1. Cut pipe in a neat manner with mechanical cutters.
 - 2. Use wheel cutters where practicable.
 - 3. Grind sharp and rough edges smooth and remove loose material from the pipe before laying.
- C. Laying
 - 1. Before lowering and while suspended, inspect the pipe for defects. Reject defective material.
 - 2. Lay pipe in compliance with ASTM D2774
- D. The trench and trench bottom shall be constructed in accordance with ASTM D 2321. Embedment materials shall be Class I, Class II or Class III materials as defined in ASTM D 2321. The use of Class IV and/or Class V materials for embedment is not permitted.
- E. Bedding of the pipe shall be performed in accordance with ASTM D 2321. Compaction should be as specified in ASTM D 2321.
- F. Haunching and initial backfill should be as specified in ASTM D 2321 using Class I, Class II or Class III materials. Materials used shall be compacted to 85 percent Standard Proctor Density.

3.2 CONSTRUCTION – ALL PIPE

- A. Systems shall be installed as shown on the drawings and in a neat and workmanlike manner using only new materials.

- B. Pipe Laying Direction: Place pipe beginning at low point and progress uphill. Install on grade with horizontal and vertical alignment as indicated on construction plans. Install all pipe and fittings per manufacturer's installation requirements.
- C. Materials shall be cleaned and inspected prior to installation. No cracked, broken or defective material shall be used in the work.
- D. The interior surfaces of all piping and equipment shall be cleaned and free of all dirt, loose scale, rust and other foreign material before installation.
- E. Pipe ends shall be reamed to remove all burrs and pipe sections shall be cleaned inside to remove all chips and foreign material prior to making up joints. Pipe lines shall be installed with as few joints as possible and short lengths of pipe coupled together shall not be used.
- F. Lateral Connections: Install per drawing details
- G. When the trench is left of the night or if pipe laying is suspended, the upper end of the pie shall be plugged to keep out dirt, water animals and other foreign matter or substances. This plug shall be kept in the end of the pipe line at all times when laying is not in actual progress.
- H. Cleanouts: Install per drawing details. Cleanouts shall be placed at all pipe junctions.
- I. Isolation Valves: Install as shown under cleanouts (H). Install isolation valves at all branch connections.

3.3 FIELD QUALITY CONTROL

- A. Perform both a pressure test and a leakage test on all pipelines. Notify the MCA at least 7 days in advance of equipment tests.
- B. Submit the final test report to MCA within 5 working days after the test.

3.4 HDPE PIPE

- A. All pipe shall have a minimum bury of 42 inches.
- B. Ropes, fabric or rubber protected slings and straps shall be used when handling pipes. Chains, cables or hooks inserted into the pipe ends shall not be used.
- C. HDPE pipe shall be installed in accordance with the instruction of the manufacturer. A qualified joining technician as specified by the manufacturer shall perform all heat fusion joints.
- D. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging of the pipe. If the pipe must be stacked for storage, such stacking should be in accordance with the pipe manufacturer's recommendations. The pipe should be handled in such a manner that it is not damaged by being dragged over sharp objects or cut by chokers or lifting equipment.

- E. Segments of pipe having cuts or gouges in excess of 10 percent of the wall thickness of the pipe shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the butt fusion joining method. Sections of polyethylene pipe should be joined into continuous lengths on the job site above ground. The joining method shall be the butt-fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt-fusion equipment used in the joining procedure shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, fusion temperature, alignment, and fusion pressure.
- F. Fused segments of pipe shall be handled so as to avoid damage to the pipe. When lifting fused sections of pipe, chains or cable-type chokers should be avoided. Nylon slings are preferred. Spreader bars should be used when lifting long, fused sections. Care should be exercised to avoid cutting or gouging the pipe.
- G. All fittings shall be butt fused, electro-fused, or flanged.
 - 1. Butt Fusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured using a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.
 - 2. Electrofusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Electrofusion Fittings shall have a manufacturing standard of ASTM F-1055. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.
 - 3. Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D-3350. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D-3261. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.
 - 4. Assemble the compression fittings according to the fitting manufacturer's recommendations.
- H. PE Pipe Encasement
 - 1. Encase in accordance with AWWA C105/A21.5.

3.5 LEAKAGE TEST

- A. Conduct the leakage test subsequent to or concurrently with the pressure test. Place the amount of water permitted as leakage for the line in a sealed container attached to the supply side of the test pump. Apply no other source of supply to the pump or line under test. Pump the water into the line by the test pump as required to maintain the specified test pressure as described for a 2 hour period.
- B. The test will be considered a failure upon exhaustion of the supply or the inability to maintain the required pressure. PE pipe experiences diametric expansion and pressure elongation during initial testing. Consult the manufacturer prior to testing for special testing considerations.

- C. Determine allowable leakage by the following I-P formula:
 - 1. $L = NDP/K$ Where:
 - a. L = Allowable leakage in gallons per hour.
 - b. N = Number of joints in length of pipeline tested. D = Nominal diameter of the pipe in inches.
 - c. P = Square root of the test pressure in psig. K = 7400 for pipe materials.
- D. At the conclusion of the test, measure the amount of water remaining in the container and record the results in the test report.

3.6 CURB STOP INSTALLATION

- A. Install E/One Uni-Lateral assembly (E/One part number NB0184PXX or NC0193GXX) or E/One Redundant Check Valve (E/One part number PC0051GXX) in the pipe lateral outside the home between the pump discharge and the street main.

3.7 TESTING

- A. All pipe shall be field tested. Contractor shall supply all labor, equipment, materials required for testing including but not limited to pumps, meters, gauges, etc. Pipe shall be tested prior to installation of final backfill or surface restoration.
- B. Pressure testing shall be in accordance with manufacturer's specifications. All pipe shall be tested at 150 psi in accordance with ASTM F2164, "Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure", unless otherwise approved by the Engineer. A test will be considered a failure if the pressure drops by more than 5 psi in 2 hours or exceeds allowable leakage.
- C. Pressure testing procedure
 - 1. Fill line slowly with water.
 - 2. Expel air from system during filling and before applying test pressure.
 - 3. Apply test pressure and allow system to stand without makeup pressure for 2 to 3 hours for expansion of pipe.
 - 4. Apply specified test pressure for 2 hours.
- D. Allowable Leakage
 - 1. HDPE Pipe – Chart 6, Allowance for Expansion Under Test Pressure, Technical Report TR31/9-79 published by the Plastic Pipe Institute (PPI).

3.8 RETESTING

- A. If any deficiencies are revealed during any test, correct such deficiencies and repeat the tests until the results of the tests are within specified allowances, without additional cost to the Owner or Contracting Authority

3.9 METALLIC LOCATING WIRE

- A. Metallic locating wire shall be installed with all plastic pipe and installation shall meet the following specifications, including those in Section 330500, Common Work Results for Utilities.
 - 1. A continuous wire shall be installed between locating boxes.
 - 2. Tracer shall connect to a brass screw in cover.

3.10 WARNING TAPE:

- A. See Section 330500, Common Work Results for Utilities.
- B. Install detectable warning tape above buried pipe.

END OF SECTION