Project Manual for:

Veterans Memorial Pool – Patton Park

Hamilton, Massachusetts

Prepared For:

Town of Hamilton

577 Bay Road
Hamilton, MA 01936

Prepared By:

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DOCUMENT 00 11 13- ADVERTISEMENT FOR BIDS

The Town of Hamilton, MA acting by and through the Hamilton Recreation Department, invites sealed bids for the Veterans Memorial Pool Patton Park Project, Hamilton, MA in accordance with Contract Documents prepared by Bargmann Hendrie + Archetype, Inc. The project includes replacement of the existing pool complex.

Sealed bids for the General Contract on forms furnished by the Awarding Authority will be received by the Awarding Authority at the Hamilton Town Hall, Town Clerk's Office, 577 Bay Road, Hamilton, MA 01936 until 2:00 p.m. local time on November 5, 2015. All General Bids will be publicly opened and read aloud immediately thereafter

Sealed sub-bids for the trades listed herein on forms furnished by the Awarding Authority will be received by the Awarding Authority at Hamilton Town Hall, Town Clerk's Office, 577 Bay Road, Hamilton, MA 01936 until 2:00 p.m. local time on October 29, 2015. All Filed Sub-Bids will be publicly opened and read aloud immediately thereafter.

All qualified general bidders shall be certified by the Division of Capital Asset Management and Maintenance (DCAM) for General Contracting services.

The following Filed Sub-Bid Categories are required for the Project. Each filed sub-bidder must be Certified by the Division of Capital Asset Management and Maintenance (DCAM) for their respective filed sub trade:

Section 07 30 01 -	Roofing and Flashing
Section 09 99 01 -	Painting
Section 15400 –	Plumbing
Section 15600 –	HVAC
Section 26 00 00 -	Electrical

Each General Bidder and each Sub-Bidder may obtain complete sets of the Contract Documents, including Bid Forms, via email from the office of the Architect, Bargmann Hendrie + Archetype.
Contact tscarlata@bhplus.com .Copies of Addenda will be emailed to registered Bidders

Each General Bid and each Filed Sub-Bid shall be accompanied by bid Security equal to five percent (5%) of the Bid amount in the form of a Bid Bond, Cash or a Certified, Treasurer's or Cashier's Check issued by a responsible U.S. bank or Trust Company, payable to the Town of Hamilton. A bid bond must be from a surety company on the US Treasury list with a rate of at least an A+, Category X. Each Bidder shall attach the required Bid Bond of Check to the Bid Form. Any bid bond must be (a) in a form satisfactory to the Town; (b) issued by a surety company qualified to do business in the commonwealth and satisfactory to the awarding authority; and (c) conditioned upon the faithful performance by the principal of the agreements contained in the Bid

The Bid Securities of all General Bidders, except those of the three lowest responsive, responsible and eligible General Bidders, will be returned within five (5) days, Saturdays, Sundays, and legal holidays excluded, after the opening of General Bids.

The Bid Securities of all Filed Sub-Bidders, except those of the Sub-Bidders named in the General Bids of the three lowest responsible and eligible General Bidders, and those of the three lowest responsive,

responsible and eligible Sub-Bidders for each sub-trade, will be returned within five (5) days, Saturdays, Sundays, and legal holidays excluded, after the opening of General Bids.

The Awarding Authority reserves the right to waive informalities in the bids, and to reject any or all bids if it were in the public interest to do so. The Awarding Authority reserves the right to reject any Filed Sub-Bid if it determines that such Sub-Bid does not represent the Sub-Bid of a person competent to perform the Work as specified and for any other reason permitted by law.

The successful General Bidder will be required to furnish a Performance Bond and a labor and materials Payment Bond for 100% of the Contract value, as required by the Contract Documents. The Performance and Labor and Materials Payment Bond must be provided by a surety company on the U.S. Treasury list with a rating of at least an A+, Category X. Performance and payment Bonds must be (a) in a form satisfactory to the Town; (b) issued by a surety company qualified to do business in the commonwealth

END OF DOCUMENT 00 11 13

DOCUMENT 00 21 13 – INSTRUCTIONS TO BIDDERS

1.1 SECURING DOCUMENTS

A. Bidding Documents include the Invitation to Bid, Instructions to Bidders, Form for General Bid, Form for Sub-Bid, and Bid Bond Form, and any Addenda issued prior to receipt of Bids. The Contract Documents for the proposed Work consist of the Bidding Documents, the Agreement (or Contract) Between Contractor And Owner, vote of Corporation authorizing Signing of Contract, Form of Subcontract Between Contractor and Subcontractor (for filed sub-bidders), the General Conditions of the Contract for Construction, Supplementary Conditions, Statutory Provisions for Massachusetts Public Construction Contracts, the Drawings, the Specifications, and all Modifications issued after execution of the Contract.

B. All definitions set forth in the General Conditions of the Contract for Construction, or in other Contract Documents, are applicable to the Bidding Documents.

C. Addenda are written or graphic instruments issued by the Owner through the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

D. A Bid is a complete and properly signed proposal to do the Work or designated portion thereof for the sums stipulated therein, submitted in accordance with the Bidding Documents.

1.2 COPIES OF BIDDING/CONTRACT DOCUMENTS

A. Bidders may obtain complete sets of the Contract Documents in PDF format from the issuing office designated in the Invitation to Bid. If hardcopies are requested they shall be provided in the number and for the deposit sum stated therein. The deposit will be returned to Bidders who return the Contract Documents in good condition within thirty (30) days after receipt of General Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder awarded a Contract may retain the Contract Documents and his deposit will be refunded.

B. Bidders shall use complete sets of Contract Documents in preparing Bids; neither the Owner nor the Architect assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

C. The Owner or the Architect in making copies of the Contract Documents available on the above terms does so only for the purpose of obtaining Bids on the Work and does not confer a license or grant for any other use.

1.3 BIDDERS RESPRESENTATIONS

A. Each Bidder by making his Bid represents that:
   1. He has read and carefully examined and understands the Contract Documents and his Bid is made in accordance therewith.

2. He has visited the site, has familiarized himself with the local conditions under which the Work is to be performed and has correlated his observations with the requirements of the proposed Contract Documents.
3. His Bid is based upon the materials, systems, and equipment required by the Contract Documents without exception.
4. He has carefully examined all available relevant information including geotechnical reports, and existing condition drawings prepared by other architects.
5. The resumes of project management and supervisory personnel attached to or included in the bid represent the assigned employees who will be dedicated 100% to the Project, for the duration of the Project.

B. By signing and submitting a General Bid, each bidder (1) represents that in regard to the conditions affecting the work to be done and the labor and materials needed, his General Bid is based solely on his familiarization with the site in conjunction with the Contract Documents and other documents, and not on any oral or other representations of any employee, officer, agent or consultant of the Awarding Authority, and (2) agrees and assures that the site, the Contract Documents have been examined; that the Contract Documents are adequate; and that the required results can be produced under the Contract Documents.

1.4 INTERPRETATION AND CORRECTION OF DOCUMENTS

A. Bidders and Sub-Bidders shall promptly notify the Architect, in writing, of any ambiguity, inconsistency or error which they may discover upon examination of the Contract Documents or the site and local conditions. Failure to so notify the Architect of any ambiguity, inconsistency or error that the bidder discovers or should have discovered in, or knows or should know exists in, the Contract Documents or the site and local conditions, shall preclude the bidder, if awarded a contract, from claiming or receiving any adjustments to the contract price or contract time on account of such ambiguity, inconsistency or error.

B. Bidders and Sub-Bidders requiring clarification or interpretation of the Contract Documents shall make a written request which shall reach the Architect at least three (3) business days prior to the date for receipt of Bids. Inquiries may be emailed to tscarlata@bhplus.com. Bidders must identify the Project in all communications.

C. Any interpretations, corrections or changes of the Contract Documents will be made, if at all, by written Addendum, which, when issued, become part of the Bidding/Contract Documents. Interpretations, corrections or changes of the Contract Documents purported to be made in any other manner shall have no standing, and Bidders shall not rely upon such interpretations, corrections and changes.

D. Any estimates of quantities of materials or work that may be provided by the Awarding Authority or its architects, engineers or other consultants are for purposes of bid comparison only and are not guaranteed.

E. The Awarding Authority makes no warranty, express or implied, that the Contract Documents and any estimates provided in connection therewith are accurate as to the kind or quantity of work required, and any such warranties are hereby expressly disclaimed. Each Bidder shall proceed at his own risk in investigating the proposed work, reviewing site conditions and the proposed Contract Documents, and submitting a bid.

1.5 ADDENDUM

A. Addenda will be sent by email and/or regular mail to all Bidders of record at the respective addresses furnished by the Bidders for such purposes. Nevertheless, Bidders are solely responsible to ensure that they have received all Addenda.

B. Copies of Addenda will be made available for inspection wherever Contract Documents are on file for that purpose.

C. No Addenda will be issued later than three (3) calendar days prior to the date for receipt of Bids except an Addendum which includes postponement of the date for receipt of Bids.

D. Each Bidder shall ascertain prior to submitting a Bid that he has received all Addenda issued, and shall acknowledge their receipt in his Bid.

1.6 PREPARATION OF GENERAL BIDS AND SUB-BIDS

A. Each General Bid and each Filed Sub-Bid shall be submitted on the prescribed FORM FOR GENERAL BID and FORM FOR SUB-BID respectively, loose copies of the BID FORMS are available without charge at the same location from which the Contract Documents may be obtained. DO NOT use the forms contained in the bound Project Manuals. However, the form may be removed and copied and reinserted into the project manual.

B. Every bid which is not accompanied by a bid deposit, in the amount of 5 percent of the total bid price, or which does not otherwise conform to sections 44A-44H, inclusive, of Chapter 149 of the General Laws, or which is on a form not completely filled in, or which is incomplete, conditional or obscure, or which contains any addition not called for, will be rejected. All blank spaces on the bid form shall be filled in, in ink or type- written, in words and figures, without alterations or erasures. Use figures alone only where no space is provided for words. Every bid shall be signed in longhand by the Bidder and shall give the Bidder's business address.

C. All bids for this Project are subject to the provisions of Massachusetts General Laws (Ter. Ed.), Chapter 30, Section 39M as amended and Chapter 149, Sections 44A through 44L inclusive and Chapter 149, Sections 26 through 27D inclusive.

1.7 BID SECURITY

A. Each General Bid and each Filed Sub-Bid shall be accompanied by bid Security equal to five percent (5%) of the Bid amount in the form of a Bid Bond, Cash or a Certified, Treasurer's or Cashier's Check issued by a responsible U.S. bank or Trust Company, payable to the Town of Hamilton. Any surety bond provided must be from a surety company on the US Treasury list with a rate of at least an A+, Category X. Each Bidder shall attach the required Bid Bond of Check to the Bid Form. A Bid Bond must be (a) in a form satisfactory to the Town; (b) issued by a surety company qualified to do business in the Commonwealth and satisfactory to the awarding authority; and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid.

1.8 SUBMISSIONS OF FILED SUB-BIDS

A. Each Sub-Bid for sub-trades designated in Item 2 of the FORM FOR GENERAL BID shall be submitted upon the FORM FOR SUB-BID provided by the Owner. DO NOT use the forms contained in the bound Project Manual. All blank spaces shall be filled in, in ink or typewritten, in words or figures without alterations or erasures. Use figures alone only where no space is provided for words. Sub-Bids must be signed by the Sub-Bidder in longhand and shall give the sub-bidder's business address. The FORM FOR SUB-BID, including the required Bid Security, shall be enclosed in a sealed envelope with the following plainly marked on the outside:

FROM: Bidder's Name and Business Address
SUB-BID FOR_____(Section Number and Title) VETERANS MEMORIAL POOL –PATTON PARK

1. Each **Sub-Bidder** shall include the following forms with their bids:
   a. Form for the Sub-Bid
   b. Bid Security
   c. DCAM Certificate of Eligibility
   d. Contractor Update Statement, DCAM Form

B. Each Sub-bid must include a DCAM Certificate of Eligibility and DCAM Update Statement, as indicated above. Failure to submit these documents with the sub-bid shall result in rejection of the sub-bid.

C. If the Bid is mailed, the Sub-Bidder shall enclose his sealed Bid in an outer envelope, addressed as follows:

FROM: Filed Sub- Bidder's Name and Business Address
VETERANS MEMORIAL POOL –PATTON PARK, HAMILTON, MA

TO: Town Clerk
Town of Hamilton
577 Bay Road
P.O. Box 429
Hamilton, MA 01936

1.9 SUBMISSIONS OF GENERAL BIDS

A. For each Bid, the General Contractor shall use the responsive and eligible Sub-Bid submitted for each Bid category.

B. Each General Bid shall be submitted on the FORM FOR GENERAL BID furnished by the Owner, or copied from the bound Project Manual. All blank spaces shall be filled in, in ink or typewritten, in words or figures without alterations or erasures. Use figures alone only where no space is provided for words. The FORM FOR GENERAL BID must be signed in longhand by the General Bidder and shall give the general bidder's business address. The Form for General

Bid, including the Bid Security, shall be enclosed in a sealed envelope with the following plainly marked on the outside:

GENERAL BID FOR:
VETERANS MEMORIAL POOL –PATTON PARK, HAMILTON, MA

If the Bid is mailed, the Bidder shall enclose his sealed Bid in an outer envelope, addressed as follows:

FROM: General Bidder's Name and Business Address
VETERANS MEMORIAL POOL –PATTON PARK, HAMILTON, MA

TO: Town Clerk
Town of Hamilton
577 Bay Road
P.O. Box 429
Hamilton, MA 01936

1. Each **General Bidder** shall include the following with their Bid:
   a. Form for the General-Bid
   b. Unit Price Sheet
   c. Bid Security
   d. DCAM Certificate of Eligibility
   e. Contractor Update Statement, DCAM Form
   f. Resumes of Project Management and Supervisory Personnel

C. Only General Bidders who were Pre-Qualified by the Town of Hamilton may submit bids for the Project.

D. As required by M.G.L., c. 149, Section 44D, every General Bid must be accompanied by a Certificate of Eligibility issued by the Division of Capital Asset Management.. Each General Bid shall also be accompanied by an updated statement on the form prescribed by said Division. Any General Bid submitted without the appropriate Certificate and update statement shall be invalid.

E. All bidders are cautioned to allow ample time for transmittal of Bids. Bids received after the specified time and date will not be accepted nor recognized. The time of receipt will determine the acceptability of mailed bids, regardless of postmark.

F. Any bid may be withdrawn prior to the time scheduled for the opening of such bids or authorized postponement thereof. No bid may be withdrawn for thirty (30) days, Saturdays, Sundays and legal holidays excluded, after opening of General Bids. No telephone or telegraphic bid, change in bid or withdrawal of bid will be received nor recognized.

1.10 FILED SUB-BID PROCEDURES (See G.L. c.149, 44F)

A. Every Sub-Bidder filing a Sub-Bid with the Awarding Authority shall be bound thereby to every General Bidder not expressly excluded therein, and any variance from such Sub-Bid communicated to a General Bidder shall be of no effect.

B. Within two (2) days, Saturdays, Sundays and legal holidays excluded, after opening of Sub-Bids, the Awarding Authority will reject every Sub-Bid which is not accompanied by a Bid Security, or which is on a form not completely filled in, or which is incomplete, conditional or obscure, or which contains any addition not called for. However, failure of the Awarding Authority to reject such a Sub-Bid within such period shall not validate such a Sub-Bid nor preclude the Awarding Authority from subsequently rejecting it.

C. Not later than the second day, Saturdays, Sundays and legal holidays excluded, before the day fixed by the Awarding Authority for the opening of General Bids, the Awarding Authority will mail to every person on record as having taken a set of Bidding Documents, a list of Sub-Bidders arranged by Sub-Trades and listing for each sub-trade, the name, address and Sub-Bid price of every Sub-Bidder submitting a Sub-Bid thereon not rejected by the Awarding Authority, and the names of all General Bidders expressly precluded from using such Sub-Bid.

D. A person shall not be named by a General Bidder as a Sub-Bidder for a sub-trade in Item 2 of the Form for General Bid unless such person is included for such sub-trade in the list of sub-bidders.

E. No valid General Bid will be rejected because of errors in the Sub-Bid list or because of any invalid action of the Awarding Authority in connection with Sub-Bids.

F. If no sub-bid is filed for a sub-trade designated in the General Bid Form or if the only sub-bids which are filed are restricted to the use of one or more General Bidders, the Awarding Authority may state, in an addendum issued with the list of Sub-Bidders, that the General Bidder shall include in the cost of his own work an amount to cover all the work required for any such sub-trade. The General Contractor shall cause the work covered by such sub-trade to be done by a qualified and responsible sub-contractor, subject to the written approval of the Awarding Authority. If the Awarding Authority determines that any sub-contractor chosen by the General Contractor under this section is not qualified or responsible, the General Contractor shall obtain another sub-contractor who is satisfactory to the Awarding Authority with no adjustment in the General Contractor's price.

G. If a rejection of all Sub-Bids for a sub-trade designated in Item 2 of the Form for General Bid occurs for the reasons stated in G.L.c.149 §44F(4)(a)(2), the Awarding Authority will state in an Addendum issued with the list of Sub-Bidders, the amount to be included by each General Bidder under Item 2 of the Form For General Bid for such sub-trade; and without affecting other Sub-Bidders in any way, who have conformed to the prescribed bidding procedure, new Sub-Bids for such sub-trade will be requested by written invitation to three (3) or more qualified Sub-Bidders and will be publicly opened and read by the Awarding Authority at a time and place to be specified in such invitation. In such case, the Contract Price will be adjusted by the difference between the Filed Sub-Bid of the lowest responsible and eligible Sub-Bidder and the amount stated in the Addendum for such work.

H. If a selected Sub-Bidder fails within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation of a Subcontract by the General Bidder selected as the General

Contractor, to perform his agreement to execute a Subcontract in the form set forth herein with such General Bidder, contingent upon the execution of the General Contract, and, if required to do so pursuant to the pre-qualification process under section 44D 3/4 of Chapter 149 of the General Laws, or if required to do so by such General Bidder in the General Bid, to furnish a Performance and Payment Bond as stated in his Sub-Bid, such General Bidder and the Awarding Authority shall select, from the other Sub-Bidders, the lowest responsible and eligible Sub-Bidder at the amount named in his Sub-Bid against whose standing and ability the General Contractor makes no objection, and the Contract Price will be adjusted by the difference between the amount of such Sub-Bid and the amount of the Sub-Bid of the delinquent Sub-Bidder.

1.11 RIGHT TO REJECT BIDS

A. The Awarding Authority reserves the right to reject any or all Bids if it be in the public interest so to do, and for any other reason permitted by law. (G.L. c.149, §.44E)

B. The Awarding Authority reserves the right to reject any Sub-Bid for any sub-trade if it determines that such Sub-Bid does not represent the Sub-Bid of a person competent, responsible and eligible to perform the work as specified, and for the reasons permitted by G.L. c. 149, § 44F, and for any other reason permitted by law.

1.12 METHOD OF AWARD

A. The General Contract will be awarded to the lowest responsible and eligible General Bidder on the basis of the proposed Contract Price.

B. The award of Contract will be made, if at all, within thirty (30) days, Saturdays, Sundays and legal holidays excluded, after the opening of General Bids

C. Special attention is directed to the provisions of Sections 44A through 44L of Chapter 149 defining the term "lowest responsible and eligible Bidder" and giving the Awarding Authority the right to require essential information in regard to qualifications

D. The successful General Bidder must submit a performance bond and payment bond each in the amount of bid price. Such bonds must be issued by a surety who is qualified to do business in the Commonwealth of Massachusetts and who is satisfactory to the Awarding Authority.

E. If the General Bidder selected as General Contractor fails to execute the Agreement in accordance with the terms of his General Bid and G.L.c.149, §44E, and to furnish a 100 percent Performance Bond and a 100 percent Payment Bond as required by the Bidding Documents, an award will be made to the next lowest responsible and eligible General Bidder.

F. The 30 day time limit will not apply to a second or subsequent award made after the expiration of the time limit because the first lowest responsible and eligible General Bidder fails to execute the Agreement or to furnish a Performance Bond and Payment Bond.

1.13 EXECUTION OF CONTRACTS

A. The General Bidder who is selected as General Contractor shall promptly confer with the Owner on the question of Sub-Bidders; shall execute the Agreement with the Owner within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation thereof in accordance with his General Bid; and shall furnish with the executed Agreement, a Performance Bond and also a Payment Bond, each of which shall be in the sum of 100 percent of the Contract Price, the premiums for which are to be paid by the General Contractor and are included in the Contract Price. The forms for the bonds are contained herein. The Surety company must be qualified to do business under the laws of the Commonwealth of Massachusetts and must be satisfactory to the Awarding Authority. Attorneys-in-fact who sign bonds must file with each bond a certified and effectively dated copy of their power-of-attorney.

B. A selected Sub-Bidder, within five (5) days, Saturdays, Sundays, and legal holidays excluded, after presentation of a Subcontract by the General Bidder selected as General Contractor, shall execute a Subcontract in accordance with the terms of his Sub-Bid and contingent upon the execution of the General Contract and if required, shall furnish a Performance Bond and Payment Bond as prescribed in the Sub-Bid Form. The Form of Subcontracts is contained herein.

C. Subcontracts other than those for which Sub-Bids are required shall be negotiated by the General Contractor who shall furnish a list of all Subcontractors to the Owner, through the Architect, upon request. The receipt of such list, and the approval or absence of approval of any subcontractor on such list, shall not be interpreted as, and shall not constitute, an approval of any such subcontractor by the Awarding Authority under G.L. c. 30, § 39F.

D. The selected General Bidder must agree to commence work within five(5) days of execution of a General Contract and to substantially complete all Work in accordance with the phasing schedule contained in the Contract Documents.

E. In case all work is not substaintially completed within the time specified for each phase, it shall be understood and agreed that the Contractor shall pay the Owner, not as a penalty but as liquidated damages, the amounts indicated in the Agreement for each calendar day of delay until the entire Work is substantially complete, up to and including the day of Substantial Completion as further provided in the Contract Documents.

1.14 SALES TAX

A. The Owner is exempt from payment of sales and use taxes in the Commonwealth of Massachusetts. Bidders shall not include in their Bid any tax imposed upon the sales or rentals of tangible personal property in this Commonwealth, such as any and all building materials, supplies, services and equipment required to construct and complete the Work of this Contract.

B. The Owner will furnish tax exemption certificates as required to the selected Contractor and Subcontractors.

1.15 SUBSTITUTIONS

A. The Project is subject to M.G.L. Ch. 30, Section 39M (b), requiring that specifications be written to provide full competition for each item of material to be furnished under the Contract. Notwithstanding anything to the contrary herein, the Town shall consider any proposed equals in accordance with and to the extent required by section 39M(b) of chapter 30 of the General Laws, which is incorporated herein by reference.

B. Basis-of-Design Product Specification: The specifications may contain specific manufacturer's products 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 other named manufacturers. This shall not limit the use of products from other manufacturers considered equal to the named product.

C. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, 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. M.G.L. Ch. 30, Section 39M(b), further defines “or equal” as a product that”
   1. Is at least equal in quality, durability, appearance, strength and design.
   2. Will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased.
   3. Conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications.

D. Any bidder that questions the “or equal” status of a product or system is encouraged to submit the product to the Architect during the bid phase for review and approval as an “or equal.”
   1. 1. A substitution request form has been included in the Bidding Documents (CSI form 1.5C) for the bidders use.

1.16 PREVAILING WAGES AND HAMILTON RESIDENTS

A. Prevailing wages are applicable to this project under G.L. c. 149, §§ 26-27D. The prevailing wage rate sheets applicable to the project work, and example payroll record form and statement of compliance form are included in the Bidding Documents.

B. Employment of Local Residents: Attention is directed to the provisions of MGL Chapter 149, Section 26, which requires Contractor to give preference in employment to citizens of Hamilton and surrounding communities.

1.17 PERMITS AND FEES

A. Contractor shall obtain all permits required for construction work.

B. The Town of Hamilton will waive all fees required by the Town of Hamilton for the building permit. Do not include the building permit fee in the contract amount.

C. Contractor shall pay for all other permits, governmental fees and licenses for the Work.

D. Costs associated with Police or Fire Department Details shall be included as part of the Contract Price.

1.18 COMMENCEMENT OF WORK AND TIME OF COMPLETION

A. The selected General Bidder must agree to commence work within five (5) days after execution of a General Contract and to substantially complete within 210 calendar days .

END OF SECTION 002113

DOCUMENT 00 41 13 - FORM FOR GENERAL BID

To: Town of Hamilton, Massachusetts, Awarding Authority

From: _____
Contractor

A. The undersigned proposes to furnish all labor and materials required for **Veterans Memorial Pool – Patton Park** located in Hamilton, Massachusetts, in accordance with the accompanying plans and specifications prepared by Bargmann Hendrie + Archetype, Inc. specified below, subject to additions and deductions according to the terms of the specifications, for the lump sum price of"

_____ Dollars
(Total contract price in words, which governs)

(_____)
(Total contract price amount in numbers)

C. ADDENDA: This Bidder has received, and this bid includes, the following addenda of which receipt is hereby acknowledged:

Date	Number
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

D. SUB-DIVISION OF BID FOR **Veterans Memorial Pool Patton Park**: The sub-division of the Proposed Contract Price is as follows:

Item 1: The work of the General Contractor, being all work other than that covered by Item 2:

_____ Dollars
(Total contract price in words, which governs)

(_____)
(Total contract price amount in numbers)

Item 2: The work of the Sub-Bidders Indicated by Class of Work and Name of Filed Sub-Bidder.

Trade and Name of Sub-Bidder	Amount	Bond Required
Section 07 30 01- ROOFING & FLASHING		
_____	_____	Yes / No
Section 09 99 01- PAINTING		
_____	_____	Yes / No
Section 15400- PLUMBING		
_____	_____	Yes / No
Section 15600- HVAC		
_____	_____	Yes / No
Section 02 60 00- ELECTRICAL		
_____	_____	Yes / No

Bidder shall circle YES or NO indicating whether a bond is required. Failure to circle any or all spaces in the Bonds Required will be construed as an entry of the word "NO".

E. FILED SUB BIDDERS: The undersigned agrees that each of the above named sub-bidders will be used for the work indicated at the amount stated, unless a substitution is made. The undersigned further agrees to pay the premiums for the performance and payment bonds furnished by sub-bidders as requested herein and that all of the cost of all such premiums is included in the amount set forth in Item 1 of this bid.

The undersigned agrees that if he is selected as general contractor, he will promptly confer with the awarding authority on the question of sub-bidders; and that the awarding authority may substitute for any sub-bid listed above a sub-bid filed with the awarding authority by another sub-bidder for the sub-trade against whose standing and ability the undersigned makes no objection; and that the undersigned will use all such finally selected sub-bidders at

the amounts named in their respective sub-bids and be in every way as responsible for them and their work as if they had been originally named in this general bid, the total contract price being adjusted to conform thereto.

F. CONTRACT: The undersigned agrees that, if he is selected as general contractor, he will within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the awarding authority, execute a contract in accordance with the terms of this sub-bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the awarding authority and each in the sum of the contract price, the premiums for which are to be paid by the general contractor and are included in the contract price; provided, however, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable.

G. Examined Conditions and Documents: The undersigned Bidder hereby declares that he has visited the site, the conditions present, and has carefully examined the Contract Documents, together with all Addenda issued, received and acknowledged below, and has familiarized himself with the legal requirements (federal, state, and local laws, ordinances, and rule and regulations) and other conditions which may affect the cost, progress or performance of Work, and has made independent investigations, deemed necessary by the Bidder

H. LABOR: 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 Occupational Safety and Health Administration that is at least 10 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 made subject to section forty-four A of Chapter 149 of the Massachusetts General Laws.

I. CERTIFICATE OF ELIGIBILITY: The undersigned has included with this Bid his Certificate of Eligibility and Update Statement as required by the General Laws.

J. NON-COLLUSION CERTIFICATION: The undersigned 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 Paragraph, the word "person" shall mean any natural person, joint venture, partnership, corporation, or other business or legal entity.

K. TAXES: As required by MGL, Chapter 62C, s49A, the undersigned certifies that the bidder has complied with all laws of the Commonwealth relating to taxes.

L. DEBARMENT: The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under provisions of Section 29F of Chapter 29, or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulation promulgated thereunder.

M. TIME OF COMPLETION: If selected Contractor the undersigned agrees to begin and complete the work as specified in the Contract Documents.

N. AUTHORITY RIGHTS: The Bidder understands and agrees that the Awarding Authority has the right to reject any and all bids in accordance with law and the Contract Documents.

Should the Invitation to Bid, Instruction to Bidders, Form For General Bid, Conditions of the Contract, Plans or Specifications require submission of special data to accompany the Bid, the Awarding Authority reserves the right to rule the bidder's failure to submit such data an informality and to receive said data subsequently, within a reasonable time as set by the Authority.

The Bidder acknowledges that no bid may be withdrawn for 30 days, Saturdays, Sundays, and legal holidays excluded, after opening of bids per MGL c. 149, 44A(3).

Date: _____

Name of Bidder: _____

By: _____ _____

(Signature) (Title of Person Signing Bid)

_____

(Business Address)

_____

(City and State)

_____

Telephone

_____

Fax

_____

email

END OF DOCUMENT 00 41 13

DOCUMENT 00 41 16 -FORM FOR SUB-BID

To all General Bidders Except those Excluded for **Veterans Memorial Pool Patton Pool Project**

A. The undersigned proposes to furnish all labor and materials required for completing, in accordance with the hereinafter described plans, specifications and addenda, all the work specified in:

Section No. _____

Section Name: _____

of the specifications and in any plans specified in such section, prepared by Bargmann Hendrie + Archetype, Inc. for **Center and North Town Hall Renovation Project Veterans Memorial Pool Patton Pool Project** contract sum of

_____ Dollars
(Total contract price in words, which governs)

(_____)
(Total contract price amount in numbers)

C. EXCLUSIONS FOR **Veterans Memorial Pool Patton Pool Project**: This Sub-Bid

May be used by any General Bidder except:

☐

_____

_____

_____

_____

May only be used by the following General Bidders:

☐

_____

_____

_____

_____

(To exclude general bidders, insert "X" in one box only, and fill in blank following that box. Do not answer "D" if no general bidders are excluded.)

E. SUB-SUBCONTRACTOR LISTING FOR **Veterans Memorial Pool Patton Pool Project**: The names of all persons, firms and corporation furnishing to the undersigned labor or labor and materials for the class or classes or part thereof of work for which the provisions of the Section of the Specifications for this sub-trade require a listing in this paragraph (including the undersigned if customarily furnished by persons on his own payroll and in the absence of a contrary provision in the specifications), the name of each such class of work or part thereof and the bid price for each such class of work or part thereof are:

Name of Sub-Subcontractor	Class of Work	Amount
_____	_____	_____
_____	_____	_____
_____	_____	_____

(Do not give bid price for any class or part thereof furnished by the undersigned.)

The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the hereinbefore described plans, specifications and addenda and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the awarding authority.

D. **ADDENDA**:
This Bidder has received, and this bid includes, the following addenda of which receipt is hereby acknowledged:

Date	Number
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

E. The sub-bidder has been in business under the present business name for _____ years.

F. Has the sub-bidder ever failed to complete any work awarded? _____.

G. List one or more recent buildings with names of the general contractor and architect on which the undersigned sub-bidder served as a subcontractor for work of similar character as required for the building projects for which the sub-bid(s) is (are) being submitted.

	Building	Architect	General Contractor	Contract Amount
(a)				
(b)				
(c)				

H. Provide bank reference _____.

I. EXECUTION OF CONTRACT: The undersigned agrees that, if he is selected as a sub-bidder, he will, within five (5) days, Saturdays, Sundays, and legal holidays excluded, after presentation of a subcontract by the General Bidder selected as the General Contractor, execute with such General Bidder a subcontract in accordance with the terms of this sub-bid and contingent upon the execution of the General Contract, and, if pre-qualification is required pursuant to G.L.c.149, §44D 3/4, or if requested so to do in the general bid by such General Bidder, who shall pay the premiums therefore, furnish a performance bond, also a labor and materials payment bond, each of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the Awarding Authority, and each in the full sum of the subcontract price.

The undersigned further agrees to be bound to the general contractor by the terms of the hereinbefore described plans, specifications, including all general conditions stated therein, and addenda, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the owner

J. Examined Conditions and Documents: The undersigned Bidder hereby declares that he has visited the site, the conditions present, and has carefully examined the Contract Documents, together with all Addenda issued, received and acknowledged below, and has familiarized himself with the legal requirements (federal, state, and local laws, ordinances, and rule and regulations) and other conditions which may affect the cost, progress or performance of Work, and has made independent investigations, deemed necessary by the Bidder

The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the hereinbefore described plans, specifications and addenda and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the awarding authority.

K CERTIFICATE OF ELIGIBILITY: The undersigned has included with this Bid his Certificate of Eligibility and Update Statement as required by the General Laws.

L. TAXES: As required by MGL, Chapter 62C, s49A, the undersigned certifies that the bidder has complied with all laws of the Commonwealth relating to taxes.

M. DEBARMENT: The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under provisions of Section 29F of Chapter 29, or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulation promulgated thereunder.

N. LABOR: 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 Occupational Safety and Health Administration that is at least 10 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 44 F of Chapter 149 of the Massachusetts General Laws.

O. NON-COLLUSION The undersigned further certifies under the penalties of perjury that this sub-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.

Date: _____

Name of Bidder: _____

By: _____ _____

(Signature) (Title of Person Signing Bid)

_____
(Business Address)

_____
(City and State)

_____
Telephone

_____
Fax

_____
Email

Town and State NOTE: This proposal must bear the written signature of the bidder. If the bidder is a partnership, the proposal must be signed by a partner. If the bidder is a corporation, the proposal must be signed by a duly authorized officer or agent of such corporation.

END OF DOCUMENT 00 41 16

DOCUMENT 00 43 13 – BID BOND

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

_____as Principal, and

_____as Surety, are hereby held and firmly bound unto the_____,_____, _____, as Owner, in the penal sum of

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

Signed and sealed this ____day of_____2015

The Condition of the above obligation is such that whereas the Principal has submitted to the_____, a certain Bid, attached hereto and hereby made a part hereof, to enter into a Contract in writing for the construction of the_____, _____,
_____.

NOW, THEREFORE,

(a) If said Bid shall be rejected, or in the alternative,

(b) If said Bid shall be accepted and the Principal shall execute and deliver a Contract in the Form of Contract attached (properly completed in accordance with said Bid) and the Principal shall furnish Performance and Labor/Materials (Payment) bonds for his faithful performance of all of the elements of said Contract including performance criteria and delivery dates, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all respects perform the Agreement created by 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 and 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 within which the Owner may accept such; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the 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 _____

By_____
Seal Surety

By _____

END OF DOCUMENT 004313

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THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

RONALD L. WALKER, II
Secretary

WILLIAM D MCKINNEY
Director

Awarding Authority: Town of Hamilton

Contract Number:

City/Town: HAMILTON

Description of Work: Veterans Memorial Pool Replacement - Replacement of existing outdoor pool including demolition, new pool, support buildings, site development including a septic system.

Job Location: Patton Park, Bay Road Hamilton, MA

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **If an apprentice rate is not listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAS, the apprentice must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Issue Date: 10/02/2015 **Wage Request Number:** 20151002-039

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2015	$31.65	$10.41	$9.33	$0.00	$51.39
	12/01/2015	$31.65	$10.41	$10.08	$0.00	$52.14
	06/01/2016	$32.15	$10.41	$10.08	$0.00	$52.64
	08/01/2016	$32.15	$10.91	$10.08	$0.00	$53.14
	12/01/2016	$32.15	$10.91	$10.89	$0.00	$53.95
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2015	$31.72	$10.41	$9.33	$0.00	$51.46
	12/01/2015	$31.72	$10.41	$10.08	$0.00	$52.21
	06/01/2016	$32.22	$10.41	$10.08	$0.00	$52.71
	08/01/2016	$32.22	$10.91	$10.08	$0.00	$53.21
	12/01/2016	$32.22	$10.91	$10.89	$0.00	$54.02
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2015	$31.84	$10.41	$9.33	$0.00	$51.58
	12/01/2015	$31.84	$10.41	$10.08	$0.00	$52.33
	06/01/2016	$32.34	$10.41	$10.08	$0.00	$52.83
	08/01/2016	$32.34	$10.91	$10.08	$0.00	$53.33
	12/01/2016	$32.34	$10.91	$10.89	$0.00	$54.14
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$88.29	$9.80	$19.23	$0.00	$117.32
AIR TRACK OPERATOR *LABORERS - ZONE 2*	06/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	12/01/2015	$32.40	$7.30	$12.30	$0.00	$52.00
	06/01/2016	$32.90	$7.30	$12.30	$0.00	$52.50
	12/01/2016	$33.65	$7.30	$12.30	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	06/01/2015	$33.43	$10.40	$5.95	$0.00	$49.78
	12/01/2015	$34.38	$10.40	$5.95	$0.00	$50.73
ASPHALT RAKER *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.83	$10.00	$14.55	$0.00	$67.38
	12/01/2015	$44.08	$10.00	$14.55	$0.00	$68.63
	06/01/2016	$44.83	$10.00	$14.55	$0.00	$69.38
	12/01/2016	$46.08	$10.00	$14.55	$0.00	$70.63
	06/01/2017	$47.08	$10.00	$14.55	$0.00	$71.63
	12/01/2017	$48.08	$10.00	$14.55	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.83	$10.00	$14.55	$0.00	$67.38
	12/01/2015	$44.08	$10.00	$14.55	$0.00	$68.63
	06/01/2016	$44.83	$10.00	$14.55	$0.00	$69.38
	12/01/2016	$46.08	$10.00	$14.55	$0.00	$70.63
	06/01/2017	$47.08	$10.00	$14.55	$0.00	$71.63
	12/01/2017	$48.08	$10.00	$14.55	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 2*	06/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	12/01/2015	$32.40	$7.30	$12.30	$0.00	$52.00
	06/01/2016	$32.90	$7.30	$12.30	$0.00	$52.50
	12/01/2016	$33.65	$7.30	$12.30	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2015	$40.32	$6.97	$16.21	$0.00	$63.50
	01/01/2016	$41.62	$6.97	$16.21	$0.00	$64.80
	01/01/2017	$42.92	$6.97	$16.21	$0.00	$66.10

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$26.21	$6.97	$10.54	$0.00	$43.72
2	65	$26.21	$6.97	$10.54	$0.00	$43.72
3	70	$28.22	$6.97	$11.35	$0.00	$46.54
4	75	$30.24	$6.97	$12.16	$0.00	$49.37
5	80	$32.26	$6.97	$12.97	$0.00	$52.20
6	85	$34.27	$6.97	$13.78	$0.00	$55.02
7	90	$36.29	$6.97	$14.59	$0.00	$57.85
8	95	$38.30	$6.97	$15.40	$0.00	$60.67

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$27.05	$6.97	$10.54	$0.00	$44.56
2	65	$27.05	$6.97	$10.54	$0.00	$44.56
3	70	$29.13	$6.97	$11.35	$0.00	$47.45
4	75	$31.22	$6.97	$12.16	$0.00	$50.35
5	80	$33.30	$6.97	$12.97	$0.00	$53.24
6	85	$35.38	$6.97	$13.78	$0.00	$56.13
7	90	$37.46	$6.97	$14.59	$0.00	$59.02
8	95	$39.54	$6.97	$15.40	$0.00	$61.91

Notes:

Apprentice to Journeyworker Ratio:1:5

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (LYNN)*	08/01/2015	$49.86	$10.18	$18.57	$0.00	$78.61
	02/01/2016	$50.43	$10.18	$18.57	$0.00	$79.18
	08/01/2016	$51.33	$10.18	$18.65	$0.00	$80.16
	02/01/2017	$51.90	$10.18	$18.65	$0.00	$80.73

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Lynn*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.93	$10.18	$18.57	$0.00	$53.68
2	60	$29.92	$10.18	$18.57	$0.00	$58.67
3	70	$34.90	$10.18	$18.57	$0.00	$63.65
4	80	$39.89	$10.18	$18.57	$0.00	$68.64
5	90	$44.87	$10.18	$18.57	$0.00	$73.62

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.22	$10.18	$18.57	$0.00	$53.97
2	60	$30.26	$10.18	$18.57	$0.00	$59.01
3	70	$35.30	$10.18	$18.57	$0.00	$64.05
4	80	$40.34	$10.18	$18.57	$0.00	$69.09
5	90	$45.39	$10.18	$18.57	$0.00	$74.14

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.42	$10.00	$14.55	$0.00	$66.97
	12/01/2015	$43.66	$10.00	$14.55	$0.00	$68.21
	06/01/2016	$44.41	$10.00	$14.55	$0.00	$68.96
	12/01/2016	$45.64	$10.00	$14.55	$0.00	$70.19
	06/01/2017	$46.63	$10.00	$14.55	$0.00	$71.18
	12/01/2017	$47.62	$10.00	$14.55	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2015	$36.20	$7.30	$13.40	$0.00	$56.90
	12/01/2015	$36.95	$7.30	$13.40	$0.00	$57.65
	06/01/2016	$37.70	$7.30	$13.40	$0.00	$58.40
	12/01/2016	$38.70	$7.30	$13.40	$0.00	$59.40
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2015	$35.05	$7.30	$13.40	$0.00	$55.75
	12/01/2015	$35.80	$7.30	$13.40	$0.00	$56.50
	06/01/2016	$36.55	$7.30	$13.40	$0.00	$57.25
	12/01/2016	$37.55	$7.30	$13.40	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2015	$35.05	$7.30	$13.40	$0.00	$55.75
	12/01/2015	$35.80	$7.30	$13.40	$0.00	$56.50
	06/01/2016	$36.55	$7.30	$13.40	$0.00	$57.25
	12/01/2016	$37.55	$7.30	$13.40	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	03/01/2015	$35.75	$9.80	$16.48	$0.00	$62.03

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 03/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.88	$9.80	$1.63	$0.00	$29.31
2	60	$21.45	$9.80	$1.63	$0.00	$32.88
3	70	$25.03	$9.80	$11.59	$0.00	$46.42
4	75	$26.81	$9.80	$11.59	$0.00	$48.20
5	80	$28.60	$9.80	$13.22	$0.00	$51.62
6	80	$28.60	$9.80	$13.22	$0.00	$51.62
7	90	$32.18	$9.80	$14.85	$0.00	$56.83
8	90	$32.18	$9.80	$14.85	$0.00	$56.83

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (LYNN)*	07/01/2015	$45.82	$10.90	$18.71	$1.30	$76.73
	01/01/2016	$46.44	$10.90	$18.71	$1.30	$77.35

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CEMENT MASONRY/PLASTERING - Eastern Mass (Lynn)*

Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.91	$10.90	$12.21	$0.00	$46.02
2	60	$27.49	$10.90	$13.71	$1.30	$53.40
3	65	$29.78	$10.90	$14.71	$1.30	$56.69
4	70	$32.07	$10.90	$15.71	$1.30	$59.98
5	75	$34.37	$10.90	$16.71	$1.30	$63.28
6	80	$36.66	$10.90	$17.71	$1.30	$66.57
7	90	$41.24	$10.90	$18.71	$1.30	$72.15

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.22	$10.90	$12.21	$0.00	$46.33
2	60	$27.86	$10.90	$13.71	$1.30	$53.77
3	65	$30.19	$10.90	$14.71	$1.30	$57.10
4	70	$32.51	$10.90	$15.71	$1.30	$60.42
5	75	$34.83	$10.90	$16.71	$1.30	$63.74
6	80	$37.15	$10.90	$17.71	$1.30	$67.06
7	90	$41.80	$10.90	$18.71	$1.30	$72.71

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$43.83	$10.00	$14.55	$0.00	$68.38
	12/01/2015	$45.08	$10.00	$14.55	$0.00	$69.63
	06/01/2016	$45.83	$10.00	$14.55	$0.00	$70.38
	12/01/2016	$47.08	$10.00	$14.55	$0.00	$71.63
	06/01/2017	$48.08	$10.00	$14.55	$0.00	$72.63
	12/01/2017	$49.08	$10.00	$14.55	$0.00	$73.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$29.61	$10.00	$14.55	$0.00	$54.16
	12/01/2015	$30.48	$10.00	$14.55	$0.00	$55.03
	06/01/2016	$31.00	$10.00	$14.55	$0.00	$55.55
	12/01/2016	$31.87	$10.00	$14.55	$0.00	$56.42
	06/01/2017	$32.56	$10.00	$14.55	$0.00	$57.11
	12/01/2017	$33.25	$10.00	$14.55	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2015	$48.56	$7.85	$16.10	$0.00	$72.51
	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.28	$7.85	$0.00	$0.00	$32.13
2	55	$26.71	$7.85	$3.66	$0.00	$38.22
3	60	$29.14	$7.85	$3.99	$0.00	$40.98
4	65	$31.56	$7.85	$4.32	$0.00	$43.73
5	70	$33.99	$7.85	$14.11	$0.00	$55.95
6	75	$36.42	$7.85	$14.44	$0.00	$58.71
7	80	$38.85	$7.85	$14.77	$0.00	$61.47
8	90	$43.70	$7.85	$15.44	$0.00	$66.99

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.76	$7.85	$0.00	$0.00	$32.61
2	55	$27.23	$7.85	$3.66	$0.00	$38.74
3	60	$29.71	$7.85	$3.99	$0.00	$41.55
4	65	$32.18	$7.85	$4.32	$0.00	$44.35
5	70	$34.66	$7.85	$14.11	$0.00	$56.62
6	75	$37.13	$7.85	$14.44	$0.00	$59.42
7	80	$39.61	$7.85	$14.77	$0.00	$62.23
8	90	$44.56	$7.85	$15.44	$0.00	$67.85

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 2*	06/01/2015	$35.25	$7.30	$13.20	$0.00	$55.75
	12/01/2015	$36.00	$7.30	$13.20	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 2*	06/01/2015	$36.25	$7.30	$13.20	$0.00	$56.75
	12/01/2015	$37.00	$7.30	$13.20	$0.00	$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 2*	06/01/2015	$36.00	$7.30	$13.20	$0.00	$56.50
	12/01/2015	$36.75	$7.30	$13.20	$0.00	$57.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 2*	06/01/2015	$36.25	$7.30	$13.20	$0.00	$56.75
	12/01/2015	$37.00	$7.30	$13.20	$0.00	$57.50
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 2*	06/01/2015	$36.00	$7.30	$13.20	$0.00	$56.50
	12/01/2015	$36.75	$7.30	$13.20	$0.00	$57.25

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 2*	06/01/2015	$35.25	$7.30	$13.20	$0.00	$55.75
	12/01/2015	$36.00	$7.30	$13.20	$0.00	$56.50
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.42	$10.00	$14.55	$0.00	$66.97
	12/01/2015	$43.66	$10.00	$14.55	$0.00	$68.21
	06/01/2016	$44.41	$10.00	$14.55	$0.00	$68.96
	12/01/2016	$45.64	$10.00	$14.55	$0.00	$70.19
	06/01/2017	$46.63	$10.00	$14.55	$0.00	$71.18
	12/01/2017	$47.62	$10.00	$14.55	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$58.86	$9.80	$19.23	$0.00	$87.89
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$63.06	$9.80	$19.23	$0.00	$92.09
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$88.23	$9.80	$19.23	$0.00	$117.26
DRAWBRIDGE OPERATOR (Construction) *ELECTRICIANS LOCAL 103*	09/01/2015	$45.67	$13.00	$15.89	$0.00	$74.56
	03/01/2016	$46.17	$13.00	$16.39	$0.00	$75.56
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN *ELECTRICIANS LOCAL 103*	09/01/2015	$45.67	$13.00	$15.89	$0.00	$74.56
	03/01/2016	$46.17	$13.00	$16.39	$0.00	$75.56

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.27	$13.00	$0.55	$0.00	$31.82
2	40	$18.27	$13.00	$0.55	$0.00	$31.82
3	45	$20.55	$13.00	$11.86	$0.00	$45.41
4	45	$20.55	$13.00	$11.86	$0.00	$45.41
5	50	$22.84	$13.00	$12.23	$0.00	$48.07
6	55	$25.12	$13.00	$12.58	$0.00	$50.70
7	60	$27.40	$13.00	$12.95	$0.00	$53.35
8	65	$29.69	$13.00	$13.32	$0.00	$56.01
9	70	$31.97	$13.00	$13.69	$0.00	$58.66
10	75	$34.25	$13.00	$14.06	$0.00	$61.31

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.47	$13.00	$0.55	$0.00	$32.02
2	40	$18.47	$13.00	$0.55	$0.00	$32.02
3	45	$20.78	$13.00	$11.84	$0.00	$45.62
4	45	$20.78	$13.00	$11.84	$0.00	$45.62
5	50	$23.09	$13.00	$12.71	$0.00	$48.80
6	55	$25.39	$13.00	$13.07	$0.00	$51.46
7	60	$27.70	$13.00	$13.39	$0.00	$54.09
8	65	$30.01	$13.00	$13.81	$0.00	$56.82
9	70	$32.32	$13.00	$14.18	$0.00	$59.50
10	75	$34.63	$13.00	$14.55	$0.00	$62.18

Notes: :

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2015	$53.30	$13.58	$14.21	$0.00	$81.09
	01/01/2016	$54.53	$14.43	$14.96	$0.00	$83.92
	01/01/2017	$55.86	$15.28	$15.71	$0.00	$86.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.65	$13.58	$0.00	$0.00	$40.23
2	55	$29.32	$13.58	$14.21	$0.00	$57.11
3	65	$34.65	$13.58	$14.21	$0.00	$62.44
4	70	$37.31	$13.58	$14.21	$0.00	$65.10
5	80	$42.64	$13.58	$14.21	$0.00	$70.43

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.27	$14.43	$0.00	$0.00	$41.70
2	55	$29.99	$14.43	$14.96	$0.00	$59.38
3	65	$35.44	$14.43	$14.96	$0.00	$64.83
4	70	$38.17	$14.43	$14.96	$0.00	$67.56
5	80	$43.62	$14.43	$14.96	$0.00	$73.01

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2015	$37.31	$13.58	$14.21	$0.00	$65.10
	01/01/2016	$38.17	$14.43	$14.96	$0.00	$67.56
	01/01/2017	$39.10	$15.28	$15.71	$0.00	$70.09
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2015	$40.22	$10.00	$14.30	$0.00	$64.52
	11/01/2015	$40.80	$10.00	$14.30	$0.00	$65.10
	05/01/2016	$41.69	$10.00	$14.30	$0.00	$65.99
	11/01/2016	$42.28	$10.00	$14.30	$0.00	$66.58
	05/01/2017	$43.16	$10.00	$14.30	$0.00	$67.46
	11/01/2017	$43.89	$10.00	$14.30	$0.00	$68.19
	05/01/2018	$44.60	$10.00	$14.30	$0.00	$68.90
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2015	$41.65	$10.00	$14.30	$0.00	$65.95
	11/01/2015	$42.24	$10.00	$14.30	$0.00	$66.54
	05/01/2016	$43.13	$10.00	$14.30	$0.00	$67.43
	11/01/2016	$43.73	$10.00	$14.30	$0.00	$68.03
	05/01/2017	$44.62	$10.00	$14.30	$0.00	$68.92
	11/01/2017	$45.35	$10.00	$14.30	$0.00	$69.65
	05/01/2018	$46.07	$10.00	$14.30	$0.00	$70.37
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2015	$21.68	$10.00	$14.30	$0.00	$45.98
	11/01/2015	$22.02	$10.00	$14.30	$0.00	$46.32
	05/01/2016	$22.54	$10.00	$14.30	$0.00	$46.84
	11/01/2016	$22.89	$10.00	$14.30	$0.00	$47.19
	05/01/2017	$23.42	$10.00	$14.30	$0.00	$47.72
	11/01/2017	$23.84	$10.00	$14.30	$0.00	$48.14
	05/01/2018	$24.27	$10.00	$14.30	$0.00	$48.57
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 103*	09/01/2015	$45.67	$13.00	$15.89	$0.00	$74.56
	03/01/2016	$46.17	$13.00	$16.39	$0.00	$75.56
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING*ELECTRICIANS LOCAL 103*	09/01/2015	$34.25	$13.00	$14.06	$0.00	$61.31
	03/01/2016	$34.63	$13.00	$14.55	$0.00	$62.18
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$35.64	$10.00	$14.55	$0.00	$60.19
	12/01/2015	$36.69	$10.00	$14.55	$0.00	$61.24
	06/01/2016	$37.31	$10.00	$14.55	$0.00	$61.86
	12/01/2016	$38.35	$10.00	$14.55	$0.00	$62.90
	06/01/2017	$39.19	$10.00	$14.55	$0.00	$63.74
	12/01/2017	$40.02	$10.00	$14.55	$0.00	$64.57
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER *LABORERS - ZONE 2*	06/01/2015	$20.50	$7.30	$12.30	$0.00	$40.10
	12/01/2015	$20.50	$7.30	$12.30	$0.00	$40.10
	06/01/2016	$20.50	$7.30	$12.30	$0.00	$40.10
	12/01/2016	$20.50	$7.30	$12.30	$0.00	$40.10
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	09/01/2015	$41.59	$9.80	$17.53	$0.00	$68.92

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.80	$9.80	$1.79	$0.00	$32.39
2	55	$22.87	$9.80	$1.79	$0.00	$34.46
3	60	$24.95	$9.80	$12.16	$0.00	$46.91
4	65	$27.03	$9.80	$12.16	$0.00	$48.99
5	70	$29.11	$9.80	$13.95	$0.00	$52.86
6	75	$31.19	$9.80	$13.95	$0.00	$54.94
7	80	$33.27	$9.80	$15.74	$0.00	$58.81
8	85	$35.35	$9.80	$15.74	$0.00	$60.89

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.83	$10.00	$14.55	$0.00	$67.38
	12/01/2015	$44.08	$10.00	$14.55	$0.00	$68.63
	06/01/2016	$44.83	$10.00	$14.55	$0.00	$69.38
	12/01/2016	$46.08	$10.00	$14.55	$0.00	$70.63
	06/01/2017	$47.08	$10.00	$14.55	$0.00	$71.63
	12/01/2017	$48.08	$10.00	$14.55	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$29.61	$10.00	$14.55	$0.00	$54.16
	12/01/2015	$30.48	$10.00	$14.55	$0.00	$55.03
	06/01/2016	$31.00	$10.00	$14.55	$0.00	$55.55
	12/01/2016	$31.87	$10.00	$14.55	$0.00	$56.42
	06/01/2017	$32.56	$10.00	$14.55	$0.00	$57.11
	12/01/2017	$33.25	$10.00	$14.55	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 2)*	07/01/2015	$38.06	$7.85	$16.10	$0.00	$62.01
	01/01/2016	$39.01	$7.85	$16.10	$0.00	$62.96
	07/01/2016	$39.96	$7.85	$16.10	$0.00	$63.91
	01/01/2017	$40.91	$7.85	$16.10	$0.00	$64.86

Apprentice - *GLAZIER - Local 35 Zone 2*

Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.03	$7.85	$0.00	$0.00	$26.88
2	55	$20.93	$7.85	$3.66	$0.00	$32.44
3	60	$22.84	$7.85	$3.99	$0.00	$34.68
4	65	$24.74	$7.85	$4.32	$0.00	$36.91
5	70	$26.64	$7.85	$14.11	$0.00	$48.60
6	75	$28.55	$7.85	$14.44	$0.00	$50.84
7	80	$30.45	$7.85	$14.77	$0.00	$53.07
8	90	$34.25	$7.85	$15.44	$0.00	$57.54

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.51	$7.85	$0.00	$0.00	$27.36
2	55	$21.46	$7.85	$3.66	$0.00	$32.97
3	60	$23.41	$7.85	$3.99	$0.00	$35.25
4	65	$25.36	$7.85	$4.32	$0.00	$37.53
5	70	$27.31	$7.85	$14.11	$0.00	$49.27
6	75	$29.26	$7.85	$14.44	$0.00	$51.55
7	80	$31.21	$7.85	$14.77	$0.00	$53.83
8	90	$35.11	$7.85	$15.44	$0.00	$58.40

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.83	$10.00	$14.55	$0.00	$67.38
	12/01/2015	$44.08	$10.00	$14.55	$0.00	$68.63
	06/01/2016	$44.83	$10.00	$14.55	$0.00	$69.38
	12/01/2016	$46.08	$10.00	$14.55	$0.00	$70.63
	06/01/2017	$47.08	$10.00	$14.55	$0.00	$71.63
	12/01/2017	$48.08	$10.00	$14.55	$0.00	$72.63

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 06/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$23.56	$10.00	$0.00	$0.00	$33.56
2	60	$25.70	$10.00	$14.55	$0.00	$50.25
3	65	$27.84	$10.00	$14.55	$0.00	$52.39
4	70	$29.98	$10.00	$14.55	$0.00	$54.53
5	75	$32.12	$10.00	$14.55	$0.00	$56.67
6	80	$34.26	$10.00	$14.55	$0.00	$58.81
7	85	$36.41	$10.00	$14.55	$0.00	$60.96
8	90	$38.55	$10.00	$14.55	$0.00	$63.10

Effective Date - 12/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$24.24	$10.00	$0.00	$0.00	$34.24
2	60	$26.45	$10.00	$14.55	$0.00	$51.00
3	65	$28.65	$10.00	$14.55	$0.00	$53.20
4	70	$30.86	$10.00	$14.55	$0.00	$55.41
5	75	$33.06	$10.00	$14.55	$0.00	$57.61
6	80	$35.26	$10.00	$14.55	$0.00	$59.81
7	85	$37.47	$10.00	$14.55	$0.00	$62.02
8	90	$39.67	$10.00	$14.55	$0.00	$64.22

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2015	$43.31	$10.20	$21.48	$2.25	$77.24
	02/01/2016	$44.31	$10.20	$21.48	$2.25	$78.24
	08/01/2016	$45.46	$10.20	$21.48	$2.25	$79.39
	02/01/2017	$46.56	$10.20	$21.48	$2.25	$80.49
	08/01/2017	$47.66	$10.20	$21.48	$2.25	$81.59
	02/01/2018	$48.81	$10.20	$21.48	$2.25	$82.74

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	09/01/2015	$45.67	$13.00	$15.89	$0.00	$74.56
	03/01/2016	$46.17	$13.00	$16.39	$0.00	$75.56

For apprentice rates see "Apprentice- ELECTRICIAN"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2015	$43.31	$10.20	$21.48	$2.25	$77.24
	02/01/2016	$44.31	$10.20	$21.48	$2.25	$78.24
	08/01/2016	$45.46	$10.20	$21.48	$2.25	$79.39
	02/01/2017	$46.56	$10.20	$21.48	$2.25	$80.49
	08/01/2017	$47.66	$10.20	$21.48	$2.25	$81.59
	02/01/2018	$48.81	$10.20	$21.48	$2.25	$82.74
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537 (Local 138)*	09/01/2015	$47.36	$9.70	$14.89	$0.00	$71.95
	03/01/2016	$48.36	$9.70	$14.89	$0.00	$72.95
	09/01/2016	$49.36	$9.70	$14.89	$0.00	$73.95
	03/01/2017	$50.36	$9.70	$14.89	$0.00	$74.95
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537 (Local 138)*	09/01/2015	$47.36	$9.70	$14.89	$0.00	$71.95
	03/01/2016	$48.36	$9.70	$14.89	$0.00	$72.95
	09/01/2016	$49.36	$9.70	$14.89	$0.00	$73.95
	03/01/2017	$50.36	$9.70	$14.89	$0.00	$74.95
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 2*	06/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	12/01/2015	$32.40	$7.30	$12.30	$0.00	$52.00
	06/01/2016	$32.90	$7.30	$12.30	$0.00	$52.50
	12/01/2016	$33.65	$7.30	$12.30	$0.00	$53.25
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2015	$43.81	$11.50	$13.80	$0.00	$69.11
	09/01/2016	$45.81	$11.50	$13.80	$0.00	$71.11
	09/01/2017	$47.81	$11.50	$13.80	$0.00	$73.11
	09/01/2018	$50.06	$11.50	$13.80	$0.00	$75.36
	09/01/2019	$52.56	$11.50	$13.80	$0.00	$77.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.91	$11.50	$10.05	$0.00	$43.46
2	60	$26.29	$11.50	$10.80	$0.00	$48.59
3	70	$30.67	$11.50	$11.55	$0.00	$53.72
4	80	$35.05	$11.50	$12.30	$0.00	$58.85

Effective Date - 09/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.91	$11.50	$10.05	$0.00	$44.46
2	60	$27.49	$11.50	$10.80	$0.00	$49.79
3	70	$32.07	$11.50	$11.55	$0.00	$55.12
4	80	$36.65	$11.50	$12.30	$0.00	$60.45

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (LAWRENCE AREA)*	09/16/2015	$37.99	$7.80	$20.85	$0.00	$66.64
	03/16/2016	$38.99	$7.80	$20.85	$0.00	$67.64
	09/16/2016	$39.64	$7.80	$20.85	$0.00	$68.29
	03/16/2017	$40.24	$7.80	$20.85	$0.00	$68.89

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 7 Lawrence*

Effective Date - 09/16/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$22.79	$7.80	$20.85	$0.00	$51.44
2	70	$26.59	$7.80	$20.85	$0.00	$55.24
3	75	$28.49	$7.80	$20.85	$0.00	$57.14
4	80	$30.39	$7.80	$20.85	$0.00	$59.04
5	85	$32.29	$7.80	$20.85	$0.00	$60.94
6	90	$34.19	$7.80	$20.85	$0.00	$62.84

Effective Date - 03/16/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.39	$7.80	$20.85	$0.00	$52.04
2	70	$27.29	$7.80	$20.85	$0.00	$55.94
3	75	$29.24	$7.80	$20.85	$0.00	$57.89
4	80	$31.19	$7.80	$20.85	$0.00	$59.84
5	85	$33.14	$7.80	$20.85	$0.00	$61.79
6	90	$35.09	$7.80	$20.85	$0.00	$63.74

Notes:

Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 2*	06/01/2015	$31.15	$7.30	$12.30	$0.00	$50.75
	12/01/2015	$31.65	$7.30	$12.30	$0.00	$51.25
	06/01/2016	$32.15	$7.30	$12.30	$0.00	$51.75
	12/01/2016	$32.90	$7.30	$12.30	$0.00	$52.50

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 2*

Effective Date - 06/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.69	$7.30	$12.30	$0.00	$38.29
2	70	$21.81	$7.30	$12.30	$0.00	$41.41
3	80	$24.92	$7.30	$12.30	$0.00	$44.52
4	90	$28.04	$7.30	$12.30	$0.00	$47.64

Effective Date - 12/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$18.99	$7.30	$12.30	$0.00	$38.59
2	70	$22.16	$7.30	$12.30	$0.00	$41.76
3	80	$25.32	$7.30	$12.30	$0.00	$44.92
4	90	$28.49	$7.30	$12.30	$0.00	$48.09

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 2*	06/01/2015	$31.15	$7.30	$12.30	$0.00	$50.75
	12/01/2015	$31.65	$7.30	$12.30	$0.00	$51.25
	06/01/2016	$32.15	$7.30	$12.30	$0.00	$51.75
	12/01/2016	$32.90	$7.30	$12.30	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 2*	06/01/2015	$31.15	$7.30	$12.30	$0.00	$50.75
	12/01/2015	$31.65	$7.30	$12.30	$0.00	$51.25
	06/01/2016	$32.15	$7.30	$12.30	$0.00	$51.75
	12/01/2016	$32.90	$7.30	$12.30	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 2*	06/01/2015	$31.35	$7.30	$12.25	$0.00	$50.90
	12/01/2015	$31.85	$7.30	$12.25	$0.00	$51.40
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 2*	06/01/2015	$31.15	$7.30	$12.30	$0.00	$50.75
	12/01/2015	$31.65	$7.30	$12.30	$0.00	$51.25
	06/01/2016	$32.15	$7.30	$12.30	$0.00	$51.75
	12/01/2016	$32.90	$7.30	$12.30	$0.00	$52.50
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 2*	06/01/2015	$31.15	$7.30	$12.30	$0.00	$50.75
	12/01/2015	$31.65	$7.30	$12.30	$0.00	$51.25
	06/01/2016	$32.15	$7.30	$12.30	$0.00	$51.75
	12/01/2016	$32.90	$7.30	$12.30	$0.00	$52.50

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER"

LASER BEAM OPERATOR *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75

For apprentice rates see "Apprentice- LABORER"

MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2015	$38.08	$10.18	$17.25	$0.00	$65.51
	02/01/2016	$38.53	$10.18	$17.25	$0.00	$65.96
	08/01/2016	$39.23	$10.18	$17.33	$0.00	$66.74
	02/01/2017	$39.69	$10.18	$17.33	$0.00	$67.20

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.04	$10.18	$17.25	$0.00	$46.47
2	60	$22.85	$10.18	$17.25	$0.00	$50.28
3	70	$26.66	$10.18	$17.25	$0.00	$54.09
4	80	$30.46	$10.18	$17.25	$0.00	$57.89
5	90	$34.27	$10.18	$17.25	$0.00	$61.70

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.27	$10.18	$17.25	$0.00	$46.70
2	60	$23.12	$10.18	$17.25	$0.00	$50.55
3	70	$26.97	$10.18	$17.25	$0.00	$54.40
4	80	$30.82	$10.18	$17.25	$0.00	$58.25
5	90	$34.68	$10.18	$17.25	$0.00	$62.11

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2015	$49.90	$10.18	$18.57	$0.00	$78.65
	02/01/2016	$50.47	$10.18	$18.57	$0.00	$79.22
	08/01/2016	$51.37	$10.18	$18.65	$0.00	$80.20
	02/01/2017	$51.94	$10.18	$18.65	$0.00	$80.77

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.95	$10.18	$18.57	$0.00	$53.70
2	60	$29.94	$10.18	$18.57	$0.00	$58.69
3	70	$34.93	$10.18	$18.57	$0.00	$63.68
4	80	$39.92	$10.18	$18.57	$0.00	$68.67
5	90	$44.91	$10.18	$18.57	$0.00	$73.66

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.24	$10.18	$18.57	$0.00	$53.99
2	60	$30.28	$10.18	$18.57	$0.00	$59.03
3	70	$35.33	$10.18	$18.57	$0.00	$64.08
4	80	$40.38	$10.18	$18.57	$0.00	$69.13
5	90	$45.42	$10.18	$18.57	$0.00	$74.17

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.42	$10.00	$14.55	$0.00	$66.97
	12/01/2015	$43.66	$10.00	$14.55	$0.00	$68.21
	06/01/2016	$44.41	$10.00	$14.55	$0.00	$68.96
	12/01/2016	$45.64	$10.00	$14.55	$0.00	$70.19
	06/01/2017	$46.63	$10.00	$14.55	$0.00	$71.18
	12/01/2017	$47.62	$10.00	$14.55	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.42	$10.00	$14.55	$0.00	$66.97
	12/01/2015	$43.66	$10.00	$14.55	$0.00	$68.21
	06/01/2016	$44.41	$10.00	$14.55	$0.00	$68.96
	12/01/2016	$45.64	$10.00	$14.55	$0.00	$70.19
	06/01/2017	$46.63	$10.00	$14.55	$0.00	$71.18
	12/01/2017	$47.62	$10.00	$14.55	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 2) *MILLWRIGHTS LOCAL 1121 - Zone 2*	04/01/2015	$34.69	$9.80	$16.21	$0.00	$60.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 2*

Effective Date - 04/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$19.08	$9.80	$4.48	$0.00	$33.36
2	65	$22.55	$9.80	$13.36	$0.00	$45.71
3	75	$26.02	$9.80	$14.18	$0.00	$50.00
4	85	$29.49	$9.80	$14.99	$0.00	$54.28

Notes:

Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$21.97	$10.00	$14.55	$0.00	$46.52
	12/01/2015	$22.62	$10.00	$14.55	$0.00	$47.17
	06/01/2016	$23.01	$10.00	$14.55	$0.00	$47.56
	12/01/2016	$23.66	$10.00	$14.55	$0.00	$48.21
	06/01/2017	$24.17	$10.00	$14.55	$0.00	$48.72
	12/01/2017	$24.69	$10.00	$14.55	$0.00	$49.24
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$25.68	$10.00	$14.55	$0.00	$50.23
	12/01/2015	$26.43	$10.00	$14.55	$0.00	$50.98
	06/01/2016	$26.89	$10.00	$14.55	$0.00	$51.44
	12/01/2016	$27.64	$10.00	$14.55	$0.00	$52.19
	06/01/2017	$28.24	$10.00	$14.55	$0.00	$52.79
	12/01/2017	$28.85	$10.00	$14.55	$0.00	$53.40
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.42	$10.00	$14.55	$0.00	$66.97
	12/01/2015	$43.66	$10.00	$14.55	$0.00	$68.21
	06/01/2016	$44.41	$10.00	$14.55	$0.00	$68.96
	12/01/2016	$45.64	$10.00	$14.55	$0.00	$70.19
	06/01/2017	$46.63	$10.00	$14.55	$0.00	$71.18
	12/01/2017	$47.62	$10.00	$14.55	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2015	$48.56	$7.85	$16.10	$0.00	$72.51
	01/01/2016	$49.51	$7.85	$16.10	$0.00	$73.46
	07/01/2016	$50.46	$7.85	$16.10	$0.00	$74.41
	01/01/2017	$51.41	$7.85	$16.10	$0.00	$75.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.28	$7.85	$0.00	$0.00	$32.13
2	55	$26.71	$7.85	$3.66	$0.00	$38.22
3	60	$29.14	$7.85	$3.99	$0.00	$40.98
4	65	$31.56	$7.85	$4.32	$0.00	$43.73
5	70	$33.99	$7.85	$14.11	$0.00	$55.95
6	75	$36.42	$7.85	$14.44	$0.00	$58.71
7	80	$38.85	$7.85	$14.77	$0.00	$61.47
8	90	$43.70	$7.85	$15.44	$0.00	$66.99

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.76	$7.85	$0.00	$0.00	$32.61
2	55	$27.23	$7.85	$3.66	$0.00	$38.74
3	60	$29.71	$7.85	$3.99	$0.00	$41.55
4	65	$32.18	$7.85	$4.32	$0.00	$44.35
5	70	$34.66	$7.85	$14.11	$0.00	$56.62
6	75	$37.13	$7.85	$14.44	$0.00	$59.42
7	80	$39.61	$7.85	$14.77	$0.00	$62.23
8	90	$44.56	$7.85	$15.44	$0.00	$67.85

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2015	$39.46	$7.85	$16.10	$0.00	$63.41
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2016	$40.41	$7.85	$16.10	$0.00	$64.36
	07/01/2016	$41.36	$7.85	$16.10	$0.00	$65.31
	01/01/2017	$42.31	$7.85	$16.10	$0.00	$66.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.73	$7.85	$0.00	$0.00	$27.58
2	55	$21.70	$7.85	$3.66	$0.00	$33.21
3	60	$23.68	$7.85	$3.99	$0.00	$35.52
4	65	$25.65	$7.85	$4.32	$0.00	$37.82
5	70	$27.62	$7.85	$14.11	$0.00	$49.58
6	75	$29.60	$7.85	$14.44	$0.00	$51.89
7	80	$31.57	$7.85	$14.77	$0.00	$54.19
8	90	$35.51	$7.85	$15.44	$0.00	$58.80

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.21	$7.85	$0.00	$0.00	$28.06
2	55	$22.23	$7.85	$3.66	$0.00	$33.74
3	60	$24.25	$7.85	$3.99	$0.00	$36.09
4	65	$26.27	$7.85	$4.32	$0.00	$38.44
5	70	$28.29	$7.85	$14.11	$0.00	$50.25
6	75	$30.31	$7.85	$14.44	$0.00	$52.60
7	80	$32.33	$7.85	$14.77	$0.00	$54.95
8	90	$36.37	$7.85	$15.44	$0.00	$59.66

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2015	$37.52	$7.85	$16.10	$0.00	$61.47
	01/01/2016	$38.47	$7.85	$16.10	$0.00	$62.42
	07/01/2016	$39.42	$7.85	$16.10	$0.00	$63.37
	01/01/2017	$40.37	$7.85	$16.10	$0.00	$64.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.76	$7.85	$0.00	$0.00	$26.61
2	55	$20.64	$7.85	$3.66	$0.00	$32.15
3	60	$22.51	$7.85	$3.99	$0.00	$34.35
4	65	$24.39	$7.85	$4.32	$0.00	$36.56
5	70	$26.26	$7.85	$14.11	$0.00	$48.22
6	75	$28.14	$7.85	$14.44	$0.00	$50.43
7	80	$30.02	$7.85	$14.77	$0.00	$52.64
8	90	$33.77	$7.85	$15.44	$0.00	$57.06

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.24	$7.85	$0.00	$0.00	$27.09
2	55	$21.16	$7.85	$3.66	$0.00	$32.67
3	60	$23.08	$7.85	$3.99	$0.00	$34.92
4	65	$25.01	$7.85	$4.32	$0.00	$37.18
5	70	$26.93	$7.85	$14.11	$0.00	$48.89
6	75	$28.85	$7.85	$14.44	$0.00	$51.14
7	80	$30.78	$7.85	$14.77	$0.00	$53.40
8	90	$34.62	$7.85	$15.44	$0.00	$57.91

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) *LABORERS - ZONE 2*	06/01/2015	$31.15	$7.30	$12.30	$0.00	$50.75
	12/01/2015	$31.65	$7.30	$12.30	$0.00	$51.25
	06/01/2016	$32.15	$7.30	$12.30	$0.00	$51.75
	12/01/2016	$32.90	$7.30	$12.30	$0.00	$52.50
For Apprentice rates see "Apprentice- LABORER"						
PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	07/01/2015	$38.06	$7.85	$16.10	$0.00	$62.01
	01/01/2016	$39.01	$7.85	$16.10	$0.00	$62.96
	07/01/2016	$39.96	$7.85	$16.10	$0.00	$63.91
	01/01/2017	$40.91	$7.85	$16.10	$0.00	$64.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.03	$7.85	$0.00	$0.00	$26.88
2	55	$20.93	$7.85	$3.66	$0.00	$32.44
3	60	$22.84	$7.85	$3.99	$0.00	$34.68
4	65	$24.74	$7.85	$4.32	$0.00	$36.91
5	70	$26.64	$7.85	$14.11	$0.00	$48.60
6	75	$28.55	$7.85	$14.44	$0.00	$50.84
7	80	$30.45	$7.85	$14.77	$0.00	$53.07
8	90	$34.25	$7.85	$15.44	$0.00	$57.54

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.51	$7.85	$0.00	$0.00	$27.36
2	55	$21.46	$7.85	$3.66	$0.00	$32.97
3	60	$23.41	$7.85	$3.99	$0.00	$35.25
4	65	$25.36	$7.85	$4.32	$0.00	$37.53
5	70	$27.31	$7.85	$14.11	$0.00	$49.27
6	75	$29.26	$7.85	$14.44	$0.00	$51.55
7	80	$31.21	$7.85	$14.77	$0.00	$53.83
8	90	$35.11	$7.85	$15.44	$0.00	$58.40

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2015	$36.12	$7.85	$16.10	$0.00	$60.07
	01/01/2016	$37.07	$7.85	$16.10	$0.00	$61.02
	07/01/2016	$38.02	$7.85	$16.10	$0.00	$61.97
	01/01/2017	$38.97	$7.85	$16.10	$0.00	$62.92

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 07/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.06	$7.85	$0.00	$0.00	$25.91
2	55	$19.87	$7.85	$3.66	$0.00	$31.38
3	60	$21.67	$7.85	$3.99	$0.00	$33.51
4	65	$23.48	$7.85	$4.32	$0.00	$35.65
5	70	$25.28	$7.85	$14.11	$0.00	$47.24
6	75	$27.09	$7.85	$14.44	$0.00	$49.38
7	80	$28.90	$7.85	$14.77	$0.00	$51.52
8	90	$32.51	$7.85	$15.44	$0.00	$55.80

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$18.54	$7.85	$0.00	$0.00	$26.39
2	55	$20.39	$7.85	$3.66	$0.00	$31.90
3	60	$22.24	$7.85	$3.99	$0.00	$34.08
4	65	$24.10	$7.85	$4.32	$0.00	$36.27
5	70	$25.95	$7.85	$14.11	$0.00	$47.91
6	75	$27.80	$7.85	$14.44	$0.00	$50.09
7	80	$29.66	$7.85	$14.77	$0.00	$52.28
8	90	$33.36	$7.85	$15.44	$0.00	$56.65

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2012	$30.28	$9.07	$8.00	$0.00	$47.35
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2015	$42.04	$9.80	$19.23	$0.00	$71.07

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.02	$9.80	$19.23	$0.00	$50.05
2	60	$25.22	$9.80	$19.23	$0.00	$54.25
3	70	$29.43	$9.80	$19.23	$0.00	$58.46
4	75	$31.53	$9.80	$19.23	$0.00	$60.56
5	80	$33.63	$9.80	$19.23	$0.00	$62.66
6	80	$33.63	$9.80	$19.23	$0.00	$62.66
7	90	$37.84	$9.80	$19.23	$0.00	$66.87
8	90	$37.84	$9.80	$19.23	$0.00	$66.87

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537 (Local 138)*	09/01/2015	$47.36	$9.70	$14.89	$0.00	$71.95
	03/01/2016	$48.36	$9.70	$14.89	$0.00	$72.95
	09/01/2016	$49.36	$9.70	$14.89	$0.00	$73.95
	03/01/2017	$50.36	$9.70	$14.89	$0.00	$74.95

Apprentice - *PIPEFITTER Local 537 (Local 138)*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$18.94	$9.70	$5.50	$0.00	$34.14
2	45	$21.31	$9.70	$14.89	$0.00	$45.90
3	60	$28.42	$9.70	$14.89	$0.00	$53.01
4	70	$33.15	$9.70	$14.89	$0.00	$57.74
5	80	$37.89	$9.70	$14.89	$0.00	$62.48

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.34	$9.70	$5.50	$0.00	$34.54
2	45	$21.76	$9.70	$14.89	$0.00	$46.35
3	60	$29.02	$9.70	$14.89	$0.00	$53.61
4	70	$33.85	$9.70	$14.89	$0.00	$58.44
5	80	$38.69	$9.70	$14.89	$0.00	$63.28

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
PLUMBER *PLUMBERS & GASFITTERS LOCAL 12 (Local 138)*	09/01/2015	$46.38	$10.82	$15.14	$0.00	$72.34
	03/01/2016	$47.53	$10.82	$15.14	$0.00	$73.49
	09/01/2016	$48.58	$10.82	$15.14	$0.00	$74.54
	03/01/2017	$49.58	$10.82	$15.14	$0.00	$75.54

Apprentice - *PLUMBER/GASFITTER - Local 12 (Local 138)*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$16.23	$10.82	$5.63	$0.00	$32.68
2	40	$18.55	$10.82	$6.37	$0.00	$35.74
3	55	$25.51	$10.82	$8.56	$0.00	$44.89
4	65	$30.15	$10.82	$10.03	$0.00	$51.00
5	75	$34.79	$10.82	$11.48	$0.00	$57.09

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$16.64	$10.82	$5.61	$0.00	$33.07
2	40	$19.01	$10.82	$6.36	$0.00	$36.19
3	55	$26.14	$10.82	$8.56	$0.00	$45.52
4	65	$30.89	$10.82	$10.02	$0.00	$51.73
5	75	$35.65	$10.82	$11.48	$0.00	$57.95

Notes:

Steps are 1 yr
Step 4 with lic$54.05 Step5 with lic$60.13

Apprentice to Journeyworker Ratio:1:5

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537 (Local 138)*	09/01/2015	$47.36	$9.70	$14.89	$0.00	$71.95
	03/01/2016	$48.36	$9.70	$14.89	$0.00	$72.95
	09/01/2016	$49.36	$9.70	$14.89	$0.00	$73.95
	03/01/2017	$50.36	$9.70	$14.89	$0.00	$74.95
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER *LABORERS - ZONE 2*	06/01/2015	$32.15	$7.30	$12.30	$0.00	$51.75
	12/01/2015	$32.65	$7.30	$12.30	$0.00	$52.25
	06/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
	12/01/2016	$33.90	$7.30	$12.30	$0.00	$53.50
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.83	$10.00	$14.55	$0.00	$67.38
	12/01/2015	$44.08	$10.00	$14.55	$0.00	$68.63
	06/01/2016	$44.83	$10.00	$14.55	$0.00	$69.38
	12/01/2016	$46.08	$10.00	$14.55	$0.00	$70.63
	06/01/2017	$47.08	$10.00	$14.55	$0.00	$71.63
	12/01/2017	$48.08	$10.00	$14.55	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.83	$10.00	$14.55	$0.00	$67.38
	12/01/2015	$44.08	$10.00	$14.55	$0.00	$68.63
	06/01/2016	$44.83	$10.00	$14.55	$0.00	$69.38
	12/01/2016	$46.08	$10.00	$14.55	$0.00	$70.63
	06/01/2017	$47.08	$10.00	$14.55	$0.00	$71.63
	12/01/2017	$48.08	$10.00	$14.55	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$29.61	$10.00	$14.55	$0.00	$54.16
	12/01/2015	$30.48	$10.00	$14.55	$0.00	$55.03
	06/01/2016	$31.00	$10.00	$14.55	$0.00	$55.55
	12/01/2016	$31.87	$10.00	$14.55	$0.00	$56.42
	06/01/2017	$32.56	$10.00	$14.55	$0.00	$57.11
	12/01/2017	$33.25	$10.00	$14.55	$0.00	$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS LOCAL 42*	05/01/2015	$22.66	$8.49	$9.89	$0.00	$41.04
	11/01/2015	$22.78	$8.49	$9.89	$0.00	$41.16
	04/30/2016	$22.78	$8.49	$10.25	$0.00	$41.52
	05/01/2016	$24.15	$8.49	$10.68	$0.00	$43.32
	04/30/2017	$24.15	$8.49	$11.07	$0.00	$43.71
	05/01/2017	$24.21	$8.49	$11.54	$0.00	$44.24
	04/30/2018	$24.21	$8.49	$11.96	$0.00	$44.66
	05/01/2018	$24.24	$8.49	$12.46	$0.00	$45.19
	04/30/2019	$24.24	$8.49	$12.92	$0.00	$45.65
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.42	$10.00	$14.55	$0.00	$66.97
	12/01/2015	$43.66	$10.00	$14.55	$0.00	$68.21
	06/01/2016	$44.41	$10.00	$14.55	$0.00	$68.96
	12/01/2016	$45.64	$10.00	$14.55	$0.00	$70.19
	06/01/2017	$46.63	$10.00	$14.55	$0.00	$71.18
	12/01/2017	$47.62	$10.00	$14.55	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RESIDENTIAL WOOD FRAME (All Other Work) *CARPENTERS -ZONE 2 (Residential Wood)*	04/01/2011	$24.24	$8.67	$15.51	$0.00	$48.42
RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement.*CARPENTERS -ZONE 2 (Residential Wood)*	05/01/2011	$24.24	$6.34	$6.23	$0.00	$36.81

As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Residential Wood Frame) - Zone 2*

Effective Date - 05/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.54	$6.34	$0.00	$0.00	$20.88
2	60	$14.54	$6.34	$6.23	$0.00	$27.11
3	65	$15.76	$6.34	$6.23	$0.00	$28.33
4	70	$16.97	$6.34	$6.23	$0.00	$29.54
5	75	$18.18	$6.34	$6.23	$0.00	$30.75
6	80	$19.39	$6.34	$6.23	$0.00	$31.96
7	85	$20.60	$6.34	$6.23	$0.00	$33.17
8	90	$21.82	$6.34	$6.23	$0.00	$34.39

Notes:

Apprentice to Journeyworker Ratio:1:5

RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.42	$10.00	$14.55	$0.00	$66.97
	12/01/2015	$43.66	$10.00	$14.55	$0.00	$68.21
	06/01/2016	$44.41	$10.00	$14.55	$0.00	$68.96
	12/01/2016	$45.64	$10.00	$14.55	$0.00	$70.19
	06/01/2017	$46.63	$10.00	$14.55	$0.00	$71.18
	12/01/2017	$47.62	$10.00	$14.55	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	08/01/2015	$40.11	$11.00	$12.00	$0.00	$63.11
	02/01/2016	$41.01	$11.00	$12.00	$0.00	$64.01

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 33*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.06	$11.00	$3.38	$0.00	$34.44
2	60	$24.07	$11.00	$12.00	$0.00	$47.07
3	65	$26.07	$11.00	$12.00	$0.00	$49.07
4	75	$30.08	$11.00	$12.00	$0.00	$53.08
5	85	$34.09	$11.00	$12.00	$0.00	$57.09

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.51	$11.00	$3.38	$0.00	$34.89
2	60	$24.61	$11.00	$12.00	$0.00	$47.61
3	65	$26.66	$11.00	$12.00	$0.00	$49.66
4	75	$30.76	$11.00	$12.00	$0.00	$53.76
5	85	$34.86	$11.00	$12.00	$0.00	$57.86

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	08/01/2015	$40.36	$11.00	$12.00	$0.00	$63.36
	02/01/2016	$41.26	$11.00	$12.00	$0.00	$64.26
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2015	$43.31	$10.20	$21.48	$2.25	$77.24
	02/01/2016	$44.31	$10.20	$21.48	$2.25	$78.24
	08/01/2016	$45.46	$10.20	$21.48	$2.25	$79.39
	02/01/2017	$46.56	$10.20	$21.48	$2.25	$80.49
	08/01/2017	$47.66	$10.20	$21.48	$2.25	$81.59
	02/01/2018	$48.81	$10.20	$21.48	$2.25	$82.74

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.32	$10.20	$4.90	$0.00	$32.42
2	40	$17.32	$10.20	$4.90	$0.00	$32.42
3	45	$19.49	$10.20	$9.59	$1.18	$40.46
4	45	$19.49	$10.20	$9.59	$1.18	$40.46
5	50	$21.66	$10.20	$10.45	$1.27	$43.58
6	50	$21.66	$10.20	$10.70	$1.28	$43.84
7	60	$25.99	$10.20	$12.17	$1.45	$49.81
8	65	$28.15	$10.20	$13.04	$1.54	$52.93
9	75	$32.48	$10.20	$14.76	$1.72	$59.16
10	85	$36.81	$10.20	$15.98	$1.89	$64.88

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$17.72	$10.20	$4.90	$0.00	$32.82
2	40	$17.72	$10.20	$4.90	$0.00	$32.82
3	45	$19.94	$10.20	$9.59	$1.19	$40.92
4	45	$19.94	$10.20	$9.59	$1.19	$40.92
5	50	$22.16	$10.20	$10.45	$1.28	$44.09
6	50	$22.16	$10.20	$10.70	$1.29	$44.35
7	60	$26.59	$10.20	$12.17	$1.47	$50.43
8	65	$28.80	$10.20	$13.04	$1.56	$53.60
9	75	$33.23	$10.20	$14.76	$1.75	$59.94
10	85	$37.66	$10.20	$15.98	$1.92	$65.76

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR *PAINTERS LOCAL 35 - ZONE 2*	06/01/2013	$25.81	$7.07	$7.05	$0.00	$39.93

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SIGN ERECTOR - Local 35 Zone 2*

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$12.91	$7.07	$0.00	$0.00	$19.98
2	55	$14.20	$7.07	$2.45	$0.00	$23.72
3	60	$15.49	$7.07	$2.45	$0.00	$25.01
4	65	$16.78	$7.07	$2.45	$0.00	$26.30
5	70	$18.07	$7.07	$7.05	$0.00	$32.19
6	75	$19.36	$7.07	$7.05	$0.00	$33.48
7	80	$20.65	$7.07	$7.05	$0.00	$34.77
8	85	$21.94	$7.07	$7.05	$0.00	$36.06
9	90	$23.23	$7.07	$7.05	$0.00	$37.35

Notes:

Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2015	$31.94	$10.41	$9.33	$0.00	$51.68
	12/01/2015	$31.94	$10.41	$10.08	$0.00	$52.43
	06/01/2016	$32.44	$10.41	$10.08	$0.00	$52.93
	08/01/2016	$32.44	$10.91	$10.08	$0.00	$53.43
	12/01/2016	$32.44	$10.91	$10.89	$0.00	$54.24
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2015	$32.23	$10.41	$9.33	$0.00	$51.97
	12/01/2015	$32.23	$10.41	$10.08	$0.00	$52.72
	06/01/2016	$32.73	$10.41	$10.08	$0.00	$53.22
	08/01/2016	$32.73	$10.91	$10.08	$0.00	$53.72
	12/01/2016	$32.73	$10.91	$10.89	$0.00	$54.53
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2*	10/01/2015	$49.35	$8.42	$15.65	$0.00	$73.42
	01/01/2016	$48.99	$8.67	$15.80	$0.00	$73.46
	03/01/2016	$49.89	$8.67	$15.80	$0.00	$74.36
	10/01/2016	$50.93	$8.67	$15.80	$0.00	$75.40
	03/01/2017	$51.83	$8.67	$15.80	$0.00	$76.30

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SPRINKLER FITTER - Local 550 (Section B) Zone 2*

Effective Date - 10/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.27	$8.42	$8.40	$0.00	$34.09
2	40	$19.74	$8.42	$8.40	$0.00	$36.56
3	45	$22.21	$8.42	$8.40	$0.00	$39.03
4	50	$24.68	$8.42	$8.40	$0.00	$41.50
5	55	$27.14	$8.42	$8.40	$0.00	$43.96
6	60	$29.61	$8.42	$8.40	$0.00	$46.43
7	65	$32.08	$8.42	$8.40	$0.00	$48.90
8	70	$34.55	$8.42	$8.40	$0.00	$51.37
9	75	$37.01	$8.42	$8.40	$0.00	$53.83
10	80	$39.48	$8.42	$8.40	$0.00	$56.30

Effective Date - 01/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$17.15	$8.67	$8.55	$0.00	$34.37
2	40	$19.60	$8.67	$8.55	$0.00	$36.82
3	45	$22.05	$8.67	$8.55	$0.00	$39.27
4	50	$24.50	$8.67	$8.55	$0.00	$41.72
5	55	$26.94	$8.67	$8.55	$0.00	$44.16
6	60	$29.39	$8.67	$8.55	$0.00	$46.61
7	65	$31.84	$8.67	$8.55	$0.00	$49.06
8	70	$34.29	$8.67	$8.55	$0.00	$51.51
9	75	$36.74	$8.67	$8.55	$0.00	$53.96
10	80	$39.19	$8.67	$8.55	$0.00	$56.41

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.42	$10.00	$14.55	$0.00	$66.97
	12/01/2015	$43.66	$10.00	$14.55	$0.00	$68.21
	06/01/2016	$44.41	$10.00	$14.55	$0.00	$68.96
	12/01/2016	$45.64	$10.00	$14.55	$0.00	$70.19
	06/01/2017	$46.63	$10.00	$14.55	$0.00	$71.18
	12/01/2017	$47.62	$10.00	$14.55	$0.00	$72.17

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.42	$10.00	$14.55	$0.00	$66.97
	12/01/2015	$43.66	$10.00	$14.55	$0.00	$68.21
	06/01/2016	$44.41	$10.00	$14.55	$0.00	$68.96
	12/01/2016	$45.64	$10.00	$14.55	$0.00	$70.19
	06/01/2017	$46.63	$10.00	$14.55	$0.00	$71.18
	12/01/2017	$47.62	$10.00	$14.55	$0.00	$72.17

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	09/01/2015	$34.25	$13.00	$14.06	$0.00	$61.31
	03/01/2016	$34.63	$13.00	$14.55	$0.00	$62.18

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

Effective Date - 09/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.70	$13.00	$0.41	$0.00	$27.11
2	40	$13.70	$13.00	$0.41	$0.00	$27.11
3	45	$15.41	$13.00	$11.03	$0.00	$39.44
4	45	$15.41	$13.00	$11.03	$0.00	$39.44
5	50	$17.13	$13.00	$11.30	$0.00	$41.43
6	55	$18.84	$13.00	$11.58	$0.00	$43.42
7	60	$20.55	$13.00	$11.86	$0.00	$45.41
8	65	$22.26	$13.00	$12.13	$0.00	$47.39
9	70	$23.98	$13.00	$12.41	$0.00	$49.39
10	75	$25.69	$13.00	$12.68	$0.00	$51.37

Effective Date - 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$13.85	$13.00	$0.42	$0.00	$27.27
2	40	$13.85	$13.00	$0.42	$0.00	$27.27
3	45	$15.58	$13.00	$11.52	$0.00	$40.10
4	45	$15.58	$13.00	$11.52	$0.00	$40.10
5	50	$17.32	$13.00	$11.79	$0.00	$42.11
6	55	$19.05	$13.00	$12.06	$0.00	$44.11
7	60	$20.78	$13.00	$12.34	$0.00	$46.12
8	65	$22.51	$13.00	$12.62	$0.00	$48.13
9	70	$24.24	$13.00	$12.90	$0.00	$50.14
10	75	$25.97	$13.00	$13.17	$0.00	$52.14

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2015	$48.80	$10.18	$18.57	$0.00	$77.55
	02/01/2016	$49.37	$10.18	$18.57	$0.00	$78.12
	08/01/2016	$50.27	$10.18	$18.65	$0.00	$79.10
	02/01/2017	$50.84	$10.18	$18.65	$0.00	$79.67

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 08/01/2015

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.40	$10.18	$18.57	$0.00	$53.15
2	60	$29.28	$10.18	$18.57	$0.00	$58.03
3	70	$34.16	$10.18	$18.57	$0.00	$62.91
4	80	$39.04	$10.18	$18.57	$0.00	$67.79
5	90	$43.92	$10.18	$18.57	$0.00	$72.67

Effective Date - 02/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.69	$10.18	$18.57	$0.00	$53.44
2	60	$29.62	$10.18	$18.57	$0.00	$58.37
3	70	$34.56	$10.18	$18.57	$0.00	$63.31
4	80	$39.50	$10.18	$18.57	$0.00	$68.25
5	90	$44.43	$10.18	$18.57	$0.00	$73.18

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	06/01/2015	$36.45	$7.30	$13.40	$0.00	$57.15
	12/01/2015	$37.20	$7.30	$13.40	$0.00	$57.90
	06/01/2016	$37.95	$7.30	$13.40	$0.00	$58.65
	12/01/2016	$38.95	$7.30	$13.40	$0.00	$59.65
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	06/01/2015	$35.17	$7.30	$13.40	$0.00	$55.87
	12/01/2015	$35.92	$7.30	$13.40	$0.00	$56.62
	06/01/2016	$36.67	$7.30	$13.40	$0.00	$57.37
	12/01/2016	$37.67	$7.30	$13.40	$0.00	$58.37
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2015	$35.05	$7.30	$13.40	$0.00	$55.75
	12/01/2015	$35.80	$7.30	$13.40	$0.00	$56.50
	06/01/2016	$36.55	$7.30	$13.40	$0.00	$57.25
	12/01/2016	$37.55	$7.30	$13.40	$0.00	$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.42	$10.00	$14.55	$0.00	$66.97
	12/01/2015	$43.66	$10.00	$14.55	$0.00	$68.21
	06/01/2016	$44.41	$10.00	$14.55	$0.00	$68.96
	12/01/2016	$45.64	$10.00	$14.55	$0.00	$70.19
	06/01/2017	$46.63	$10.00	$14.55	$0.00	$71.18
	12/01/2017	$47.62	$10.00	$14.55	$0.00	$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2015	$32.52	$10.41	$9.33	$0.00	$52.26
	12/01/2015	$32.52	$10.41	$10.08	$0.00	$53.01
	06/01/2016	$33.02	$10.41	$10.08	$0.00	$53.51
	08/01/2016	$33.02	$10.91	$10.08	$0.00	$54.01
	12/01/2016	$33.02	$10.91	$10.89	$0.00	$54.82
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	06/01/2015	$47.33	$7.30	$13.80	$0.00	$68.43
	12/01/2015	$48.08	$7.30	$13.80	$0.00	$69.18
	06/01/2016	$48.83	$7.30	$13.80	$0.00	$69.93
	12/01/2016	$49.83	$7.30	$13.80	$0.00	$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	06/01/2015	$49.33	$7.30	$13.80	$0.00	$70.43
	12/01/2015	$50.08	$7.30	$13.80	$0.00	$71.18
	06/01/2016	$50.83	$7.30	$13.80	$0.00	$71.93
	12/01/2016	$51.83	$7.30	$13.80	$0.00	$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	06/01/2015	$39.40	$7.30	$13.80	$0.00	$60.50
	12/01/2015	$40.15	$7.30	$13.80	$0.00	$61.25
	06/01/2016	$40.90	$7.30	$13.80	$0.00	$62.00
	12/01/2016	$41.90	$7.30	$13.80	$0.00	$63.00
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	06/01/2015	$41.40	$7.30	$13.80	$0.00	$62.50
	12/01/2015	$42.15	$7.30	$13.80	$0.00	$63.25
	06/01/2016	$42.90	$7.30	$13.80	$0.00	$64.00
	12/01/2016	$43.90	$7.30	$13.80	$0.00	$65.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	08/01/2015	$31.94	$10.41	$9.33	$0.00	$51.68
	12/01/2015	$31.94	$10.41	$10.08	$0.00	$52.43
	06/01/2016	$32.44	$10.41	$10.08	$0.00	$52.93
	08/01/2016	$32.44	$10.91	$10.08	$0.00	$53.43
	12/01/2016	$32.44	$10.91	$10.89	$0.00	$54.24
WAGON DRILL OPERATOR *LABORERS - ZONE 2*	06/01/2015	$31.40	$7.30	$12.30	$0.00	$51.00
	12/01/2015	$31.90	$7.30	$12.30	$0.00	$51.50
	06/01/2016	$32.40	$7.30	$12.30	$0.00	$52.00
	12/01/2016	$33.15	$7.30	$12.30	$0.00	$52.75
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2015	$42.83	$10.00	$14.55	$0.00	$67.38
	12/01/2015	$44.08	$10.00	$14.55	$0.00	$68.63
	06/01/2016	$44.83	$10.00	$14.55	$0.00	$69.38
	12/01/2016	$46.08	$10.00	$14.55	$0.00	$70.63
	06/01/2017	$47.08	$10.00	$14.55	$0.00	$71.63
	12/01/2017	$48.08	$10.00	$14.55	$0.00	$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12 (Local 138)*	09/01/2015	$46.38	$10.82	$15.14	$0.00	$72.34
	03/01/2016	$47.53	$10.82	$15.14	$0.00	$73.49
	09/01/2016	$48.58	$10.82	$15.14	$0.00	$74.54
	03/01/2017	$49.58	$10.82	$15.14	$0.00	$75.54
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$25.66	$8.70	$4.48	$0.00	$38.84
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$36.55	$8.70	$6.58	$0.00	$51.83
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$29.94	$8.70	$6.05	$0.00	$44.69
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$23.52	$8.70	$5.24	$0.00	$37.46
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$36.35	$8.70	$9.43	$0.00	$54.48
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$32.08	$8.70	$6.59	$0.00	$47.37
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$23.52	$8.70	$3.72	$0.00	$35.94
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	09/01/2013	$19.25	$8.70	$2.85	$0.00	$30.80
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	09/01/2013	$42.77	$8.70	$11.78	$0.00	$63.25

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.66	$8.70	$4.24	$0.00	$38.60
2	65	$27.80	$8.70	$4.71	$0.00	$41.21
3	70	$29.94	$8.70	$5.43	$0.00	$44.07
4	75	$32.08	$8.70	$6.16	$0.00	$46.94
5	80	$34.22	$8.70	$6.88	$0.00	$49.80
6	85	$36.35	$8.70	$7.62	$0.00	$52.67
7	90	$38.49	$8.70	$8.83	$0.00	$56.02

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/01/2015	$28.12	$4.25	$3.09	$0.00	$35.46
	01/01/2016	$28.98	$4.25	$3.12	$0.00	$36.35
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/01/2015	$26.49	$4.25	$3.04	$0.00	$33.78
	01/01/2016	$27.31	$4.25	$3.07	$0.00	$34.63
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	01/01/2015	$26.49	$4.25	$3.04	$0.00	$33.78
	01/01/2016	$27.31	$4.25	$3.07	$0.00	$34.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TREE TRIMMER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/01/2015	$18.05	$3.55	$0.00	$0.00	$21.60
	01/31/2016	$18.51	$3.55	$0.00	$0.00	$22.06

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground. This classification does not apply to wholesale tree removal.

TREE TRIMMER GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/01/2015	$15.92	$3.55	$0.00	$0.00	$19.47
	01/31/2016	$16.32	$3.55	$0.00	$0.00	$19.87

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

AIA® Document A101™ – 2007

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

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

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

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

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

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

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

The Architect:
(Name, address and other information)

The Owner and Contractor agree as follows.

Sample

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TABLE OF ARTICLES

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10 INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

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

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

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

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§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than
( ) days from the date of commencement, or as follows:
(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

, subject to adjustments of this Contract Time as provided in the Contract Documents.
(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)

ARTICLE 4 CONTRACT SUM

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

§ 4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

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

Item	Units and Limitations	Price Per Unit

§ 4.4 Allowances included in the Contract Sum, if any:
(Identify allowance and state exclusions, if any, from the allowance price.)

Item	Price

ARTICLE 5 PAYMENTS

§ 5.1 PROGRESS PAYMENTS

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

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

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

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

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

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

.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of percent (%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction;

.2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of percent (%);

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007.

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

.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and
(Section 9.8.5 of AIA Document A201–2007 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)

.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2007.

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

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

§ 5.2 FINAL PAYMENT

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

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

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

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 INITIAL DECISION MAKER

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

§ 6.2 BINDING DISPUTE RESOLUTION

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A201–2007, the method of binding dispute resolution shall be as follows:
(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2007

☐ Litigation in a court of competent jurisdiction

☐ Other *(Specify)*

ARTICLE 7 TERMINATION OR SUSPENSION

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

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

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ARTICLE 8 MISCELLANEOUS PROVISIONS

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

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

§ 8.3 The Owner's representative:
(Name, address and other information)

§ 8.4 The Contractor's representative:
(Name, address and other information)

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

§ 8.6 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

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

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

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

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

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

Section	Title	Date	Pages

Sample

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

Number	Title	Date

§ 9.1.6 The Addenda, if any:

Number	Date	Pages

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

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

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

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

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007.
(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007.)

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

OWNER *(Signature)*

CONTRACTOR *(Signature)*

(Printed name and title)

(Printed name and title)

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

Init.

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DOCUMENT 00 61 13 – PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____
(Name of Contractor)

a _____ hereinafter called "Principal" and
(Corporation, Partnership, Joint Venture or Individual)

_____of _____, State of _____
(Surety) (City)

hereinafter called the "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the Town of _____, Massachusetts, hereinafter called "Owner", in the penal sum of
_____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas the Principal has entered into a certain contract with the Owner (the "Construction Contract"), dated the _____ day of _____, 20___, for the construction described as follows:
_____.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of the Construction Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under the Construction Contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise, this obligation shall remain in full force and effect.

PROVIDED, FURTHER, that the Surety's obligation under this Bond shall arise after
(1) the Owner has declared the Principal in default of the Construction Contract or (2) has declared that the Principal has failed, or is otherwise unable or unwilling, to execute the work consistent with, and in conformance to, the Construction Contract (collectively referred to as a "Contractor Default"). The determination of a Contractor Default shall be made solely by the Owner.

When the Surety's obligation under this Bond arises, the Surety, at its sole expense and at the consent and election of the Owner, shall immediately take one of following steps: (1) arrange for the Principal to perform and complete the work of the Construction Contract; (2) arrange for a contractor other than the Principal to perform and complete the work of the Construction Contract; (3) reimburse the Owner, in a manner and at such time as the Owner shall decide, for all costs and expenses incurred by the Owner in performing and completing the work of the Construction Contract.

If the Surety does not proceed as provided in this Bond with due diligence and all deliberate speed, the Surety shall be deemed to be in default of this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner.

After the Surety's obligation under this Bond arises, the Surety is obligated, to the limit of the amounts of this Bond, for (1) the correction of defective work and completion of the Construction Contract; (2) additional design, professional services, and legal costs, including attorney's fees, resulting from the Contractor Default or from the default of the Surety under this Bond; (3) any additional work beyond the Construction Contract made necessary by the Contractor Default or default of the Surety under this Bond; and (4) liquidated damages as provided in the Construction Contract, or if none are so specified, actual and foreseeable consequential damages resulting from the Contractor Default or default of the Surety under this Bond.

Any proceeding, legal or equitable, under this Bond shall be instituted in any court of competent jurisdiction in the Commonwealth of Massachusetts.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Construction Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Construction Contract or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument is executed in _____ ( ) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 2015

ATTEST:

_____
Principal

_____ By _____
(Principal Secretary)

_____

_____

_____
(Address-Zip Code)

_____ (SEAL)
Witness as to Principal

_____

_____
(Address-Zip Code)

Veterans Memorial Pool-Patton Park
Hamilton, MA

ATTEST:

_____
Surety

_____

_____
(Attorney-In-Fact)

_____
(Address-Zip Code

_____ (SEAL)
Witness as To Surety

_____

_____
(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF DOCUMENT 00 61 13

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DOCUMENT 00 61 13.16 – PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we, the undersigned

_____

_____

a corporation organized under the laws of _____

and having a usual place of business in _____

_____ in the County of _____ and the State of _____

The laws_____ and having a usual place of business in _____in the County of

Massachusetts, as SURETY, are held and firmly bound unto the _____, _____, _____,as

OBLIGEE, in the sum of _____DOLLARS.

($_____) lawful money of the United States of America, for payment of which well and truly to be made, we hereby, jointly and severally, bind ourselves and our respective heirs, executors, administrators, successors and assigns, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated , 2015 , for construction of the _____, _____, _____, which Contract in its entirety, including any Addenda, is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW THEREFORE, the condition of this obligation is such that if the Principal and each Subcontractor shall pay for labor performed or furnished and materials used or employed in such construction, including lumber so employed which is not incorporated therein and is not wholly or necessarily consumed or made so worthless as to lose its identity, but only to the extent of its purchase price less its fair salvage value, and including also any material specially fabricated at the order of the Principal or Subcontractor for use as a component part of said building so as to be unsuitable for use elsewhere, even though such material has not been delivered and incorporated into the building, but only to the extent of its purchase price less its fair salvage value and only to the extent that such specially fabricated material is in conformity with the Contract, Drawings and Specifications or any changes therein duly made; and shall pay transportation charges for materials used or employed therein, which are consigned to the Principal or to a Subcontractor who has a direct contractual relationship with the Principal; and shall pay any sums due for the rental or hire of vehicles, steam shovels, rollers propelled by steam or other power, concrete mixers, tools, and other appliances and equipment employed in such construction; and shall pay transportation charges directly related to such rental or hire; and shall pay any sums due trustees or other persons authorized to collect such payments from the Principal or Subcontractors, based upon the labor performed or furnished as aforesaid for health and welfare plans, supplementary unemployment benefit plans, and other fringe benefits which are payable in cash and provided for in collective bargaining agreements between organized labor and the Principal or Subcontractors, all in accordance with the provisions of the General Laws, Chapter 149, Section 29, and other sections of said Chapter and all acts amendatory thereof or supplementary thereto (this bond being in compliance with the requirements of said Chapter to furnish security thereunder), then this obligation shall be null and void: otherwise, it shall remain in full force and effect. \

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the Drawings and Specifications accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Drawings and Specifications.

IN WITNESS WHEREOF, the Principal and the 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 or agents, this

_____Day of _____, 2015.

ATTEST:

_____
Principal

By _____

_____

_____
Title

SEAL

_____
(Surety)

By:_____ SEAL_____
Attorney in Fact

END OF DOCUMENT 00 61 13.13

AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

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

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

THE OWNER:
(Name and address)

THE ARCHITECT:
(Name and address)

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

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

§ 1.1.2 THE CONTRACT

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

§ 1.1.3 THE WORK

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

§ 1.1.4 THE PROJECT

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

§ 1.1.5 THE DRAWINGS

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

§ 1.1.6 THE SPECIFICATIONS

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

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

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

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

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

§ 1.3 CAPITALIZATION

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

§ 1.4 INTERPRETATION

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

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

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

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

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

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

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

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

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

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

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

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

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

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

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

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

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§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

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

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

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

§ 3.4 LABOR AND MATERIALS

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

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

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

§ 3.5 WARRANTY

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

§ 3.6 TAXES

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

§ 3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

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

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,

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but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

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

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

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

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

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

Sample

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§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

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

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

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

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

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

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled

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to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

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

§ 3.15 CLEANING UP

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

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

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

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

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

§ 3.18 INDEMNIFICATION

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

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other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

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

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

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate For Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

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

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the

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Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

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

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

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

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

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

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

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

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

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

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

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

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

§ 5.3 SUBCONTRACTUAL RELATIONS

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

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

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

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

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

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

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

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

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

§ 6.2 MUTUAL RESPONSIBILITY

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

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

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

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

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

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§ 6.3 OWNER'S RIGHT TO CLEAN UP

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

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

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

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

§ 7.2 CHANGE ORDERS

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

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

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

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

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

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.7.

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

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

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

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§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

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

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

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

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

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

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

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

§ 8.2 PROGRESS AND COMPLETION

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

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be

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furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

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

§ 8.3 DELAYS AND EXTENSIONS OF TIME

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

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

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

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2., for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

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

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

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the

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Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

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

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

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

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

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

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

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

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

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§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

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

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

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

§ 9.7 FAILURE OF PAYMENT

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

§ 9.8 SUBSTANTIAL COMPLETION

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

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

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

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

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

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

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

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

§ 10.2 SAFETY OF PERSONS AND PROPERTY

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

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

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

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

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

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

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

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

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

§ 10.3 HAZARDOUS MATERIALS
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

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

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

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

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

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§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

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

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

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the Final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's Consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

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

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's

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risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

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

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

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

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

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

§ 11.3.2 BOILER AND MACHINERY INSURANCE

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

§ 11.3.3 LOSS OF USE INSURANCE

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

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

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

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§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

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

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

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

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

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

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

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

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

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

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

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

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

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

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

Sample

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ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

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

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

§ 13.3 WRITTEN NOTICE

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

§ 13.4 RIGHTS AND REMEDIES

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

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

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

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

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

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

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

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

§ 13.6 INTEREST

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

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

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

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

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

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

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

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

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

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

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

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

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

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

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

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

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

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker.

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Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

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

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

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

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

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

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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

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

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§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

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

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

Sample

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

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

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

Sample

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DOCUMENT 00 83 00- SUPPLEMENTARY GENERAL CONDITIONS

The provisions of this document, the Supplementary General Conditions, modify, delete or add to the "General Conditions of the Contract for Construction," AIA Document A201-2007, published by the American Institute of Architects, Articles 1 through 15 inclusive (the "General Conditions"). Provisions of the General Conditions not expressly modified or deleted by the terms hereof shall remain in effect.

Sections or Subsections contained in these Supplementary General Conditions and marked with an asterisk (*) are required by or are intended to be consistent with the requirements of Massachusetts statutes governing construction contracts awarded by public agencies in the Commonwealth of Massachusetts (sometimes referred to in the Contract Documents as the "Commonwealth"). Such provisions containing statutory references are intended to be consistent with the statutes referenced, and any deviations or inconsistencies between the provisions contained herein and the referenced statutes are unintentional; in all cases the actual statutory provisions shall be controlling. Any additional provisions required by law or regulation to be included in this Contract shall be deemed to be so included. In addition, the Owner and the Contractor recognize that other rights, duties and obligations relating to public construction contracts are provided for by law or regulation, but may not be expressly included or referred to in the Contract Documents. In case of conflict between the asterisked provisions and other provisions of the Contract Documents, the asterisked provisions shall govern. In case of conflict between the provisions of the Contract Documents and the provisions of any applicable law or regulation, the provisions of such law or regulation shall govern. Where the term "awarding authority" appears in any asterisked provision, it shall mean the Owner.

ARTICLE 1 GENERAL PROVISIONS

1.1.1 Delete the last sentence and substitute the following: "The Contract Documents include bidding documents such a Advertisement and Invitation to Bid, Instructions to Bidders, sample forms, the Contractor's Bid and portions of addenda relating to any of these or any other documents.

1.1.2 Insert the following at the end of clause (1) in the fourth sentence of Subsection 1.1.2: "(except as provided in Section 3.18)"; insert the following at the end of clause (2): "(except as provided in Section 5.4)"; insert the words "of the Contractor" after the word "obligations" in the fifth sentence of Subsection 1.1.2. Add the following at the end of Subsection 1.1.2:

The Contractor understands that the Architect's obligations under its agreement with the Owner are solely for the benefit of the Owner, and that in performing such obligations the Architect may consequently increase the burdens and expense of the Contractor, Subcontractors or material suppliers.

1.1.3 Insert the following at the end of the first sentence of Subsection 1.1.3: ", including the Contractor's obligations during the correction period provided for in Section 12.2."

1.2.1 Insert the following before the semicolon in the second sentence of Subsection 1.2.1: "(for example, any item indicated in the Specifications which is omitted from the Drawings or vice versa shall be construed as though contained in both)". Add the following at the end of Subsection 1.2.1:

All Work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such

Work is to be done by others. In the event of any conflict, discrepancy or ambiguity among the Contract Documents, the documents shall be construed according to the following priorities:

Highest Priority:	Modifications - later date to take precedence
Second Priority:	Agreement
Third Priority:	Addenda – later date to take precedence
Fourth Priority:	Supplementary General Conditions
Fifth Priority:	General Conditions
Sixth Priority:	General Requirements - Division 1
Seventh Priority:	Drawings and Specifications

Among Drawings, large scale details shall control over small scale details, and figured dimensions shall control over Drawings not dimensioned. In the event of conflicts, discrepancies or ambiguities between the Drawings and the Specifications, or within either the Drawings or the Specifications, the Contractor shall provide the better quality or greater quantity of Work, or comply with the more stringent requirement, as applicable, unless otherwise directed by a Modification.

1.2.2 Add the following at the end of Subsection 1.2.2:

", except as provided by law. The Contractor shall refer to all of the Drawings and to all of the Sections of the Specifications, and shall perform all Work reasonably inferable therefrom as being necessary to produce the indicated results."

1.2.4-
1.2.10 Add new Subsections 1.2.4 through 1.2.12 as follows:

1.2.4 All indications or notations which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Contract Documents.

1.2.5 Where codes, standards, requirements and publications of public and private bodies are referred to in the Specifications, references shall be understood to be to the latest revision prior to the date of receiving bids, except where otherwise indicated.

1.2.6 Where no explicit quality or standards for materials or workmanship are established for Work, such Work is to be of good quality for the intended use and consistent with the quality of the surrounding Work and of the construction of the Project generally.

1.2.7 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.

1.2.8 The Mechanical, Electrical and Fire Protection Drawings are diagrammatic only, and are not intended to show the exact alignment, physical locations or configurations of such Work. Such Work shall be installed without additional cost to the Owner so as to avoid conflicts, provide clear access to all control devices, clear all obstructions, permit adequate clearances for the Work of other trades and for proper operation and maintenance, and present an orderly appearance where exposed. Prior to beginning such Work, the Contractor shall prepare coordination drawings showing the exact alignment, physical location and configuration of the Mechanical, Electrical and Fire Protection installations and demonstrating to the Owner's and the Architect's satisfaction that the installations will comply with the preceding sentence. The Contractor shall be solely liable and responsible for any costs and/or delays resulting from the Contractor's failure to prepare such coordination drawings on a timely basis.

1.2.9 Exact locations of fixtures and outlets shall be obtained from the Architect as provided in Section 3.2 before the Work is roughed in; Work installed without such information from the Architect shall be relocated at the Contractor's expense.

1.2.10 Where the Work is to fit with existing conditions or work to be performed by others, the Contractor shall fully and completely join the Work with such conditions or work, unless otherwise specified.

1.2.11 Test boring or soil test information included with the Contract Documents or otherwise made available to the Contractor was obtained by the Owner for use by the Architect in the design of the Project or Work. The Owner does not hold out such information to the Contractor as an accurate or approximate indication of subsurface conditions, and no claim for extra cost or extension of time resulting from reliance by the Contractor on such information shall be allowed except as provided in Subsection 3.7.4.

1.2.12 The Contract is subject to, and shall be performed in accordance with, all laws, statutes, regulations, codes, ordinances, rules and orders of the United States of America, the Commonwealth of Massachusetts, the Town of Lexington, and other governmental or public agencies and authorities, and all amendments thereto, (collectively, "laws and regulations") and any agreements between the Owner and any such governmental or public agencies and authorities, and other agreements or commitments, if any, referred to or incorporated in the Contract Documents, and where any provisions contained in the Contract Documents do not conform to or are inconsistent with such laws and regulations or agreements to which the Contract is subject or by which it is governed, such laws and regulations or agreements shall have precedence over any matters set forth in the Contract Documents.

1.5.1 In Subsection 1.5.1,add to the end of the first sentence: ", subject to the rights reserved by the Owner in its agreement with the Architect.".

ARTICLE 2 OWNER

2.1.1 Delete the fourth sentence of Subsection 2.1.1.

2.1.2 Delete Subsection 2.1.2.

2.2.1 Delete Subsection 2.2.1.

2.2.3 Delete the second sentence of Subsection 2.2.3.

2.2.4 Change Subsection 2.2.4 to read as follows:

2.2.4 Information or services required of the Owner hereunder shall be furnished by the Owner with reasonable promptness after receipt from the Contractor of a written request for such information or services.

2.2.5 Delete Subsection 2.2.5 and substitute the following: The Contractor will be furnished free of charge up to two (2) copies of Drawings and the Project Manuals by the Owner. Additional copies will be furnished at the cost of reproduction, postage and handling.

2.3. Add the following to the end of Subsection 2.3: The Owner shall have the authority to clean up or correct any situation which presents a hazard or unsafe condition or affects the Owner's use of the facility, without any notice requirements to the Contractor. The cost of the Owner's correction of any unsafe condition caused by an act or omission of the Contractor or Subcontractor shall be deducted from the Contract Amount.

2.4.1 In the third sentence of Subsection 2.4.1, insert the words "or Construction Change Directive" after the words "Change Order," and delete the fourth sentence of Subsection 2.4.1.

ARTICLE 3 CONTRACTOR

3.2.1 Delete Subsection 3.2.1 and substitute the following:

3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has examined and understands all of the Contract Documents, visited the site, and become familiar with local conditions under which the Work is to be performed, verified to its satisfaction the nature and quality of the Work involved, and correlated personal observations with requirements of the Contract Documents. The Contract shall be executed in three complete sets, one of the signed sets shall be deposited with the Architect by the Owner.

3.2.2 In Subsection 3.2.2, insert the words "and in their relation to the Work as a whole" after the words "portion of the Work" in line two. Add the following at the end of Subsection 3.2.2:

Nothing in this subsection shall relieve the Contractor from its obligation to construct the Project in compliance with all applicable building codes and regulations. If the Contractor proceeds with the Work without such notice to the Architect, having discovered any such errors, inconsistencies or omissions, or if by reasonable study of the Contract Documents the Contractor could have discovered such, the Contractor shall bear all costs of correction and other costs arising therefrom.

3.2.4 Add the following at the end of Subsection 3.2.4: "or unless the Contractor failed to perform the obligations of Subsections 3.2.2 and 3.2.3 and would reasonably have discovered such error, inconsistency, omission, nonconformance or difference had the Contractor properly performed such obligations."

3.2.5-
3.2.6 Add new Subsections 3.2.5 and 3.2.6 as follows:

3.2.4 The Contractor shall give the Architect timely notice of any additional Drawings, Specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work.

3.2.5 The Contractor shall not proceed with any Work not clearly and consistently defined in detail in the Contract Documents, but shall request additional drawings or instructions from the Architect as provided in Subsection 3.2.3. If the Contractor proceeds with such Work without obtaining further Drawings, Specifications or instructions, the Contractor shall correct Work incorrectly done at the Contractor's own expense.

3.3.1 Delete the last eleven words of the second sentence, and sentences three, four and five of Subsection 3.3.1, and insert the following in place thereof:

Where the Contract Documents refer to particular construction means, methods, techniques, sequences or procedures or indicate or imply that such are to be used in the Work, such reference is intended only to indicate that the operations of the Contractor shall be such as to produce at least the quality of work implied by the operations described, but the actual determination of whether or not the described operations may be safely and suitably employed on the Work shall be the responsibility of the Contractor, who shall notify the Architect in writing of the actual means, methods, techniques, sequences or procedures which will be employed on the Work, if these differ from those referred to in the Contract Documents. All loss, damage, or liability, or cost of correcting defective work arising from the employment of any construction means, methods, techniques, sequences or procedures shall be borne by the Contractor, notwithstanding that such construction means, methods, techniques, sequences or procedures are referred to, indicated or implied by the Contract Documents, unless the Contractor has given timely notice to the Owner and Architect in writing that such means, methods, techniques, sequences or procedures are not safe or suitable, and the Owner has then instructed the Contractor in writing to proceed at the Owner's risk.

3.3.2 Delete Subsection 3.3.2 and substitute the following:

3.3.2 The Contractor shall be responsible to the Owner for the acts and omissions of all entities or persons performing or supplying the Work.

3.3.4-
3.3.5 Add new Subsections 3.3.4 and 3.3.5 as follows:

3.3.4 The Contractor shall arrange for and attend job meetings with the Architect and such other persons as the Owner or the Architect may from time to time wish to have present. Job meetings shall be held at the site unless otherwise agreed by all parties and the schedule for job meetings shall be subject to the Owner's approval. If requested by the Owner, the Contractor shall prepare and circulate minutes of job meetings in a form acceptable to the Owner (or, at the Owner's election, meeting minutes will be prepared by the Architect). The Contractor shall be represented at such meetings by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor's own project superintendent. An authorized representative of any Subcontractor or Sub-subcontractor shall attend such meetings if requested by the Owner or the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives.

3.3.5 The Contractor shall be responsible for properly laying out the Work, and for all lines, elevations and measurements for all of the Work subject, however, to the Owner's obligations under Subsection 2.2.3. Without limitation, the Contractor shall establish the building grades, lines, levels, column, wall and partition lines required by the various Subcontractors in laying out their Work. The Contractor shall verify the figures shown on the Drawings before laying out the Work and will be responsible for any errors or inaccuracies resulting from its failure to do so. If the Contractor, while laying out the Work, becomes aware of any conflicts between the Drawings or Specifications and the actual layout of the Work, or any conflicts or inconsistencies in the Drawings and Specifications themselves, the Contractor shall promptly notify the Architect and the Owner, without whose instructions the Contractor shall not adjust the matter except at its own risk.

3.4.1 Add the following at the end of Subsection 3.4.1:

The word "provide" shall mean furnish and install complete, including connections, unless otherwise specified. The Contractor shall furnish labor that can and will work in harmony with all other elements of labor employed or to be employed on the Project. The Contractor warrants that its financial condition is sound and that the Contractor is capable of obtaining any bonds or increase in bond amounts now or hereafter required pursuant to the Contract Documents. The Contractor shall promptly advise the Owner of any occurrence, event, fact, or other matter that has had, will have, or might reasonably be predicted to have a material adverse effect upon the financial condition of the Contractor or its ability to properly perform the Contract. Directions, specifications and recommendations by manufacturers for installation, handling, sorting, adjustment and operation of their materials or equipment shall be complied with; but the Contractor shall nonetheless have the responsibility of determining whether such directions, specifications and recommendations may safely and suitable by employed in the Work, and of notifying the Owner in advance, in writing, of any deviation or modification necessary for installation safety or proper operation of the item.

3.4.4-
3.4.11 Add new Subsections 3.4.4, 3.4.5, 3.4.6, 3.4.7, 3.4.8, 3.4.9, 3.4.10, and 3.4.11 as follows:

***3.4.4** (Statutory reference: M.G.L. c.149, §§ 30 and 34) No laborer, worker, mechanic, foreman or inspector working within this Commonwealth in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency.

***3.4.5** (Statutory reference: M.G.L. c.149 §25) Every employee under this contract shall lodge, board and trade where and with whom he elects, and neither the Contractor nor his agents or employees shall, either directly or indirectly, require as a condition of the employment of any person that the employee shall lodge, board or trade at a particular place or with a particular person.

***3.4.6** (Statutory reference: M.G.L. c.149 §34B) The Contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wage paid to regular police officers in such city or town.

***3.4.7** (Statutory reference: M.G.L. c.149, §26-27H) It is the obligation of the Contractor to assure that the Contractor and all of its subcontractors comply with the requirements of the Massachusetts Prevailing Wage Law, MGL c. 149 §26-27H. The Contractor shall be responsible for all loss, cost and damage suffered or incurred by the Owner as a result of any stop work order or other enforcement action taken by the Attorney General under the authority of MGL c.149 §27, and shall release, indemnify, hold harmless and defend the Owner, the Architect, their officers, employees and consultants, from and against all claims, actions, suits, fines, or administrative proceedings arising out of or related to the violation by the Contractor or any subcontractor of the said Prevailing Wage Law (or, in the case of the Contractor's defense obligation, the claimed violation thereof). Unless otherwise expressly provided in the Contract Documents, all payroll records required to be submitted to the Owner shall be delivered to a designated employee of the Owner, and not to the Architect.

3.4.8 The Contractor is solely responsible for the proper and safe operation and maintenance of all utility systems within the construction limits, whether these are supplied by the Owner's distribution system or otherwise, until the Work is accepted by the Owner, and until the Owner has notified the Contractor that other arrangements have been made. The Contractor shall maintain and operate appurtenances within the construction area, which serve the distribution system, subject to periodic inspection by the Owner's operating personnel. Inspection by any representative or personnel of the Owner shall not relieve the Contractor or responsibilities in connection with operation and maintenance of these facilities and equipment. The Contractor shall notify the Owner's representatives at least 72 hours in advance of the desire to extend, connect, disconnect, turn on or off any steam, electric, water or other service from the authorized representatives of the Owner. All plumbing, heating, and electrical work, including installation of equipment and any other work to be performed by the Contractor, shall be carried out w9ithout interference with the Owner's normal operation. Where any work requires interruption of any service, the Contractor shall make advance arrangements with the Owner for dealing with such interruption.

3.4.9 The Owner will supply to the Contractor all water and electricity reasonably required for all construction requirements. Utilities furnished by the Owner will be discontinued if, in the opinion of the Owner, they are wastefully used. In such event, the Contractor shall supply thereafter all water and electricity required to complete the Work. The Contractor shall supply all hoses, extension cords and other tools necessary for the proper installation of the Work.

3.4.10 Adequate toilet facilities for use during construction will be supplied by the Owner. The Contractor shall leave sanitary facilities as clean as they were at the start of the Work.

3.4.11 The Contractor shall be responsible for materials which are removed from the Work or from the site, including the Owner's property, which are to be built back into the Work at a later time. The costs of damage to or loss of such materials while removed from the Work or the Owner's property shall be borne by the Contractor.

3.5. Add number 3.5.1 to the beginning of the text of Section 3.5.

3.5.2-
3.5.12 Add new Subsections 3.5.2 through 3.5.12 as follows:

3.5.2 All special guarantees and warranties shall commence as of the date of Substantial Completion of the Work, except that warranties for punch list items shall commence when such

items have been completed. All Subcontractor's, supplier's and manufacturer's warranties required under the Contract Documents shall be deemed furnished and assigned to the Owner pursuant to this Contract without further action by the Contractor. All such guarantees and warranties shall extend for the period of time provided therein. Copies of all such warranties shall be submitted to the Owner through the Architect prior to final payment

3.5.3 The Contractor shall be responsible for determining that all materials and equipment furnished for the Work meet all requirements of the Contract Documents. The Architect may require the Contractor to produce reasonable evidence that a material or item of equipment meets such requirements, such as certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Architect, would lead to a reasonable certainty that such material or equipment used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense. This provision shall not require the Contractor to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed by the Contractor.

***3.5.4** (Statutory reference: M.G.L. c.30 §39M(b)) Where products or materials are described by manufacturer name, trade name or catalog reference, the words "or approved equal" shall be understood to follow. An item shall be considered equal to the item so named or described if, in the opinion of the Architect:

a. it is at least equal in quality, durability, appearance, strength and design;

b. it performs at least equally the function imposed by the general design for the work; and

c. it conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the specifications.

3.5.5 In all cases in which a manufacturer's name, trade name or other proprietary designation is used in connection with materials, equipment or other items to be furnished under this Contract, whether or not the phrase "or equal" is used after such name(s), the Contractor shall furnish the product of the named manufacturer(s) without substitution, unless a written request for substitution has been submitted by the Contractor and approved in writing by the Architect as provided in this Section 3.5.

3.5.6 If the Contractor proposes to use a material or item of equipment which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the material or item of equipment is submitted for approval, and shall request written approval of the deviation from the requirements of the Contract Documents.

3.5.7 By making requests for substitutions, the Contractor:

.1 represents that it has personally investigated the proposed substitute product and determined that it meets the conditions specified in Subsection 3.5.4;

.2 represents that it will provide the same warranties and guarantees for the substitute product that it would for that specified;

.3 certifies that all cost data presented with respect to the proposed substitution are accurate and complete and include all related (direct and indirect) costs under the Contract, and waives all claims for additional costs related to the substitution that subsequently become apparent; and

.4 will coordinate the installation of the substitute, if approved, making such changes as may be required for the Work to be complete in all respects.

In requesting approval of deviations or substitutions, the Contractor shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or deviation will meet the conditions set forth in Subsection 3.5.4. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.

3.5.8 The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building including visible items of mechanical and electrical equipment have been selected to have a coordinated design in relation to the overall appearance of the building. The Architect shall judge the design and appearance of proposed substitutions on the basis of their suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The Architect will not approve as equal to materials or equipment specified proposed substitutions which, in the Architect's opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Project. In order to permit coordinated design of color and finishes the Contractor shall, if required by the Architect, furnish the substituted material in any color, finish, texture, or pattern which would have been available from the manufacturer(s) originally specified, at no additional cost to the Owner.

3.5.9 Any additional cost, or any loss or damage arising from the substitution or proposed substitution of any material, equipment or method for those originally specified shall be borne by the Contractor, including, without limitation, costs of evaluating substitutions whether or not approved, costs of any structural, mechanical or other changes necessary to accommodate substituted materials or equipment, and costs of modifying design documents and other additional design fees, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner or the Architect. If any approved substitution results in a cost savings, the Owner shall be entitled to a credit, reducing the Contract Sum, in an amount equal to the net reduced cost of the substituted material or equipment after taking into account such related costs.

3.5.10 The warranty provided in this Section 3.5 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law.

3.5.11 The Contractor shall procure and deliver to the Architect, no later than the date claimed by the Contractor as the date of Substantial Completion, all warranties required by the Contract Documents. Delivery by the Contractor shall constitute the Contractor's guarantee to the Owner that the warranty will be performed in accordance with its terms and conditions.

3.5.12 No additional charge shall be made by the Contractor for attending meetings at the site to diagnose problems or to instruct the Owner's personnel in the proper operation or maintenance of the Work, or for making initial or seasonal adjustments (not including normal maintenance) of mechanical systems or other Work during the applicable warranty period. The Contractor shall

provide such service promptly upon request from the Owner. In case of emergency, service shall be provided as necessary to avoid loss or damage or to maintain normal use of the premises.

3.6.1 Add the following at the end of Subsection 3.6.1:

However, the Contractor shall not pay, and the Owner shall not reimburse or pay the Contractor for, any sales taxes on building supplies or materials for which an exemption is provided pursuant to M.G.L. c.64H, §6(f).

3.7 Add the following at the end of Subsection 3.7.1:

Such permits and approvals shall include, without limitation, plumbing and electrical inspections, certificates of occupancy upon completion of the Work and permits for temporary occupancy or obstruction of sidewalks, streets or other public ways. Fees for local permits and inspections will be waived. The Contractor shall not use, occupy or obstruct, nor permit any Subcontractor or any other person performing the Work to use, occupy or obstruct, any lands or areas outside of the legal limits of the site, unless written permission satisfactory to the Owner has been obtained by the Contractor at the Contractor's sole cost. The Contractor shall arrange for and provide at its expense all local policemen required to be present at or adjacent to the site for traffic control or other purposes.

Delete Subsections 3.7.3, 3.7.4 and 3.7.5 and substitute the following:

***3.7.3** (statutory reference: M.G.L. c.30 §39N) If, during the progress of the work, the Contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the Contract Documents, either the Contractor or the awarding authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a Contractor, or upon its own initiative, the awarding authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the Contract Documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and Contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the awarding authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

3.7.4 The Drawings and Specifications indicate all pipes, conduits, lines or other structures or equipment of public and private utility companies ("utility equipment") at and adjacent to the site of which the Owner is aware. However, the Owner makes no representation or warranty that the utility equipment shown on the Drawings or referred to in the Specifications is the only utility equipment that may be encountered. Prior to commencing work, the Contractor shall visit the site and to the extent possible shall confirm the existence and location of all utility equipment and shall, during the course of the Work, make diligent and continuous efforts to confirm the locations of all utility equipment at and adjacent to the site. The Contractor shall promptly notify the Architect in writing, prior to commencing affected portions of the Work, of any utility equipment that the Contractor discovers and that has not been identified on the Drawings. If and

as directed by the Architect, the Contractor shall make necessary arrangements with utility companies for the protection, alteration or relocation of utility equipment necessary in connection with performance of the Work, and shall notify all municipal departments and utility companies concerned of the time and location of any work which may affect them. The Contractor shall be responsible for all costs and all claims, damages and liabilities arising directly or indirectly from any damage to utility equipment or any intentional or unintentional interruption of service occurring in connection with the Work or other operations of the Contractor.

3.8 Delete Section 3.8.

3.9.1 Delete Subsection 3.9.1 and substitute the following:

The Contractor shall employ a project manager and a superintendent, each of whom shall be subject to the approval of the Owner, and necessary assistants. The Contractor's superintendent shall be in attendance at the Project site full time during the progress of the Work until the date of Substantial Completion, and for such additional time thereafter as the Architect may determine to be necessary for the expeditious completion of the Work. Both the project manager and the superintendent shall have full authority to act on behalf of the Contractor. The Contractor shall not remove the project manager or superintendent unless requested to do so in writing by the Owner. If so requested by the Owner, the Contractor shall promptly replace the project manager or superintendent with a competent person acceptable to the Owner.

3.9.2 Delete Subsection 3.9.2:

3.9.4-3.9.5 Add new Subsections 3.9.4 and 3.9.5 as follows:

3.9.4 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of Work and the storage of materials.

3.9.5 The Contractor shall provide the Owner and the Architect with contact information, including telephone numbers, of the Superintendent and Project Manager, by which they can be contacted at all times, including non-work hours, in the event of emergencies.

3.10.3 Delete Subsection 3.10.3. add substitute the following

3.10.3 The Contractor shall prepare and maintain a construction schedule in accordance with the requirements of Section 01320 of the Specifications. Such schedule is sometimes referred to in the Contract Documents as the Progress Schedule or the Construction Schedule. Unless a different time period is stated in the Specifications, a draft of the schedule shall be submitted to the Architect and the Owner within two weeks after notice to proceed. The schedule shall be based on an orderly progression of the Work, allowing adequate time for each operation (including adequate time for submission and review of submittals), and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The schedule will be reviewed by the Architect for compliance with the requirements of the Specifications and other

applicable provisions of the Contract Documents and will be accepted by the Architect or returned to the Contractor for revision and re-submittal. Without limitation of the provisions contained in Article 9, failure of the Contractor to comply with the requirements of the Specifications concerning the Schedule shall be grounds for withholding of progress payments to the Contractor. The Architect's review of the schedule shall not impose any duty on the Architect or the Owner with respect to the timing, planning, scheduling, or execution of the Work. Without limitation, if the Contractor proposes a schedule indicating a date of Substantial Completion which is earlier than the Contract Time, the Contractor shall not be entitled to additional payment or compensation of any kind if, for any reason, the full Contract Time is required to achieve Substantial Completion of the Work. Acceptance or approval of the schedule by the Architect or the Owner shall not constitute approval of construction means, methods, techniques, sequences or procedures, for which the Contractor shall have sole responsibility.

3.11.1 Add the following at the end of Subsection 3.11.1:

Without limitation, the Contractor shall keep at the site at all times a separate and complete set of blackline prints of the Drawings and Specifications on which shall be noted neatly, accurately and currently, as the Work progresses and in no event less often than monthly: (a) the progress of the Work installed by coloring in all pipe lines, ducts and other apparatus as constructed or installed, and (b) all revisions to the Work, including but not limited to plumbing, electrical, HVAC and architectural work, wherever such Work was installed other than as shown on the Drawings or as described in the Specifications (with approval as required pursuant to the Contract Documents). The Contractor shall be responsible for assuring that the progress of the Work and all revisions are delineated by the specific trades involved on a current basis. The Owner and the Architect shall have access to such as-built Drawings at all times. When final as-built Drawings are found by the Architect to be complete, the Contractor shall furnish to the Architect the record set of Drawings in hard copy reproducible format with each sheet clearly marked "Record Drawing" and dated. In addition, the Contractor shall update the Drawings contained in the Architect's CADD files to reflect all changes during construction of the Work so as to make the CADD Drawings consistent with the Record Drawings. The Architect will make available to the Contractor the electronic CADD files for the Drawings prepared by the Architect for the Project. Delivery by the Contractor of the final as-built Record Drawings, and the CADD Drawings updated to reflect as-built conditions, shall be a condition to final payment, and furnishing of the Record Drawings and CADD Drawings may be carried on the punch list with a scheduled value determined by the Architect.

3.12.6 Delete Subsection 3.12.6 and substitute the following:

3.12.6 By approving and submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor thereby represents that the Contractor has determined and verified all dimensions (including field dimensions), quantities, relationship to existing work, coordination with work to be installed later, coordination with information on previously accepted Shop Drawings, Product Data, Samples, or similar submittals, and verification of compliance with all the requirements of the Contract Documents. The accuracy of all such information is the responsibility of the Contractor. In reviewing Shop Drawings, Product Data, Samples, and similar submittals the Architect shall be entitled to rely upon the Contractor's representation that such information is complete and accurate.

3.13.1 Delete Subsection 3.13.1 and substitute the following:

3.13.1 The right of possession of the site and the improvements made thereon by the Contractor shall remain at all times in the Owner. The Contractor's right to entry and use thereof arises solely from the permission granted by the Owner under the Contract Documents. The Contractor shall confine the Contractor's apparatus, the storage of materials and the operations of the Contractor's workmen to limits indicated by law, ordinances, the Contract Documents and permits and/or directions of the Owner or the Architect, and shall not unreasonably encumber the site with the Contractor's materials or equipment. The site and the building under construction shall, at all times, be maintained in a safe and orderly condition with access and egress ways kept clear. The Owner shall not be liable to the Contractor, any Subcontractors, their employees or anyone else with respect to the conditions of the premises, except only for a condition caused directly and solely by the negligence of the Owner.

Notwithstanding the designation of contract limits or the indication of temporary fences or barricades, the provisions of the Contract Documents governing certain phases or portions of the Work may require that certain operations be carried out beyond such designated limits. Such Work, if required beyond such designated limits, shall be scheduled in such a manner as to cause a minimum of inconvenience or disturbance to or interference with the normal operations of the Owner, abutters and the public. The Contractor shall obtain the Owner's prior approval and all necessary approvals from abutters, public authorities and utility companies for such operations, prosecute such operations expeditiously and restore the affected area to its original condition immediately upon completion of such operations, unless otherwise specified in the Contract Documents. All existing walkways, roadways, paved or landscaped areas disturbed by construction or over which temporary driveways or walkways are rerouted shall be restored to their original condition, immediately upon completion of the related phases or portions of the Work, unless otherwise specified in the Contract Documents.

3.14.2 Add new Subsection 3.14.2 as follows:

3.14.2 The Contractor shall be responsible to install all required sleeves and inserts for any built-in building component. No finished materials or existing structural work shall be cut unless shown on the Contract Documents, without the Architect's approval after submittal of appropriate detail drawings. Cutting and patching of all building elements caused by failure to provide or properly locate sleeves, forms and inserts, incorrect location of Work or failure to cooperate with other trades, shall be completed by the Contractor without additional cost to the Owner. All such installation and repair work shall be carried out by mechanics skilled in the repair trade involved, with due regard to the trade practices and suitable protection of existing work all at no cost to the Owner and subject to the Owner approval.

3.15.1 Add the following at the end of Subsection 3.15.1:

Without limitation, the Contractor shall be responsible for the removal of all crates, cartons and other flammable waste materials or trash from the work areas regardless of cause at the end of each working day or at more frequent intervals if required to maintain the site in a safe and orderly condition. At the completion of the Work, the Contractor shall remove all waste materials and rubbish from and about the site as well as all tools, construction equipment, machinery and surplus materials, and shall leave the site in a neat and clean condition satisfactory to the Owner. Immediately prior to the Architect's inspection for Substantial Completion, the

Contractor shall completely clean the premises. Concrete and ceramic surfaces shall be cleaned and washed. Resilient coverings shall be cleaned, waxed and buffed. Woodwork shall be dusted and cleaned. Sash, fixtures and equipment shall be thoroughly cleaned. Stains, spots, dust, marks and smears shall be removed from all surfaces. Hardware and all metal surfaces shall be cleaned and polished. Glass and plastic surfaces shall be thoroughly cleaned on both sides by professional window cleaners. All damaged, broken or scratched glass or plastic shall be replaced by the Contractor at the Contractor's expense.

3.18.1 Delete Subsection 3.18.1 and substitute the following:

3.18.1 The Contractor shall indemnify, defend with counsel acceptable to the Owner and hold harmless the Owner, the Owner's consultants, the Architect, the Architect's consultants, and agents and employees of any of them (collectively, the "Indemnitees") from and against claims, demands, suits, actions, judgments, damages, losses and other expenses or liabilities (collectively, "Liabilities"), including but not limited to attorneys' fees, arising out of, relating to or resulting from (a) performance of the Work, provided that such Liabilities are attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, and are caused in whole or in part by acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, or (b) any breach or failure of the Contractor to comply with the terms and conditions of the Contract Documents, regardless of whether or not such Liability is caused in part by an Indemnitee. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

3.18.3-
3.18.5 Add Subsections 3.18.3 through 3.18.5 as follows:

3.18.3 Nothing contained herein shall be construed to create a contractual relationship or cause of action between the Architect and the Contractor, except as expressly provided in Subsection 3.18.1 above. The Contractor shall not bring any suit, action or other proceeding in law, equity, or arbitration against the Architect, or the officers or employees of the Architect, for the enforcement of any provisions of this Contract.

3.18.4 With respect to any Liabilities of a type not covered by insurance required to be provided hereunder or otherwise carried by the Owner or the Contractor, the Contractor's indemnity obligation under this Contract shall not extend to any loss or damage to the extent caused by the negligence of an Indemnitee. Accordingly, if any such uninsured Liability involves a claim of comparative or contributory negligence of an Indemnitee, all legal fees and expenses incurred in defending such claim, and any loss or damage determined to be payable as a result of the occurrence giving rise to the Liability (by settlement, judgment or otherwise) shall be apportioned between or among the responsible parties based upon relative degrees of fault, except in the instance of gross negligence or willful misconduct of the Contractor (in which case the Contractor's indemnity shall be absolute and complete and not reduced by the comparative or contributory negligence of an Indemnitee).

3.18.5 If the Contractor has acknowledged its indemnification obligation with respect to a particular claim in accordance with the terms hereof, the Contractor shall assume, at its sole cost and expense, the defense of such claim. Counsel selected for such defense shall be reasonably acceptable to the Indemnitee. The Indemnitee shall be entitled (but not required) to participate in

(but not control) such defense through its own counsel and at its own expense; provided that if the counsel selected by the Contractor advises that, due to actual or potential conflicts, separate counsel should represent the Indemnitee, the expense of such separate counsel shall be an indemnified expense in accordance with the terms hereof. If the Contractor does not acknowledge its indemnification obligation for a particular claim, or does not timely assume the defense thereof, the Indemnitee may defend such claim in such manner as it may deem appropriate. The Contractor shall be responsible for paying the Indemnitees, on a current basis, for all legal fees and expenses incurred by the Indemnitee in defending such claim within thirty (30) days of billing therefor. Notwithstanding its control of a defense, the Contractor shall not (i) make any admission or take any other action that is binding on, or otherwise attributable to any Indemnitee, or (ii) consent to any settlement, entry of judgment, or other disposition, in all instances without the prior written consent of the affected Indemnitee.

ARTICLE 4 ADMINISTRATION OF THE CONTRACT

4.1 Delete Subsections 4.1.1, 4.1.2 and 4.1.3 and substitute the following:

4.1.1 The person variously referred to in the Contract Documents as the Architect or Engineer is one and the same, and is the person or organization identified in the Agreement, and includes his or its authorized representatives.

4.2.1 Delete Subsection 4.2.1 and substitute the following:

4.2.1 The Architect will provide administration of the Contract, as described in the Contract Documents. The Architect will have the authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

4.2.4 Delete the first sentence of Subsection 4.2.4 and substitute the following: "The Owner may communicate with the Contractor directly or through the Architect."

4.2.6 Add to the end of Subsection 4.2.6 the following sentence: “Any such rejection of Work shall not relieve the Contractor of the responsibility for maintaining protection of the Work and the Owner’s property.

4.2.7 In Subsection 4.2.7, in the first sentence delete the word “approve” and substitute therefore the word “comment”; delete the word "limited"; and insert the following at the end of the first sentence: "and only to the extent which the Architect believes desirable to protect the Owner's interest and otherwise as required by the Architect's agreement with the Owner." Delete the second sentence in Subsection 4.2.7 and substitute the following:

The Architect’s action will be taken with reasonable promptness, while allowing sufficient time in the Architect’s professional judgment to permit adequate review, taking into account the time periods set forth in the approved submittal schedule and the latest construction schedule prepared by the Contractor and approved by the Architect and the Specifications.

4.2.8 Delete the second sentence in Subsection 4.2.8.

4.2.10 Add the following at the end of Subsection 4.2.10:

If no such exhibit has been so incorporated, the duties, responsibilities, and limitations of authority of such Project Representative shall be as set forth in the edition of AIA Document B352 current as of the date of the Agreement. Alternatively, the Owner may employ a Clerk of the Works for the Project, in which case the Owner shall, upon request of the Contractor, provide the Contractor with a written statement of the duties, responsibilities and limitations of authority of such Clerk of the Works. Except as expressly set forth in such written statement, the Clerk of the Works shall have no authority to approve Work, to approve changes, or to exercise any of the power and authority of the Owner or the Architect.

4.2.11 Delete Subsection 4.2.11 and substitute the following:

4.2.11 The Architect will, if requested, interpret the requirements of the Contract Documents or evaluate the performance thereunder by the Contractor. The Architect will render, in writing, instructions and other interpretations, clarifications, decisions and approvals necessary for the proper execution and progress of the Work, with reasonable promptness and in accordance with the provisions of Section 15.4. Either party to the Contract may request such interpretations from the Architect by written request to the Architect with a copy thereof given to the other party, or the Architect may initiate such instructions or interpretations. A request for interpretation or additional information concerning the Contract Documents shall be in a form prepared or approved by the Architect and shall include a reasonably detailed written statement that indicates the specific Drawings or Specifications as to which clarification or interpretation is requested, and the nature of the clarification or interpretation requested. The Architect may, as it judges desirable, issue as a part of such instructions or interpretations additional drawings, sketches, or other material indicating in greater detail the construction or design of the various parts of the Work, and provided such drawings or instructions are reasonably consistent with the previously existing Contract Documents, the Work shall be executed in accordance with such additional drawings or instructions without increase in the Contract Sum or extension of the Contract Time. If the Contractor believes that a change in the Work has occurred by reason of the Architect's instructions or other interpretation or decision of the Architect hereunder, the Contractor shall give notice and proceed as provided in Section 15.1.

4.2.12 Delete the second sentence of Subsection 4.2.12.

4.2.13 Delete Subsection 4.2.13 and substitute the following:

4.2.13 Decisions on matters relating to aesthetic effect shall be resolved by the Architect consistently with the intent expressed in the Contract Documents, subject however, to the Owner’s approval.

ARTICLE 5 SUBCONTRACTORS

5.1.2 In Subsection 5.1.2, insert the words "or another Sub-subcontractor" after the word "Subcontractor."

5.2.5 Add new Subsection 5.2.5 as follows:

***5.2.5** The Contractor when sub-contracting with sub-bidders that filed sub-bids pursuant to M.G.L. c. 149 § 44F shall use the form of subcontract set forth in M.G.L. c.149, § 44F. The form of subcontract for non-filed Subcontractors shall be submitted to the Owner for its approval, which shall not be unreasonably withheld or delayed. Each subcontract shall expressly provide

for the contingent assignment referred to in Subsection 5.4.1. The Contractor shall furnish the Owner with copies of executed subcontracts upon request.

5.3.1 Insert the following after the first sentence in Subsection 5.3.1:

Notwithstanding the preceding sentence, the Subcontractor shall not assume toward the Contractor the obligations and agreements which the Contractor assumes toward the Owner pursuant to Section 3.18, but the subcontract shall contain provisions by which the Subcontractor agrees to indemnify the Contractor for the acts and omissions of the Subcontractor, to the maximum extent permitted by applicable law.

5.4.2 Delete Subsection 5.4.2 and substitute the following:

5.4.2 In the event of such assignment and acceptance by the Owner, the Subcontractor shall have no claim against the Owner or any third party assignee of the Owner for work performed by such Subcontractor or other matters arising prior to termination of the Contract, and the Owner or such party assignee, as the case may be, shall be liable only for obligations to the Subcontractor arising after such assignment and assumption.

5.4.3 Delete second sentence of Subsection 5.4.3.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1.4 Delete Subsection 6.1.4.

6.2.4 Add the following at the end of Subsection 6.2.4:

If a separate contractor sues or initiates an arbitration proceeding against the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend such proceedings at the Contractor's expense, and if any judgment or award against the Owner arises therefrom the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court or arbitration costs which the Owner has incurred.

ARTICLE 7 CHANGES IN THE WORK

7.1 Add new Subsections 7.1.4, 7.1.5 and 7.1.6 as follows:

***7.1.4** (Statutory reference: M.G.L. c.30 §39I) The Contractor shall perform all the work required by this Contract in conformity with the plans and specifications contained herein. No willful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations.

7.1.5 Upon request of the Owner or the Architect, the Contractor shall, without cost to the Owner, submit to the Architect and the Owner, in such form as the Architect may require, a "Change Proposal" including a full description of the character and scope of work involved in any proposed extra Work or change in the Work, an accurate written estimate of the cost of such proposed change including all elements of pricing in appropriate detail, and an explanation of the impact of the proposed change on the construction schedule. The cost estimate shall indicate the quantity and unit cost of each item of material or other product and the number of hours of Work

and hourly rate for each class of labor, as well as the description and amounts of all other costs chargeable under the terms of this article. If required by the Architect or the Owner, in order to establish the exact cost of new Work added or of previously required Work deleted, the Contractor shall obtain and furnish to the Architect bona fide proposals (on letterhead) from Subcontractors, Sub-subcontractors or recognized suppliers for furnishing labor and materials included in such Work, including the same supporting information. The Contractor shall promptly revise and resubmit such cost estimate if the Architect or the Owner determines that it is not in compliance with the requirements of this article, or that it contains errors of fact or mathematical errors. Percentage allowances for overhead and profit included in a Change Proposal shall be in accordance with provisions of Subsection 7.3.3. The Contractor shall state in the Change Proposal any extension of the Contract Time that the Contractor believes is necessary if the change or extra Work is ordered or that the Contractor believes it is entitled to for any other reason. If the Contractor claims an extension of the Contract Time, the Contractor shall provide in the Change Proposal a full explanation of the need for a time extension with supporting documentation, including a schedule impact analysis (sometimes referred to as a time impact analysis) in form acceptable to the Owner and the Architect indicating the activities affected and overall impact on the schedule of the proposed change. Requests for substitutions or other changes initiated by Contractor shall be submitted with a Change Proposal in accordance with all of the provisions of this Subsection 7.1.5.

Change Proposals shall be furnished promptly so as to occasion no delay in the Work, and shall be furnished at the Contractor's expense. By submitting a Change Proposal, the Contractor shall be deemed to certify in writing that the Change Proposal includes all Work affected by the change, that the cost estimate indicated in the Change Proposal includes all direct, supplemental, indirect, consequential, serial and cumulative costs and delays, as applicable, and that those costs and delays would be necessarily incurred if the change or extra Work is ordered, despite the Contractor's commercially reasonable and diligent efforts to mitigate them. The Contractor shall cooperate fully with the Owner and the Architect to provide sufficient substantiation and explanation of costs and schedule impacts to allow the Owner and the Architect to reasonably evaluate the Change Proposal.

7.1.6 If the Contractor believes that a change has occurred by reason of any Work performed or materials furnished or by reason of any direction or interpretation by the Owner or the Architect or by reason of any other event, circumstance or occurrence, or if the Contractor wishes to make any other Claim as described in Section 15.1, the Contractor shall submit to the Owner a notice of Claim or Contractor Change Notice as provided in Subsection 15.1.2, and shall thereafter request that a Change Order be issued by submitting to the Owner a "Contractor Change Request". A Contractor Change Request shall be expressly identified as such and shall contain, at a minimum, the information and certifications required to be included in a Change Proposal. Without limitation, a Contractor Change Request must detail the character and scope of the Work involved and provide clear and detailed justification that a change has occurred or that the Contractor is otherwise entitled to an adjustment in the Contract Sum or the Contract Time, and shall include the applicable Contract Document references supporting the Contractor's claim and the efforts taken and to be taken by the Contractor to prevent or minimize costs or schedule extension. All Contractor Change Requests submitted by the Contractor shall provide sufficient detail for the Owner to understand the basis for the adjustment in compensation or schedule extension requested. The Contractor shall furnish, within five (5) days after request from the Owner or the Architect, such further information and details including but not limited to books of account, records and other documents of the Contractor or its Subcontractors or Sub-subcontractors as may be required by the Owner or the Architect to determine the facts or issues

involved in the Contractor Change Request. The Contractor's failure to deliver such information shall be sufficient cause for rejecting any Contractor Change Request. If the Owner fails to notify the Contractor as to the Owner's determination with respect to a Contractor Change Request within thirty (30) days after receipt by the Owner of a full and complete Contractor Change Request as provided herein, such failure shall be deemed to constitute a determination by the Owner that no change has occurred, and such deemed determination shall be effective as of the last day of such thirty-day period. If the Owner rejects (or is deemed to have rejected) a Contractor Change Request in whole or in part and the Contractor disputes such rejection, such dispute shall be resolved as provided in Section 15.3. Failure of the Contractor to comply strictly with the notice requirements and time periods set forth in Section 15.1 and this Section 7.1 shall be conclusively deemed to constitute a waiver by the Contractor of any Claim or any other right to an adjustment in the Contract Sum or the Contract Time with respect to any Work or any other occurrence, event or circumstance which is the subject of a Contractor Change Request, Change Proposal or other Claim of the Contractor.

7.2.2 Add new Subsection 7.2.2 as follows:

7.2.2 A Change Order duly executed by the Owner, the Architect and the Contractor provides for an all-inclusive settlement for all changes and all direct, supplemental, indirect, consequential and cumulative costs and delays associated in any way therewith, and the Contractor's signature represents a waiver of any and all rights to make any claim on account of that instrument or the changes reflected therein. By executing the Change Order, the Contractor represents to the Owner that all Subcontractors performing Work under the Change Order have agreed to the terms of the Change Order, and the Contractor assumes full responsibility for, and shall indemnify and hold harmless the Owner with respect to, any claims from Subcontractors in connection with the Change Order or the performance of the Work covered by the Change Order.

7.3.3 Delete Subsection 7.3.3 and substitute the following:

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

(a) By unit prices stated in the Contract Documents or otherwise mutually agreed upon.

(b) By Cost and Percentage estimated by the Contractor as provided in Subsection 7.1.5 and accepted by the Owner; the Contractor’s estimate shall become a fixed price which shall not be changed by any variation in the actual cost of executing the Work covered by the change.

(c) By actual Cost determined after the Work covered by the change is completed, plus Percentage.

(d) By determination by the Architect of the fair value of the Work covered by the change.

7.3.3.1 As used in this Section, “Cost” shall mean the estimated or actual net increase or decrease in cost to the Contractor, Subcontractor, or Sub-subcontractor for performing the work covered by the change, including actual payments for materials, equipment rentals, expendable items, wages and associated taxes and benefits to workers, insurance, bonds and other provable direct costs, but not including any administrative, accounting or expediting costs, or other indirect or overhead costs, or any wages or benefits of the Contractor's job superintendent or other

supervisory or management personnel, or any amount for profit or fee to the Contractor, Subcontractor or Sub-subcontractor.

7.3.3.2 "Percentage" shall mean an allowance calculated as a percentage of Cost to be added to or subtracted from the Contract Sum to cover overhead and profit and all other expenses (including but not limited to the salary and benefits of the Contractor's job superintendent and other supervisory and management personnel) which are not included in the Cost of the work involved in the change, as defined above.

.1 Percentage for extra work performed by a Subcontractor shall be 15% of the actual net increase in the Cost of the work, whether performed by the Subcontractor's own forces or by Sub-subcontractors. In no event shall the aggregate of all Percentage allowances for overhead and profit for Subcontractors and Sub-subcontractors, regardless of tier, exceed 15% of the actual, direct costs for labor, materials and equipment incorporated in the work.

.2 Percentage for the Contractor shall be 15% of any net increase in Cost of work performed by the Contractor's own forces and 5% of any net increase in Cost of work performed for the Contractor by Subcontractors.

.3 In the case of changes that result in a credit to the Owner for work deleted, Percentage for a Subcontractor shall be 10% of any net decrease in the Cost of the work, whether performed by the Subcontractor's own forces or by Sub-subcontractors; and Percentage for the Contractor shall be 10% of any net decrease in Cost of work performed by the Contractor's own forces and 5% of any net decrease in Cost of work performed for the Contractor by Subcontractors.

.4 Related changes may be aggregated into a single Change Order or Construction Change Directive when determined appropriate by the Architect, and in such case Percentage shall be calculated based on the cumulative net increase or decrease in Cost, if any.

.5 For purposes of applying the Percentage allowances described in this Section, costs of insurance, bond premiums and taxes shall be excluded from the Cost of the work.

7.3.3.3 Unit prices stated in the Contract Documents shall, unless otherwise determined by the Owner, be used to determine the adjustments in the Contract Sum as a result of changes in the scope or quantity of work for which unit prices are specified. Such adjustments shall be recorded by Construction Change Directive or Change Order. Unless otherwise stated in the Contract Documents, such unit prices shall be deemed to include a proportionate share of the Contractor's and all Subcontractors' overhead, profit, bonds and insurance, as well as all labor, materials, equipment, delivery and disposal to perform the work item complete, and all other direct or indirect expenses of the Contractor and Subcontractors, as applicable to that class of work, and shall be the exact amount per unit to be paid to the Contractor in the case of increases in the quantity of work, or refunded to the Owner in the case of decreases. Notwithstanding the inclusion of unit prices in the Contract Documents, it shall be the Owner's option to require the adjustment of the Contract Sum on account of a change in work covered by Unit Prices to be determined by one of the other methods stated in this Subsection 7.3.3. If the Owner elects to determine the adjustment based on unit prices and the nature of the work is such that its extent cannot readily be measured after the completion of such work or any subsequent work, the Contractor shall keep daily records, available at all times to the Architect for inspection, of the

actual quantities of such work put in place, and delivery receipts or other adequate evidence, acceptable to the Architect, indicating the quantities of materials delivered to the site for use in such unit price work, and distinguishing such from other similar material delivered for use in work included in the base Contract Sum. If so required by the Architect, materials for use in unit price work shall be stored apart from all other materials on the Project.

7.3.3.4 If the Owner elects to determine the adjustment to the Contract Sum as provided in clauses (c) or (d) of Subsection 7.3.3 above, or if the method of determining the adjustment has not been established before the work is begun, the Contractor shall keep detailed daily records of labor and materials costs applicable to the work, which shall be delivered to the Owner's site representative.

7.3.4 Delete Subsection 7.3.4.

7.3.5 In Subsection 7.3.5, insert the words “and the Owner” after the word “Architect” in the second line, and in the last line delete the words “Contract Sum or”.

7.3.7-
7.3.10 Delete Subsections 7.3.7, 7.3.8, 7.3.9 and 7.3.10.

7.5 Add new Section 7.5 as follows:

***7.5 CERTIFICATE OF APPROPRIATIONS**

***7.5.1** (Statutory reference: M.G.L. c.44 §31C) This contract shall not be deemed to have been made until the auditor or accountant or other officer of the city or town having similar duties has certified thereon that an appropriation in the amount of this contract is available therefor and that an officer or agent of the city, town, or awarding authority has been authorized to execute said contract and approve all requisitions and change orders. No order to the Contractor for a change in or addition to the work, whether in the form of a drawing, plan, detail or any other written instruction, unless it is an order which the Contractor is willing to perform without any increase in the contract price, shall be deemed to be given until the auditor or accountant, or other officer of the awarding authority having similar duties, has certified thereon that an appropriation in the amount of such order is available therefore; but such certificate shall not be construed as an admission by the awarding authority of its liability to pay for such work. The certificate of the auditor or accountant or other officer of the awarding authority having similar duties, that an appropriation in the amount of this contract or in the amount of such order is available shall bar any defense by the awarding authority on the grounds of insufficient appropriation.

ARTICLE 8 TIME

8.1.3 In Subsection 8.1.3, insert the words "and approved by the Owner" after the word "Architect".

8.2.2 Delete Subsection 8.2.2.

8.2.5-
8.2.7 Add new Subsections 8.2.5 through 8.2.7 as follows:

8.2.5 The Contractor shall at all times provide adequate rates of progress for the various parts of the Work so as to properly advance the Work and so that the Project, in the opinion of the

Architect and the Owner, at all times meets the requirements of the schedule. Whenever construction activities fall behind the planned schedule of construction as shown on the schedule, the Contractor shall notify the Owner and the Architect and advise the Owner of action being taken to return the Work to the planned schedule or to revise the schedule as necessary to maintain the Substantial Completion Date, and such action shall be indicated on the schedule which shall then be re-submitted by the Contractor to the Architect and the Owner for approval.

8.2.6 Without limitation of the provisions of Subsection 8.2.5, it is agreed that in view of the critical nature of the time for completion of the Work, if the Owner determines that the progress of the Work has been materially delayed, or that the schedule is in jeopardy of not being met, the Owner shall have the right to require the Contractor to take whatever steps are necessary to recover all or a portion of such delay. If and to the extent such delay is caused by any act or omission of the Owner or the Architect and is beyond the control of the Contractor, the costs of such recovery shall be borne by the Owner; in all other cases the costs associated with such recovery shall be borne by the Contractor, and the activities required to effect such recovery shall not be deemed to be a Change in the Work and there shall be no increase in the Contract Sum on account of such recovery activities. The Contractor shall, within three days after the Owner's request to take such action, notify the Owner and the Architect in writing, and commence implementing the steps the Contractor proposes to take to effect such recovery, and provide the Owner, in a form acceptable to the Owner, a detailed recovery schedule setting forth the actions to be taken by the Contractor. If the Contractor disputes any direction given by the Owner pursuant to this Section, it shall have no right to refuse to accelerate the Work, but the Contractor shall have the right to make a Claim for additional costs in accordance with the provisions of the Contract Documents.

8.2.7 Nothing herein shall limit the Owner's right to liquidated or other damages for delays by the Contractor or to any other remedy which the Owner may possess under other provisions of the Contract Documents or by law.

8.3.1 In Subsection 8.3.1, change "other causes beyond the Contractor's control" to read "other causes (except weather) beyond the Contractor's control"; delete "'or delay authorized by the Owner pending mediation and arbitration;" and delete the last nineteen words in Subsection 8.3.1 commencing with the words "then the Contract Time shall be extended . . ." and insert the following in substitution therefor:

"and provided that the Contractor has given timely notice of such delay in accordance with Section 15.1, then the Contract Time shall be extended by Change Order or Construction Change Directive for the period of delay so caused, net of any delay caused by or attributable to the acts or omissions of the Contractor, any Subcontractor or others for whom they are responsible, and subject to the provisions of Section 15.1."

8.3.3-
8.3.5 Delete Subsection 8.3.3 and insert new Subsection 8.3.3 and Subsections 8.3.4 and 8.3.5 as follows:

8.3.3 No claim for extension of time shall be allowed on account of failure of the Architect to furnish Drawings, Specifications or instructions or to return Shop Drawings or Samples until 15 days after receipt by the Architect of written demand for such instructions, Drawings, or Samples, and not then unless such claim be reasonable.

8.3.4 The Contractor shall consider in its planning and scheduling of the Work the wide range of weather conditions historically experienced in the area where the Project is located. No extension of the Contract Time shall be granted because of delays or temporary inability to perform work as a result of high or low temperatures, humidity or precipitation, which conditions shall be solely at the risk of the Contractor, whether occurring within the time originally scheduled for completion or within the period of any extension granted. There shall be no increase in the Contract Sum on account of any additional costs of operations or conditions resulting from weather conditions.

8.3.5 The Contractor hereby agrees that the Contractor shall have no claim for increase in the Contract Sum or additional direct or indirect costs or damages of any kind against the Owner or the Architect on account of any delay in the commencement of the Work and/or any hindrance, delay or suspension of any portion of the Work, whether such delay is caused by the Owner, the Architect, or otherwise, except to the extent expressly provided under M.G.L. c.30, § 390. The Contractor acknowledges that the Contractor's sole remedy for any such hindrance, delay or suspension will be an extension of time as provided in this Article, except as provided in Section 14.3 (M.G.L. c.30, § 390) in the case of certain written orders by the Owner.

ARTICLE 9 PAYMENTS AND COMPLETION

9.2.1 Add at the end of Subsection 9.2.1:

The Schedule of values shall be revised if found at any time to be inaccurate. Changes to the Schedule of values require the Owner's approval.

9.3.1 Delete the first twelve words of the first sentence of Subsection 9.3.1 and substitute the following: "At the time or times established in the Agreement." After the first sentence of Subsection 9.3.1, add the following: "The format and number of copies of such Applications for Payment shall be as directed by the Architect. Applications for Payment are sometimes referred to in the Contract Documents as "periodic estimates."

9.3.1.1 In Subsection 9.3.1.1, delete the words "As provided in Subsection 7.3.9" in line 1; delete the words "or by interim determinations of the Architect" in line 3; and add at the end of Subsection 9.3.1.1: "when such Construction Change Directives have set forth an adjustment to the Contract Sum."

9.3.2 Add the following at the end of Subsection 9.3.2:

Where the Owner has approved payment for materials and equipment stored off-site, all costs for storage, insurance, transportation and other costs shall be borne solely by the Contractor. The Contractor shall assume responsibility to protect all such materials from loss or damage at no costs to the Owner, until they are finally incorporated into the Work, whether or not they have been paid for by the Owner. In approving payment for materials and equipment stored off-site, the Owner may require, without limitation, evidence that the off-site location is properly secure, proof of insurance, and segregation and/or marking of stored materials or equipment, and the ability of the Architect or Owners Representative to visit the location of the stored material, at the contractors expense, for verification purposes.

9.3.3 Delete Subsection 9.3.3 and substitute the following:

9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 9 as "liens." The Contractor further agrees that the submission of any Application for Payment shall conclusively be deemed to waive all liens with respect to said Work to which the Contractor may then be entitled, provided that such waiver of lien rights shall not waive the Contractor's right to payment for such Work. Transfer of title to the Owner shall not relieve the Contractor of any of his duties or obligations under the Contract Documents or of any responsibility or liability for the safe delivery and safeguarding, custody, or warehousing of the materials or equipment, nor shall it constitute a waiver of the Owner's right to absolute fulfillment by the Contractor of all of the terms of the Contract, nor shall it commence any warranty period (all warranty periods shall commence not earlier than Substantial Completion).

9.3.4-
9.3.5 Add new Subsections 9.3.4 and 9.3.5 as follows:

9.3.4 Each Application for Payment or periodic estimate requesting payment shall be accompanied by a certificate from each Subcontractor stating that the Subcontractor has been paid all amounts due the Subcontractor on account of previous applications for payment submitted by the Subcontractor, or else stating the amount not so paid and the reason for the discrepancy. In the event of any such discrepancy, the Contractor shall furnish the Contractor's own written explanation to the Owner through the Architect. Such certificate shall be in a form acceptable to the Owner. If requested by the Owner or the Architect, such certificates shall be provided by Sub-subcontractors or suppliers.

9.3.5 On a schedule established by the Architect, generally one week prior to formal submission of each Application for Payment, the Contractor shall submit the Application for Payment in draft form, including all supporting materials, to the Architect and the Owner. The Contractor shall meet with the Architect as necessary to review the draft Application for Payment, and shall supply additional information as requested by the Architect or the Owner so as to substantiate all amounts to be included in the Application for Payment. Upon agreement of the parties, the Contractor shall formally submit the Application for Payment.

9.4.1 In the first line of Subsection 9.4.1, delete the word "sever" and substitute therefor the word "ten".

9.4.2 Add to the end of the last sentence "except as provided in Subsection 9.3.3."

9.5.1 In Subsection 9.5.1, delete the fourth sentence and replace it with the following:

The Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment previously issued, and the Owner (in addition to and without limitation of any other rights and remedies of the Owner under the Contract Documents) may withhold payment of any amounts claimed to be due by the Contractor and certified for payment by the Architect, in each case to such extent as may be necessary in order to provide for retention covering the fair value of any claims the Owner may have against the Contractor or to protect the Owner from loss, cost or damage for which the Contractor is responsible, which amounts may include, but shall not be limited to, the fair value of any claims, costs, losses or damages arising from:

In Subsection 9.5.1, revise item .6 and item .7 and add new item .8 as follows:

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that retainage currently held by the Owner would not be adequate to cover actual or liquidated damage for the anticipated delay;

.7 failure to carry out the Work in accordance with the Contract Documents or other default by the Contractor under, or failure of the Contractor to comply with any provisions of, the Contract Documents; or

.8 failure of the Contractor or mechanical, electrical or other trade Subcontractors to comply with Contract requirements for maintaining record drawings. The Contractor shall check record drawings each month. Written confirmation that the record drawings are current will be required by the Architect before approval of the Contractor's monthly Applications for Payment.

9.5.3 Delete Subsection 9.5.3.

9.6.1 Add new Sub-Subsections 9.6.1.1 through 9.6.1.6, as follows: (Statutory reference: M.G.L. c.30 §39K)

***9.6.1.1** Within fifteen days (30 days in the case of the Commonwealth, including local housing authorities) after receipt from the Contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the Contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or some location agreed upon in writing) to which the Contractor has title or to which a Subcontractor has title and has authorized the Contractor to transfer title to the awarding authority, upon certification by the Contractor that he is the lawful owner and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claims against the Contractor and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of section thirty-nine F [of M.G.L. c. 30], and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five days after (a) the Contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one percent of the original contract price, or (b) the Contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the Contractor the entire balance due on the contract less (1) a retention based on its estimate of the fair value of its claims against the Contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of section thirty-nine F [of M.G.L. c. 30], or based on the record of payments by the Contractor to the Subcontractors under this contract if such record of payment indicates that the Contractor has not paid Subcontractors as provided in section thirty-nine F [of M.G.L. c. 30]. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic

estimate for final payment until fifteen days (twenty-four days in the case of the Commonwealth) after receipt of such periodic estimate from the Contractor, at the place designated by the awarding authority if such a place is so designated. The Contractor agrees to pay to each Subcontractor a portion of any such interest paid in accordance with the amount due each Subcontractor.

***9.6.1.2** The awarding authority may make changes in any periodic estimate submitted by the Contractor, and the payment due on said periodic estimate shall be computed in accordance with the changes so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven days after receipt, return to the Contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter.

***9.6.1.3** All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the Contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in sub-bid form as required by specifications and a column listing the amount paid to each Subcontractor and Sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.

***9.6.1.4** A certificate of the Architect to the effect that the Contractor has fully or substantially completed the work shall, subject to the provisions of M.G.L. c. 30 Section 39J (reproduced in Subsection 15.4.2) be conclusive for the purposes of this Subsection 9.6.1.

***9.6.1.5** Notwithstanding the provisions of this Subsection 9.6.1, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the Contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the Contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The Contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the Contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the Contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the Contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149. The provisions of this Subsection 9.6.1.5 shall not be interpreted to limit or affect in any way the rights and remedies of the Owner or the obligations of the Contractor under the Contract Documents.

9.6.1.6 No certificate for payment by the Architect, nor any progress payment made by the Owner, nor any partial or full use or occupancy of the Work or the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

9.6.2 Add new sub-Subsections 9.6.2.1 through 9.6.2.5, as follows: (Statutory reference: M.G.L. c.30 §39F)

***9.6.2.1** (a) Forthwith after the Contractor receives payment on account of a periodic estimate, the Contractor shall pay to each Subcontractor the amount paid for the labor performed and the materials furnished by that Subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.

(b) Not later than the sixty-fifth day after each Subcontractor substantially completes his work in accordance with the plans and specifications, the entire balance due under the subcontract, less amounts retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the Subcontractor; and the awarding authority shall pay that amount to the Contractor. The Contractor shall forthwith pay to the Subcontractor the full amount received from the awarding authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.

(c) Each payment made by the awarding authority to the Contractor pursuant to Subsections (a) and (b) of this Section for the labor performed and the materials furnished by a Subcontractor shall be made to the Contractor for the account of that Subcontractor; and the awarding authority shall take reasonable steps to compel the Contractor to make each such payment to each such Subcontractor. If the awarding authority has received a demand for direct payment from a Subcontractor for any amount which has already been included in a payment to the Contractor or which is to be included in a payment to the Contractor for payment to the Subcontractor as provided in Subsections (a) and (b), the awarding authority shall act upon the demand as provided in this Subsection 9.6.2.

(d) If, within seventy days after the Subcontractor has substantially completed the subcontract work, the Subcontractor has not received from the Contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the Contractor, less any amount retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the Subcontractor may demand direct payment of that balance from the awarding authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the Contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the Subcontractor has substantially completed the subcontract work. Within ten days after the Subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the Contractor, the Contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the Subcontractor at the same time. The reply shall contains a detailed breakdown of the balance due under the subcontract, including any amount due for extra labor

and materials furnished to the Contractor and of the amount due for each claim made by the Contractor against the Subcontractor.

(e) Within fifteen days after receipt of the demand by the awarding authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the awarding authority shall make direct payment to the Subcontractor of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the Contractor, less any amount (i) retained by the awarding authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the Contractor in the sworn reply; provided that the awarding authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by Subsection (d). The awarding authority shall make further direct payments to the Subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this Subsection.

(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of Subsection (e) in an interest-bearing joint account in the names of the Contractor and the Subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the Contractor and the Subcontractor and shall notify the Contractor and the Subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the Contractor and the Subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to Subsection (f) shall be made out of amounts payable to the Contractor at the time of receipt of a demand for direct payment from a Subcontractor and out of amounts which later become payable to the Contractor and in the order of receipt of such demands from Subcontractors. All direct payments shall discharge the obligation of the awarding authority to the Contractor to the extent of such payment.

(h) The awarding authority shall deduct from payments to a Contractor amounts which, together with the deposits in interest-bearing accounts pursuant to Subsection (f), are sufficient to satisfy all unpaid balances of demands for direct payment received from Subcontractors. All such amounts shall be earmarked for such direct payments, and the Subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the Contractor.

(i) If the Subcontractor does not receive payment as provided in Subsection (a) or if the Contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the Subcontractor and the Subcontractor does not receive payment for same when due less the deductions provided for in Subsection (a), the Subcontractor may demand direct payment by following the procedure in Subsection (d) and the Contractor may file a sworn reply as provided in that same Subsection. A demand made after the first day of the month following that for which the Subcontractor performed or furnished the labor and materials for which the Subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the Contractor. Thereafter the awarding authority shall proceed as provided in Subsections (e), (f), (g) and (h).

***9.6.2.2** Any assignment by a Subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of M.G.L. c.149, section 29 shall be invalid. The

assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the awarding authority or which are on deposit pursuant to Subsection (f) of Subsection 9.6.2.1 shall be subordinate to the rights of all Subcontractors who are entitled to be paid under this section and who have not been paid in full.

***9.6.2.3** "Subcontractor" as used in this Subsection 9.6.2 shall mean a person who files a sub-bid and receives a subcontract as a result of that filed subbid or who is approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the Contractor. "Subcontractor" as used in other provisions of the Contract Documents shall, except as otherwise expressly provided, have the meaning set forth in Subsection 5.1.1.

***9.6.2.4** The Contractor or a Subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in Subsection (f) of Subsection 9.6.2.1 by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A Subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in Subsection (f) of Subsection 9.6.2.1 by a petition in equity in the superior court against the awarding authority and the Contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this Section. M.G.L. c.231, sections 59 and 59B shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to sections 59 and 59B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any Subcontractor with the petition of one or more Subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a Subcontractor filing a demand for direct payment for which no funds due the Contractor are available for direct payment shall have a right to file a petition in a court of equity against the awarding authority claiming a demand for direct payment is premature, and such Subcontractor must file the petition before the awarding authority has made a direct payment to the Subcontractor and has made a deposit of the disputed portion as provided in part (iii) of Subsection (e) and in Subsection (f) of Subsection 9.6.2.1.

***9.6.2.5** In any petition to collect any claim for which a Subcontractor has filed a demand for direct payment the court shall, upon motion of the Contractor, reduce by the amount of any deposit of a disputed amount by the awarding authority as provided in part (iii) of Subsection (e) and in Subsection (f) of Subsection 9.6.2.1 any amount held under a trustee writ or pursuant to a restraining order or injunction.

9.6 Delete Subsections 9.6.3, 9.6.5 and 9.6.7.

9.6.4 Delete the first two sentences of Subsection 9.6.4.

9.7.1 Delete Subsection 9.7.

9.8.1 Add the following at the end of Subsection 9.8.1:

"pursuant to a full and unconditional certificate of occupancy, and only minor items remain which can be corrected or completed without material interference with the Owner's use of the Work for its intended purposes."

9.8.2-
9.8.5 Delete Subsections 9.8.2, 9.8.3, 9.8.4 and 9.8.5, and substitute the following:

9.8.2 When the Contractor considers that the Work, or a portion thereof designated in the Contract Documents for separate completion, is substantially complete as defined in Subsection 9.8.1 and that all tests and start-ups have been performed with a satisfactory outcome and all other requirements and conditions for Substantial Completion specified in the Contract Documents (including the requirements provided in Section 01770, Closeout Procedures, of the Specifications) have been satisfied, the Contractor shall submit to the Architect a request for Substantial Completion inspection, accompanied by (1) a comprehensive list of items to be completed or corrected, (2) all warranties and guarantees required by the Contract Documents, endorsed by the Contractor and in such form and number of copies as specified in the Contract Documents or as reasonably requested by the Architect, and (3) the permits and certificates referred to in Subsection 13.5.4. The Contractor shall continue diligently to complete and correct items on the list. The failure to include any items on the list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Architect on the basis of an inspection determines that the Work or designated portion thereof is substantially complete and all other Contract requirements and conditions for Substantial Completion have been met, the Architect will prepare a Certificate of Substantial Completion which upon the Owner's approval shall establish the date of Substantial Completion. The Certificate of Substantial Completion shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, shall incorporate a list prepared by the Architect of items which require completion or correction, and shall fix the time within which the Contractor shall complete the items on the list, which shall not exceed sixty (60) days. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of the responsibilities assigned to them in such Certificate. The Owner shall make payment to the Contractor in accordance with the provisions of Section 9.6.

9.8.3 If, through no fault of the Architect, the Architect (including its Subconsultants) is required to conduct more than two (2) inspections of any portion of the Work to determine whether such portion of the Work is substantially complete, the Contractor shall be responsible for any fees assessed by the Architect for Additional Services on account of such additional inspections. The Contractor shall promptly reimburse the Owner for any such additional fees or, if the same are not promptly reimbursed, the Owner may deduct such amounts due from amounts otherwise payable to the Contractor.

9.9.3 Delete Subsection 9.9.3 and substitute the following:

9.9.3 The Owner's use or occupancy of such designated areas or portions of the Work prior to completion and acceptance of all or other portions of the Work pursuant to this Section 9.9 is subject to applicable provisions of the Specifications, and such use and occupancy shall not

constitute acceptance of systems, materials or other elements of the Work which are not in accordance with the requirements of the Contract Documents, nor relieve the Contractor from its obligation to complete the Work, or its responsibility for loss or damage due to or arising out of defects in, or malfunctioning of, systems, materials, equipment or other elements of the Work, nor from other unfulfilled obligations or responsibilities of the Contractor under the Contract. The Contractor shall make no Claim for extension of the Contract Time or for damages of any kind arising directly or indirectly out of the exercise by the Owner of the rights reserved under this Section 9.9.

9.10.1 Add the following at the end of Subsection 9.10.1:

If, through no fault of the Architect, the Architect (including its subconsultants) is required to conduct more than two (2) inspections of the Work to determine final completion, the Contractor shall be responsible for any fees assessed by the Architect for Additional Services on account of such additional inspections. The Contractor shall promptly reimburse the Owner for any such additional fees or, if the same are not promptly reimbursed, the Owner may deduct such amounts due from amounts otherwise payable to the Contractor.

9.10.2 Delete Subsection 9.10.2 and substitute the following:

9.10.2 Prior to and as a condition precedent to final completion and final payment, all of the following matters shall have been resolved and documents and items shall have been received and approved in writing by the Owner:

.1 final documents of similar nature to those required by the Contract Documents in connection with any Application for Payment hereunder;

.2 all final permits, approvals (including, without limitation, the approval of the Owner's insurance company, if required), certificates, affidavits and authorizations as required by Subsection 13.5.4, including an unconditional permanent and full Certificate of Occupancy, unless those permits, approvals, certificates, affidavits and authorizations are not received by the Owner solely for reasons as to which the Contractor or Subcontractors have no responsibility;

.3 formally prepared "as-built" drawings, records and related data including all field notes of all the Work all in accordance with the requirements of the Contract Documents;

.4 all operating and maintenance manuals as required by the Contract Documents, parts lists, the final version of the Project Directory, and repair source lists;

.5 all guarantees and warranties to which the Owner is entitled under the Contract Documents;

.6 satisfactory proof that all claims arising out of the Work have been released;

.7 acknowledgment of prior payments and waivers of lien (to the extent permitted by law) from all Subcontractors and the Contractor;

.8 the Architect's certificate certifying that the Work is complete;

.9 reasonable assurances that all practical orientation and operating instructions for all materials, systems, and equipment have been satisfactorily completed, and that all required training of Owner's personnel has been completed;

.10 a satisfactory report by the Contractor which is approved by the Architect that all mechanical systems have been and are properly balanced;

.11 an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or its property might in any way be responsible or encumbered, have been paid or otherwise satisfied;

.12 a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be cancelled or allowed to expire until at least 30 days' prior written notice has been given to the Owner;

.13 consent of surety, if required, to final payment;

.14 if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner;

.15 delivery of all spare parts required to be submitted pursuant to the Contract Documents; and

.16 a general release of the Owner from the Contractor and, if requested, from any Subcontractor.

If the final documentation submitted by the Contractor is not deemed complete by the Owner, or if the Owner deems the Work incomplete in any respect, the Contractor shall promptly complete any such Work and shall promptly resubmit the final documentation.

9.10.4 Add the following after clause .3 in Subsection 9.10.4:

.4 faulty or defective Work appearing after final payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.1.1 Add the following at the end of Subsection 10.1.1:

Such precautions and programs shall include, but are not limited to, compliance by the Contractor and all Subcontractors with all safety precautions and programs required by the Occupational Safety and Health Act and regulations promulgated thereunder, other applicable laws and regulations, the Contract Documents, and any insurance carrier providing insurance coverage for the Owner or the Contractor in connection with the Project. Without limiting the generality of the foregoing, the Contractor shall, promptly after issuance of the Notice to Proceed, prepare a written safety program which shall be submitted to the Owner and the Architect and issued to all Subcontractors and all forces employed on the work. Such program shall include regular safety meetings, and the Contractor shall prepare, circulate and maintain on file at the site minutes of all safety meetings.

10.2.1 In Subsection 10.2.1, replace the word "reasonable" with the words "all necessary" in line one and in line two, and add new clause 10.2.1.4 as follows:

.4 any other property of the Owner, whether or not forming part of the Work, located at the site or adjacent thereto in areas to which the Contractor has access.

10.2.5 Delete Subsection 10.2.5 and substitute the following:

10.2.5 Unless otherwise instructed, the Contractor shall promptly remedy damage and loss to property referred to in clauses 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts they may be liable. If and to the extent such damage or loss is caused by the acts or omissions of the Owner or the Architect, the Owner shall be responsible for the costs of remedying such damage or loss to the extent the proceeds of Owner's insurance are insufficient to cover such costs. In all other cases, the Contractor and/or its insurer shall bear the cost of remedying such damage or loss to the extent such cost exceeds the proceeds received under property insurance covering such loss or damage. The Contractor shall be fully and solely responsible for all Work and other operations carried out by the Contractor on adjacent properties. The liability insurance required to be carried by the Contractor under Article 11 shall cover such Work or operations, and the Contractor shall indemnify and defend the Owner, the Architect, and the owners of such adjacent properties from and against all claims, suits, losses or costs arising out of such Work or operations.

10.2.9-
10.2.15 Add new Subsections 10.2.9 through 10.2.51 as follows:

10.2.9 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish and liquids shall be kept only in one-gallon quantities in approved safety cans or sealed metal containers and shall be promptly removed from the site no less often that one time each day at the conclusion of construction activities. During and flame cutting and/or welding operation, incombustible curtains and blankets shall be used to intercept and catch hot metal, sparks and burning embers. The Contractor shall employ a watchperson equipped with portable fire extinguishing equipment to maintain a fire watch continuously during all flame cutting and welding operations and for four hours minimum thereafter. All fire doors shall be kept clear of rubbish and in operating condition and closed during non-wlring hours. The Contractors shall not allow any locking and blocking of any door in the building, except entrance doors during non-working hours.

10.2.10 The Contractor shall at all times protect excavations, trenches, buildings and materials, from rain water, ground water, backup or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.

10.2.11 The Contractor shall remove snow and ice which might result in damage or delay.

***10.2.12** (Statutory reference: M.G.L. c. 149 § 44F) The Contractor shall install weather protection and furnish adequate heat in the protected area from November 1 to March 31.

10.2.13 The Contractor shall provide adequate facilities to keep the Site secure at all times when the Contractor's personnel are not present, from commencement of the Work until Substantial Completion, to assure that the Work, all materials and equipment stored at the Site, and all other property of the Owner located within the site limits or within other areas occupied or controlled by the Contractor, are fully and completely protected against loss or damage due to vandalism, theft, malicious mischief, pilferage or unexplained disappearance. If the Contractor fails to comply with the requirements of this Subsection 10.2.13, then the Owner may provide appropriate security, and charge the cost thereof to the Contractor. The Owner's provision of such security, or failure to do so, shall not relieve the Contractor of its sole responsibility to pay for loss or damage to such property due to vandalism, theft, malicious mischief, pilferage or unexplained disappearance, to the extent not covered by the Owner's insurance.

10.2.14 The Contractor shall arrange for and provide all police details required by the Town of Lexington Police Department to be present at or adjacent to the site for traffic control purposes. The cost of police details so required shall be borne by the Contractor and is included in the Contract Sum.

10.2.15 The Contractors shall protect and maintain in operation all pipelines, conduits, sewers, drains, poles, wiring and the like that in any way interfere with the Work, whether or not they are specifically show on the Drawings. The Contractor shall see that all such items are protected, supported and/or moved as necessary to adjust them to the Work.

10.3.2 In Subsection 10.3.2, insert the words "as needed and appropriate" after the word "laboratory". Delete the second, third and fourth sentences. Add to the end of the sixth sentence the following words: "only to the extent necessary and appropriate".

10.3.3 Delete Subsection 10.3.3.

ARTICLE 11 INSURANCE AND BONDS

11.1.1 In the first sentence of Subsection 11.1.1 following the word "located" insert the words "and to which the Owner has no reasonable objection". Add the following at the end of Subsection 11.1.1:

* (Statutory reference: M.G.L. c.149, §34A) The Contractor shall, before commencing performance of the Contract, provide by insurance for the payment of compensation and the furnishing of other benefits under M.G.L. c.152 to all persons to be employed under the Contract, and the Contractor shall continue such insurance in full force and effect during the term of the Contract. Sufficient proof of compliance with this Subsection must be furnished at the time of execution of this Contract. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the Contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the awarding authority at least fifteen days prior to the intended effective date thereof, which date shall be expressed in said notice.

11.1.2 Add the following at the end of Subsection 11.1.2:

The commercial general liability insurance required by Subsection 11.1.1 shall include all major divisions of coverage, and shall include premises/operations, products and completed operations

for at least three years following acceptance and final payment, independent contractors, contractual liability, additional interests of employees, incidental medical malpractice, personal injury coverage, no exclusions for X-C-U or for property in the care, custody or control of the Contractor, and notice of occurrence and knowledge of occurrence endorsements satisfactory to the Owner. The business automobile liability insurance required by Subsection 11.1.1 shall be on a comprehensive basis and shall cover owned, non-owned and hired motor vehicles, including loading and unloading of any motor vehicle. All insurance shall be written on an occurrence basis, unless otherwise approved by the Owner.

The Owner, the Architect and such other representatives or affiliates of the Owner of which the Contractor has been notified shall each be named as additional insureds on the Contractor's commercial general liability policy(ies). All such policies shall contain provisions or endorsements necessary to assure coverage of claims by one insured against another. All required insurance policies shall be endorsed to state that the Contractor's policies shall be primary to all other insurance available to the Owner and other specified additional insureds for liability arising out of or resulting from the Contractor's operations under the Contract, whether such operations be by Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable. All policies shall include permission for partial or total occupancy of the premises by the Owner within the scope of this Contract.

The minimum limits of coverage for such policies shall be:

.1 Employer's liability insurance: $1,000,000 each accident.

.2 Commercial general liability insurance: $1,000,000 per occurrence; $2,000,000 general aggregate.

.3 Automobile liability insurance: combined single limit of $1,000,000 per occurrence.

.4 Umbrella liability insurance: $5,000,000 per occurrence.

The commercial general liability policy shall be endorsed to provide that the general aggregate shall apply to this Project only.

11.1.3. Add the following at the end of the second sentence of Subsection 11.1.3:

The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending limits of coverage.

11.3.1 Delete the words "initial Contract Sum" in the first sentence of Subsection 11.3.1 and substitute: "replacement cost of the building"; delete the words "without optional deductibles" at the end of the first sentence and substitute: "with a deductible not exceeding $5,000."

In Subsection 11.3.1.1, delete the words "and debris removal including demolition occasioned by enforcement of any applicable legal requirements."

Delete Subsections 11.3.1.2, 11.3.1.3, 11.3.1.4 and 11.3.1.5, and substitute the following:

11.3.1.2 The Contractor shall be responsible for the deductible portion of all losses covered by the Owner's property insurance, not to exceed a deductible amount of $5,000.

11.3.1.3 The Owner's property insurance will cover portions of the Work stored off-site and in transit, with sublimits of $100,000.

11.3.1.4 Upon request, the Owner will furnish to the Contractor a certificate evidencing the Owner's property insurance. Property insurance for losses to materials or equipment stored off-site or in transit in excess of the coverage provided by the Owner's property policy shall be procured by the Contractor at its cost. In addition, the Owner's property insurance will not cover any tools, equipment, materials, supplies, temporary structures or other property owned or rented by the Contractor or Subcontractors which is not to be incorporated in the Work. The Contractor and Subcontractors assume these excluded risks, and waive all rights they may have against the Owner for damage to such items, and any policies of insurance covering the Contractor's or Subcontractors' own tools, equipment, facilities and other property against loss by physical damage shall include provisions or endorsements providing that the underwriters waive their rights of subrogation against the Owner.

11.3.2 Delete Subsection 11.3.2.

11.3.3 Add the following at the end of the last sentence of Subsection 11.3.3: ", to the extent of proceeds paid by insurance obtained under this Subsection 11.3.3."

11.3.4-
11.3.6 Delete Subsections 11.3.4, 11.3.5 and 11.3.6.

11.3.8 Delete the words "as fiduciary" in the first sentence of Subsection 11.3.8.

11.3.10 Delete Subsection 11.3.10.

*11.4.1 Delete Subsection 11.4.1 and substitute the following:

***11.5.1** Pursuant to M.G.L. c. 149, § 29, the Contractor shall furnish a performance bond and a labor and materials payment bond, each in the amount of the Contract Sum and each in compliance with the requirements of said section 29. The performance bond and payment bond shall be in the forms provided by the Owner and included in the bidding documents, and shall be issued by a surety company licensed or authorized by the Commissioner of Insurance to do business and issue surety bonds in the Commonwealth of Massachusetts and acceptable to the Owner. The penal sum of the bonds shall be increased by endorsement, amendment or re-issuance, in form acceptable to the Owner, in the event of any increase in the Contract Sum. The premiums for such bonds are included in the Contract Sum. Such bonds shall remain in effect for the entire duration of the Contractor's warranty obligations.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.2.1 Add the words "or the Owner" after the word "Architect" in line one of Subsection 12.2.1.1. After the words "necessary thereby," in the last sentence of Subsection 12.2.1.1 insert the following: "and any other cost, loss, or damages to the Owner resulting from such failure or defect."

12.2.2 Delete the words "unless the Owner has previously given the Contractor a written acceptance of such condition" in the second sentence of Subsection 12.2.2.1; delete the third sentence in Subsection 12.2.2.1.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.3.1 Delete Subsection 13.1.1 and substitute the following:

The Contract shall be governed by the law of the Commonwealth of Massachusetts. All applicable Federal, state and local laws, rules and regulations of all authorities having jurisdiction over the bidding, awarding, and construction of the Work shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though written out in full.

13.3.1 In Subsection 13.3.1, after the words "registered or certified mail" insert the words "or by express mail or recognized overnight delivery service providing evidence of receipt".

13.4.3 Add new Subsection 13.4.3 as follows:

13.4.3 The Owner's rights and the Contractor's obligations under Section 3.18, Article 12 and any other provisions of the Contract Documents that contemplate continuing rights and obligations, respectively, shall survive expiration of the Contract Time and termination of this Agreement.

13.5.1 Delete the last sentence in Subsection 13.5.1.

13.5.4 Add the following at the end of Subsection 13.5.4:

Without limitation, the Contractor shall obtain and deliver promptly to the Architect or the Owner any occupancy permit and any certificates of final inspection of any part of the Contractor's work and operating permits for any mechanical apparatus, such as elevators, escalators, boilers, air compressors, etc., which may be required by law to permit full use and occupancy of the premises by the Owner. Receipt of such permits or certificates by the Architect or the Owner shall be a condition precedent to Substantial Completion of the Work.

13.6-
13.7 Delete Sections 13.6 and 13.7 and substitute the following:

13.6 LIMITATION OF LIABILITY

13.6.1 The Owner shall be liable to the Contractor only to the extent of its interest in the Project, and no officer, official, employee, board member, consultant, volunteer participant or other agent of the Owner shall ever be personally or individually liable with respect to this Contract or the Work. Each Subcontract shall include the foregoing limitation, which shall be effective if the Owner ever succeeds to the Contractor's rights and obligations under a Subcontract.

13.7 FOREIGN CORPORATIONS

13.7.1 If the Contractor is a foreign corporation, it shall comply with M.G.L. c.181, §§ 3, 4 and 5 (and other applicable provisions of M.G.L. c.181), and M.G.L. c.30, § 39L.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1.1 Delete clauses 14.1.1.3 and 14.1.1.4.

14.1.3 Delete Subsection 14.1.3 and substitute the following:

14.1.3 If one of the reasons described in Subsection 14.1.1 or 14.1.2 exists, the Contractor, if not in default under the Contract, may give the Owner and the Architect written notice of its intention to terminate the Contract and if, within thirty (30) days after the Owner's receipt of such notice, the Work shall not have resumed, or the default of the Owner or the Architect shall not have been cured or action by the Owner or the Architect to effect such cure shall not have been commenced within such thirty (30) day period and diligently pursued to completion, as the case may be, then the Contractor may terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, and profit based upon the percentage of Work completed.

14.1.4 Delete Subsection 14.1.4.

14.2 Delete Section 14.2 and substitute the following:

14.2 TERMINATION BY THE OWNER

14.2.1 If the Contractor is adjudged bankrupt, or if the Contractor makes a general assignment for the benefit of its creditors, or if a receiver is appointed on account of the Contractor's insolvency, or if the Contractor refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if the Contractor fails to make prompt payment to Subcontractors or for materials or labor, or disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction or disregards an instruction, order or decision of the Architect or the Owner, or otherwise is guilty of a material violation of any provision of the Contract, then the Contractor shall be in default, and the Owner may, without prejudice to any other right or remedy and upon written notice to the Contractor, take possession of all materials, tools, appliances, equipment, construction equipment and machinery and vehicles, offices and other facilities on the Project site, and all materials intended for the Work, wherever stored, and, seven (7) days after such notice, may terminate the employment of the Contractor, accept assignment of any or all subcontracts pursuant to Section 5.4, and finish the Work by whatever method the Owner may deem expedient. The Owner shall be entitled to collect from the Contractor all direct, indirect, and consequential damages suffered by the Owner on account of the Contractor's default, including without limitation additional services and expenses of the Architect made necessary thereby. The Owner shall be entitled to hold all amounts due the Contractor at the date of termination until all of the Owner's damages have been established, and to apply such amounts to such damages.

14.3 Delete Subsections 14.3.1 and 14.3.2 and substitute the following:

***14.3.1** (Statutory reference: M.G.L. c.30 §390) (a) The awarding authority may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided, however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract prices for any increase in the cost of performance of this contract but shall not include any profit to the Contractor on such increase;

and provided further, that the awarding authority shall not make any adjustment in the contract price under this provisions for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The Contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the Contractor notified the awarding authority in writing of the act or failure to act involved in the claim.

In the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the Contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the Contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the Contractor or the Subcontractor may have against each other.

14.4.3 In Subsection 14.4.3, delete the words "not executed" at the end of Subsection 14.4.3 and insert in place thereof the following: "completed. The Contractor shall include in all subcontracts provisions allowing the termination of such subcontracts for convenience without penalty or unearned profit."

15.1.1-
15.1.2 Delete Subsections 15.1..1 and 15.1.2 and substitute the following:

15.1.1 Definition. A Claim as a demand or assertion by the Contractor seeking, as a matter of right, adjustment or interpretation of Contract terms, increase in the Contract Sum or other payment of money, extension of the Contract Time or other relief with respect to the terms of the Contract. Claims must be initiated by written notice as hereafter provided. The responsibility to substantiate Claims shall rest with the Contractor.

15.1.2 Notice of Claims. For a Claim to be valid, it must be based upon a written notice of Claim or Contractor Change Notice delivered to the Owner and the Architect promptly, but in no event later than 21 days, after the occurrence of the event or circumstance upon which the Claim or Contractor Change Notice is based. Such notice of Claim or Contractor Change Notice must clearly state the nature of the Claim. Any change or addition to a previously made Claim shall be made by timely written notice in accordance with this Subsection 15.1.2. Failure by the Contractor to provide a notice of Claim or Contractor Change Notice within the time period specified above shall be conclusively deemed to be a waiver of the Claim, including all matters arising out of the event, occurrence or circumstance giving rise to the Claim.

15.1.3 At the end of the first sentence, add: “except for dispute items” and delete the last sentence.

15.1.4 Delete Subsections 15.1.4 and substitute the following:

15.1.4 If the Contractor believes that it has incurred or will incur additional costs as a result of any acts or omissions of the Owner or the Architect, including any interpretations, instructions or orders, whether oral, written, by Drawings, or otherwise, or as a result of any other event, circumstance or occurrence, the Contractor shall promptly (and in any event within the time period specified in Subsection 15.1.2) so notify the Architect and the Owner in writing of such Claim as provided in Subsection 15.1.2 and shall not proceed with the Work relating to such Claim until the Contractor has received a further written order to proceed except, as provided in Section 10.4, in the case of an emergency affecting life or property. No Claim by the Contractor on account of such interpretations, instructions or orders, or other acts, omissions, events, circumstances or occurrences shall be valid unless the Contractor has so notified the Architect and the Owner, before proceeding, and has received a further written order to proceed.

15.1.5.2Delete Subsection 15.1.5.2 and substitute the following:

15.1.5.2 The Contractor shall give prompt written notice to the Architect and the Owner of any cause which will result (or has resulted) in delay for which the Contractor claims or intends to claim an extension of the Contract Time, including those causes which the Owner or the Architect is responsible for or has knowledge of, such as any acts or omissions of the Owner or the Architect, including interpretations, instructions or orders, whether oral, written, by Drawings or otherwise, or any other event, circumstance or occurrence. Such notice shall be given as soon as practicable after the occurrence of the event or circumstance giving rise to the delay, and in any event not later than 21 days after such event, circumstance or occurrence. Such written notice shall (1) explicitly state that a time extension is claimed; (2) state in detail the circumstances which form the basis of the delay; and (3) describe as fully as practicable at the time the date of commencement and duration or expected duration of the delay and its effect on the schedule for the various parts of the Work. The Contractor shall provide such supporting documentation as the Owner or Architect may require, including, where appropriate, a time impact analysis or a revised construction schedule indicating all of the activities affected by the circumstances which form the basis for the Claim. The submission of such written notice within the time period provided above shall be a condition precedent to any extension of the Contract Time, otherwise the Claim shall be waived. In addition, if the Contractor fails (other than for reasons beyond the Contractor's control) to give notice of a delay promptly following the occurrence of the event or circumstance giving rise to the delay, and if such failure to promptly give notice causes damage or prejudice to the Owner by affecting the Owner's ability to mitigate such delay or the costs or other consequences arising from such event, circumstance or occurrence or the delay resulting therefrom, then the Contractor shall be responsible for the costs or delays incurred as a result of such failure of the Contractor to provide prompt notice, notwithstanding that the Contractor submits notice within such 21-day period.

15.1.5.3 Add new section 15.1.5.3 as follows:

15.1.5.3 Whenever the Contractor claims an extension of the Contract Time, only the unavoidable delay caused to completion of the Work as a whole shall be considered in measuring or evaluating the extent of the delay. If, for example, remaining work can be re-sequenced, or extra work can be (or could have been) performed along with the regular work called for by the Contract Documents so as to eliminate a delay in the progress or completion of the Work or some part thereof, without causing necessary delay to such regular work, no Claim for extension of the Contract Time shall be granted. The Contractor shall have the burden of demonstrating the effect of the claimed delay on the Contract Time. In any event, even though a cause of delay meets all of the above conditions, any extension shall be granted only to the extent that the effect of such

cause cannot be (or could not have been) avoided or mitigated by the exercise of all reasonable precautions, efforts and measures (including planning, scheduling and rescheduling), whether before or after the occurrence of the cause of delay. No extension shall be granted for any delay which, in whole or in part, results from or arises out of the act or omission of the Contractor or its Subcontractors or others performing the Work. Any extension of the Contract Time allowed hereunder shall be net of any contingency or "float" time included in the Progress Schedule.

15.1.6 Delete Subsection 15.1.6 and substitute the following:

15.1.6 As soon as practicable after giving notice of a Claim, the Contractor shall submit to the Owner and the Architect a Contractor Change Request as provided in Subsection 7.1.6. If the Architect or the Owner rejects a Contractor Change Request in whole or in part, and the Contractor disputes such rejection, such dispute shall be resolved as provided in Section 15.3. The Contractor understands and agrees that the requirements of Section 15.1 are to be strictly adhered to and that none of the requirements of the Contract Documents relating to Claims shall be waived by the Owner by course of dealing, orally or informally, and that neither the Architect nor any other representative of the Owner is authorized to waive any such requirements.

15.2 Delete Section 15.2 (including all Subsections) and substitute the following:

15.2 REVIEW OF CLAIMS BY ARCHITECT

The Owner, at its election, may request that the Architect review or make recommendations with respect to any Claim made by the Contractor. The Architect shall review Claims if so requested by the Owner and may (1) defer any action with respect to all or any part of a Claim and request additional information from either party; (2) decline to render a decision or recommendation for any reason the Architect deems appropriate (including but not limited to the fact that the Claim involves allegations of fault on the part of the Architect); or (3) render a decision or recommendation on all or a part of the Claim. The Architect shall notify the parties in writing of its disposition of such Claim. If the Architect renders a decision or recommendation or declines to render a decision or recommendation, either party may proceed in accordance with Section 15.3.

15.3 Delete Section 15.3 and substitute the following:

15.3 RESOLUTION OF DISPUTES

15.3.1 If the Contractor gives notice of a Claim as provided in Section 15.1 and submits a Contractor Change Request as provided in Subsection 7.1.6, and if the Owner or the Architect rejects such Contractor Change Request in whole or in part and the Contractor disputes such rejection, or if the parties are unable to resolve any other dispute between them, then (whether or not the Architect has rendered a decision or recommendation with respect to such Claim or other dispute) either party may commence action seeking judicial resolution of the matter, provided, in the case of any Claim by the Contractor, that the Contractor has first complied with the provisions of Sections 15.1 and 7.1.6 as applicable. All such actions, together with any other outstanding claims or disputes, shall be aggregated for trial in a single action. The Contractor and any Subcontractor, Sub-subcontractor, supplier and any other person or entity performing any part of the Work agree that each of them will waive objections to jurisdiction and venue and shall submit to the jurisdiction of the Middlesex County Superior Court of the Commonwealth of Massachusetts regardless of residence or domicile, with respect to any actions or suits at law or in

equity arising under or related to the Contract or the bidding, award or performance of the Work. Any action commenced by the Contractor or any Subcontractor, supplier or other person or entity claiming by or through any such party against the Owner or any of its consultants, officials, employees, representatives or agents with regard to any matter arising out of or relating to the validity, construction, interpretation or enforcement of the Contract shall be brought in Middlesex County Superior Court in the Commonwealth of Massachusetts. The word "litigation" shall be deemed to replace the word "arbitration" wherever the latter word appears in the Contract Documents.

15.4 Delete Section 15.4 and substitute the following:

***15.4 DECISIONS BY AWARDING AUTHORITY OR ARCHITECT**

***15.4.1** (Statutory Reference: M.G.L. c.30 §39P) In every case in which this Contract requires the awarding authority, any official, its Architect or Engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, the decision shall be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, Architect or Engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty-day period and the date by which the decision will be made.

***15.4.2** (Statutory reference: M.G.L. c.30 §39J) Notwithstanding any contrary provision of this contract, no decision by the awarding authority or by the Architect on a dispute, whether of fact or of law, arising under said contract shall be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily, is unsupported by substantial evidence, or is based upon error of law.

*ARTICLE 16 CONTRACTOR'S ACCOUNTING METHOD REQUIREMENTS (Statutory reference: M.G.L. c.30, §39R)

Add new Article 16, as follows:

***16.1** The words defined herein shall have the meaning stated below whenever they appear in this Article 16:

***16.1.1** "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a Contract as defined in Subsection 16.1.2.

***16.1.2** "Contract" means any contract awarded or executed pursuant to M.G.L. c.7, §38A1/2 - 380, inclusive, and any contract awarded or executed pursuant to M.G.L. c. 25A, §1 1C, M.G.L. c. 30, §39M, or M.G.L. c.149, §44A-44H, inclusive, which is for an amount or estimated amount that exceeds the dollar amount set forth in M.G.L. c.30, §39R.

***16.1.3** "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

***16.1.4** "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public account under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

***16.1.5** "Audit," when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a CERTIFIED opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

***16.1.6** "Accountant's Report," when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the Contractor.

***16.1.7** "Management," when used herein, means the chief executive officers, partners, principals, or other person or persons primarily responsible for the financial and operational policies and practices of the Contractor.

***16.1.8** Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

***16.2** Subsection 16.1.2 hereof notwithstanding, every agreement or contract awarded or executed pursuant to M.G.L. c.7, §38A1/2 -380, inclusive, M.G.L. c. 25A, §1 IC, M.G.L. c.30, §39M, or M.G.L. c.149, §44A -44H, inclusive, shall provide that:

***16.2.1** The Contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the Contractor.

***15.2.2** Until the expiration of six years after final payment, the awarding authority, office of inspector general, and the deputy commissioner of capital planning and operations shall have the right to examine any books, documents, papers or records of the Contractor or of his Subcontractors that directly pertain to, and involve transactions relating to, the Contractor or his/her Subcontractors.

***16.2.3** If the agreement is a contract as defined herein, the Contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the Contractor's independent certified public accountant approving or otherwise commenting on the changes.

***16.2.4** If the agreement is a contract as defined herein, the Contractor has filed a statement of management on internal accounting controls as set forth in Section 16.3 below prior to the execution of the contract.

***16.2.5** If the agreement is a contract as defined herein, the Contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in Section 15.5 below.

***16.3** Every Contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the Contractor and its subsidiaries reasonably assures that:

.1 transactions are executed in accordance with management's general and specific authorization;

.2 transactions are recorded as necessary:

(i) to permit preparation of financial statements in conformity with generally accepted accounting principles, and

(ii) to maintain accountability for assets;

.3 access to assets is permitted only in accordance with management's general or specific authorization; and

.4 the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

***16.4** Every Contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to

.1 whether the representations of management in response to this Section and Section 15.2 above are consistent with the result of management's evaluation of the system of internal accounting controls; and

.2 whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

***16.5** Every Contractor awarded a contract by the Commonwealth or by any political subdivision thereof shall annually file with the Division of Capital Asset Management and Maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report.

*ARTICLE 17 EQUAL EMPLOYMENT OPPORTUNITY (Statutory reference: M.G.L. c. 151B)

Add new Article 16 as follows:

***17.1.1** Non-Discrimination. During the performance of his contract, the Contractor and all of (his) Subcontractors (hereinafter collectively referred to as the Contractor), for himself, his assignees, and successors in interest, agree as follows:

***17.1.2** In connection with the performance of work under this contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age, sex, sexual orientation, genetic information, ancestry or handicap. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising; recruitment layoff; termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Commission setting forth the provisions of the Fair Employment Practices Law of the Commonwealth.

***17.1.3** The Contractor, in the performance of all work after award, and prior to completion of the contract work, will not discriminate on grounds of race, color, religious creed, national origin, age sex, sexual orientation, genetic information, ancestry or handicap in employment practices, in the selection or retention of Subcontractors, or in the procurement of materials and rentals of equipment.

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SECTION 011000 - SUMMARY

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:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Work under separate contracts.
5. Access to site.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and drawing conventions.
9. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Veterans Memorial Pool – Patton Park

1. Project Location: Patton Park, Bay Road, Hamilton, MA

B. Owner: Town of Hamilton MA

C. Architect: Bargmann Hendrie + Archetype, Inc. 300 A Street, Boston, MA 02210. Contact Thomas A. Scarlata, AIA, CCS, CSI tscarlata@bhplus.com.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Demolition of the existing swimming pool complex and construction of the new swimming pool, bathhouse, and support building. Work also includes associated sitework.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.

1. Construction of Parking Lot

1.6 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

C. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

D. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.7 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.

1.8 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 5 Hours:

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Architect and Owner] not less than two days in advance of proposed utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

E. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard or scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.3 BULLETINS- GENERAL

A. The Architect will also respond to minor changes in the work and potential contract modifications with Bulletins. An example Bulletin form has been included at the end of this Section. The Bulletin will be sequentially numbered and dated. The Bulletins will be issued in three forms:
   1. Supplemental Instructions (SI): The Architect will issue a bulletin with supplemental instructions authorizing minor changes in the work not involving adjustment to the Contract Time or Sum.
   2. Proposal Requests (PR): The Architect will issue a bulletin with a date, description of proposed changes in the Work that require adjustment to the Contract Sum or Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   3. Construction Change Directive (CCD): When the Owner and the Contractor disagree, or sufficient time is not available to establish final terms of a Proposal Request, the Architect may issue a Bulletin in the form of a Construction Change Directive. The Construction Change Directive instructs the Contractor to proceed with a change in the Work for subsequent inclusion in a Change Order.

1.4 MINOR CHANGES IN THE WORK BULLETINS (ASI)

A. Architect will issue a Bulletin for Work not involving adjustment to the Contract Sum or the Contract Time. Bulletin is similar to AIA Document G710, "Architect's Supplemental Instructions."

1.5 CHANGE ORDER PROPOSAL REQUEST BULLETINS (PR)

A. Proposal Requests: The Architect will issue a Bulletin requesting a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time.

1. Proposal requests issued by the Architect are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
2. Within 7 calendar days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Architect for the Owner's review.
   a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
   b. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
   c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

1.6 CONSTRUCTION CHANGE DIRECTIVE BULLETIN

A. Construction Change Directive: Architect may issue a Bulletin similar AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

   1. Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Work Change Directive.

   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 PROPOSAL REQUESTS

A. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to the Architect and Owner’s Project Manager (OPM).

   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Include costs of labor and supervision directly attributable to the change.
   5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect and OPM.

1.8 ADMINISTRATIVE CHANGE ORDERS

A. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.9 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on a form similar to AIA Document G701.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

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SECTION 012900 - 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 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

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 Architect and Owner’s Project Manager (OPM) at earliest possible date, but no later than seven (7) 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 Architect.
    c. Architect'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.
3. 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. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. 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.

C. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. A minimum breakdown shall be as follows. Architect and OPM will expand this list upon receipt of preliminary Schedule of Values.

1. Mobilization
2. Bonds
3. Insurance
4. Environmental Protection
5. Site Clearing
6. Pool Demolition
7. Building Demolition
8. Concrete Work
    a. Footings
    b. Foundation Walls
    c. Slabs on Grade
9. Miscellaneous Metals
10. Rough Carpentry
11. Finish Carpentry
    a. Exterior Wood Trim
    b. Interior Wood Trim
    c. Exterior Wood Paneling

   d. Interior Wood Paneling
   e. Millwork
12. Asphalt Shingle Roofing
13. Cedar Shingles
14. Cedar Clapboard
15. Flashing
16. Sealants
17. Doors
   a. Metal Doors and Frames
   b. Overhead Coiling Doors
18. Windows
   a. Type 1
   b. Type 2
19. Hardware
20. Painting/Staining
   a. Bathhouse
   b. Service Building
21. Toilet Partitions
22. Signage
   a. Interior Room Signage
23. Fire Protection Specialties
24. Toilet Accessories
25. Pool Structure
   a. Reinforcing
   b. Bonding
   c. Gunite
26. Pool Recirculation
   a. Skimmers
   b. Piping
   c. Main Drains
   d. Returns
27. Pool Filtration
   a. Filter Tanks
   b. Pumps, Piping, Valves, etc.
   c. Chemicals and Controls
28. Miscellaneous Pool
29. Pool Maintenance, Safety and Deck Equipment (One line item for each piece of equipment.)
30. Start-up and Training
31. O& M Manuals
32. Mechanical
   a. Fans
   b. Equipment
33. Plumbing
   a. Rough-In Material
   b. Rough-In Install
   c. Fixtures Material
   d. Fixtures Install
   e. Testing
34. Electrical
   a. Service Entrance

b. Distribution Rough-In Material
c. Distribution Rough-In Install
d. Devices Equipment
e. Devices Install
f. Light Fixtures Material
g. Light Fixtures Install
h. Testing

35. Demolition of Site Elements
36. Pool Excavation
37. Building Excavation
38. Subgrade Preparation
39. Utility Excavation
40. Miscellaneous Excavation
41. Building Backfill
42. Utility Backfill
43. Miscellaneous Backfill
44. Site Utilities
    a. Structures Material
    b. Structures Install
    c. Piping Material
    d. Piping Install
45. Septic System
46. Concrete Paving
    a. Walks
    b. Pool Decks
47. Landscape
    a. Lawns
48. Site Improvements
49. Fencing

D. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

E. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   1. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

F. 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.

G. 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.

H. 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 Architect and paid for by Owner.

   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: A draft Application shall be submitted to Architect and OPM a minimum of 1 week prior to submission of a Final Application. Coordinate submission with a regularly scheduled project meeting to afford time for review. Submit Application for Payment to Architect and OPM on or before a the last day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment or similar forms.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect 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.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:

      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit six (6) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

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. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

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. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Certificates of insurance and insurance policies.
13. Performance and payment bonds.

I. Application for Payment at Substantial Completion: After Architect 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. Evidence that claims have been settled.
5. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
6. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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SECTION 013100 - 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 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

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

1.4 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. 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 fifteen (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.

1.5 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. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with 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 with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. 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.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities 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.

E. 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.

1.6 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. Intent: Coordination drawings for the Project are intended to ensure all underground piping related to the swimming pool, drainage, domestic water, gas, communications and power are properly coordinated.

2. Building Coordination: Primary concern for building coordination drawings is to ensure overhead services such as piping, ductwork and conduit, visible from within the building are located and installed in a manner that is visually acceptable to the Architect and functionally located for maintenance staff.

3. 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, pool and underground utility systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Indicate required installation sequences.
f. 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 Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

    a. Architect 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 Agreement form acceptable to Owner and Architect.

1.7 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. Architect will return RFIs submitted to Architect 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.
3. RFI’s shall be submitted electronically in PDF format. Architect shall respond directly on the Contractor’s RFI form or on Architects RFI response form. All RFI’s will be returned electronically be email.

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 Architect
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: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow five (5) working days for Architect's response for each RFI. RFIs received by Architect 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 Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and OPM in writing within ten [10] days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within five (5) days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

A. General: The Schedule of Project Meetings will be at a mutually agreed upon time. Meetings will be held at the Belmont Town Library adjacent to the Underwood Pool site.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: The Architect will record significant discussions and agreements achieved for the preconstruction conference and project meetings; Contractor is responsible for all preinstallation meetings. Architect will distribute minutes to attendees.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than seven [7] days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Owner's Project Manager Architect, 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. Critical work sequencing and long-lead items.
    c. Designation of key personnel and their duties.
    d. Lines of communications.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. Preparation of record documents.
    l. Use of the premises
    m. Work restrictions.
    n. Working hours.
    o. Owner's occupancy requirements.
    p. Responsibility for temporary facilities and controls.
    q. Procedures for moisture and mold control.
    r. Procedures for disruptions and shutdowns.
    s. Construction waste management and recycling.
    t. Parking availability.
    u. Office, work, and storage areas.
    v. Equipment deliveries and priorities.
    w. First aid.
    x. Security.
    y. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Project Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.
    j. Compatibility requirements.
    k. Time schedules.
    l. Weather limitations.
    m. Manufacturer's written instructions.
    n. Warranty requirements.
    o. Compatibility of materials.
    p. Acceptability of substrates.
    q. Temporary facilities and controls.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than thirty [30] 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, Owner's Project Manager, Architect, 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.

E. Progress Meetings: Architect will conduct progress meetings at regular intervals depending on construction activity.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Owner’s OPM and Architect, 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) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.

7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) 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.

F. Coordination Meetings: Conduct Project coordination meetings at appropriate intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, the Owner’s OPM and Architect, 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 meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined 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.
   b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
   c. Review present and future needs of each contractor present, including the following:

      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Deliveries.
      5) Off-site fabrication.

6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - 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. Contractor's construction schedule.
   2. Construction schedule updating reports.
   3. Material location reports.
   4. Site condition reports.
   5. Special reports.

B. Related Requirements:
   1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
   2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. PDF electronic file.
   2. Four (4) paper copies in color if applicable.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1.4 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, 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 commencement of the Work to date of final completion.

1. Substantial Completion and Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. 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.
2. Startup and Testing Time: Include no fewer than seven (7) days for startup and testing.
3. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
4. Punch List and Final Completion: Include not more than thirty [30] days for completion of punch list items and final completion.

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. Building and pool Demolition

b. Site Preparation for new structures

c. Utilities

d. Pool Tanks

e. Building Foundations

f. Buildings Enclosed

g. Pool Decks
h. Pool Equipment
i. Pool Start-up
j. Landscape
k. Substantial Completion.

C. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

D. 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.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within thirty [30] days of date established for commencement of the 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.

2.3 REPORTS

A. 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.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner 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 monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule and submit during a regularly scheduled progress meeting simultaneously with the draft application for payment.

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 Architect, Owner's OPM, Owner, 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 013200

SECTION 013300 - 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 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings may be provided by Architect 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. 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. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect'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.

E. Identification: Place a permanent label or title block on each submittal for identification.

F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

G. Preliminary and Final: Unless additional copies are required for final submittal, and unless Architect or Owner's Project Manager observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect shall return submittals received from sources other than Contractor.

   1. SUBMITTALS SHALL BE TRANSMITTED VIA EMAIL IN PDF FORMAT IN ORDER TO ENSURE TIMELY REVIEW AND RETURN.

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: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

   1. Number of Copies to Architect: If hardcopies are being submitted, submit 6 copies of each submittal, unless otherwise indicated. Architect will return 3 copies. Mark up and retain one returned copy as a Project Record Document.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

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.

D. Samples: Prepare physical units of materials or products, including the following:
   1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
   2. Samples for Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   3. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
   4. Number of Samples for Selection: Submit three full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
   5. 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.

E. Schedule of Values: Comply with requirements in Division 1 Section "Payment Procedures."

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Progress Schedule (BAR CHART FORMAT)."

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. 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.

K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

L. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures. "

M. Design Data: Prepare 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.

N. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

O. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service 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.

P. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

Q. Pre-Construction Photographs : Comply with requirements in Division 1 Section "Construction Progress Documentation."

R. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Owner's Project Managers.

B. 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 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it.
   1. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
   2. In lieu of an action stamp, Architect may attach a submittal response form identified action taken and providing comments. Samples are included at the end of this section.

C. Informational Submittals: Architect and Owner's Project Managers will review each submittal and will not return it, or will reject and return it if it does not comply with requirements.

D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

3.3 SPECIMEN STAMPS

A. Architect's Action Stamp

BARGMANN HENDRIE + ARCHETYPE, INC.

This submittal has been reviewed for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. This review has not been conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities or for substantiating instructions for installation or performance of equipment or systems designed by the Contractor, all of which remain the responsibility of the Contractor to the extent required by the Contract Documents. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. When professional certification of performance characteristics of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon such certification to establish that the materials, systems or equipment will meet the performance criteria required by the Contract Documents.

ACTION:

[ ] *Reviewed and approved, subject to the limitations noted above.*

[ ] *Reviewed and approved as noted, subject to the limitations noted above.*

[ ] *Revise and resubmit.*

[ ] *Disapproved.*

*By:*_____ *Date:*_____

END OF SECTION 013300

BARGMANN HENDRIE + ARCHETYPE, INC.
Architecture | Planning | Interior Design

300 A Street
Boston, MA 02210-1710

617 350 0450 tel
617 350 0215 fax

bha@bhplus.com
www.bhplus.com

submittal response form

date:

to: contractor name
address

project & number: Veterans Memorial Pool- Patton Park
BH+A Project No. 3223

submittal no:

cc: Owner name

This submittal has been reviewed for the limited purpose of checking for conformance with information given and the design concept expressed inn the Contract Documents. This review has not been conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities or for substantiating instructions for installation or performances of equipment or systems designed by the Contractor, all of which remain the responsibility of the Contractor to the extent required by the Contract Documents. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. When professional certification of performance characteristics of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon such certification to establish that the materials, systems or equipment will meet the performance criteria required by the Contract Documents.

action: Reviewed and approved, subject to the limitations noted above

Reviewed and approved as noted, subject to the limitations noted above.

Revise and Resubmit

Disapproved

One of the four actions above will be selected by the architect.

reviewed by:

comments:

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SECTION 014000 - 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 Architect, Owner,[Commissioning Authority,] [Construction Manager,] or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified 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. 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 Architect.

C. 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.

D. 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.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. 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.

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) 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 Architect 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 Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. 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:

B. 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.

C. 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.

1.6 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.

1.7 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.

G. 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.

H. 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.

1.8 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. 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, and the Contract Sum will be adjusted by Change Order.

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.

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 Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect OPM 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.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

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 Architect.
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 Architect's and OPM’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.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as

possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

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 014000

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SECTION 014200 - REFERENCES

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 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
   1. ICC - International Code Council; www.iccsafe.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

   1. COE - Army Corps of Engineers; www.usace.army.mil.
   2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
   3. EPA - Environmental Protection Agency; www.epa.gov.
   4. OSHA - Occupational Safety & Health Administration; www.osha.gov.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

   1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

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 temporary utilities, support facilities, and security and protection facilities.

B. Pre Demolition and Construction Pest Control

C. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

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, Owner's OPM, Architect, testing agencies, and authorities having jurisdiction.

B. Water Service: Pay water-service use charges for water used by all entities for construction operations.

C. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

D. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use with metering. Provide connections and extensions of services as required for construction operations.

E. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use with metering at Contractor’s option. Provide connections and extensions of services as required for construction operations. If existing service is not

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Work outside of the Conservation Setback, do not disturb areas outside of the project limits.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.

C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 PRE DEMOLITION AND CONSTRUCTION PEST CONTROL

A. General Requirements: Before beginning demolition, retain a local exterminator or pest control company acceptable to the Owner to develop a plan and procedures for exterminating rats and other pests inhabiting the project site and preventing them from migrating from the project site to adjacent properties. Perform control operations in a lawful manner using environmentally safe products.

B. Final Inspection and Report: Prior to requesting inspection to certify substantial completion, require the licensed exterminator or pest control company which has been responsible for rodent control on the site to make a final inspection and prepare a report recording rodent-related activity (or absence thereof) at the site at the time of Substantial Completion, and recommend follow-up activities, if appropriate.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from

adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: 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.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

I. Telephone Service: Provide superintendent with cellular telephone for use on the Project site.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction and the Town of Hamilton.

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

D. Parking: Limited parking is available on site. Contractor responsible for parking construction personnel of site.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as specified in Section 015813.
2. Temporary Signs: Provide other signs as required to inform and warn the public and individuals regarding traffic patterns, site entry gates, and other items affecting use of the public right-of-way.

G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. 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.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to Town of Hamilton, requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. 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.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

G. Site Enclosure Fence: Before construction operations begin furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations. Sections of the existing fence may be used as security fence for as long as construction allows.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

3.6 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.

3.7 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.

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. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

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SECTION 015813 - TEMPORARY PROJECT SIGN

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. This Section includes the design requirements for the project identification signage.

B. Contractor shall obtain all relative permits for installation of the temporary project sign.

C. Related Sections include the following:
   1. Section 061000- Rough Carpentry

PART 2 - PRODUCTS

A. Lumber and Plywood: Comply with requirements in Section 061000.

PART 3 - EXECUTION

A. Project Identification Sign: Prepare Project identification signs in size indicated.
   1. Install Sign as directed by the Owner and Architect.
   2. Do not permit installation of unauthorized signs.
   3. Engage an experienced sign fabricator to apply graphics for Project identification signs. Comply with details indicated.
   4. Construct sign of exterior-type Grade B-B high-density concrete form overlay plywood in, no less than ½ inch in thickness. Support on posts or framing of preservative-treated wood or steel.
   5. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer or provide weatherproof acrylic sheet over face of sign.
   6. Paint rear face of sign, edges and supports to protect material
   7. Size:
      a. 3 feet high by 4 feet wide.
   8. Maintain sign throughout construction; relocate as required. Provide temporary supports system as required.

B. Sign Text: (Final Artwork and Layout will be provided by Architect in electronic format to Contractor.)

Veterans Memorial Pool Project

Town of Hamilton & Wenham Massachusetts

Architect:	Bargmann Hendrie + Archetype, Inc.
Civil Engineer:	Pare Corporation
MEP Engineering	Allied Consulting Engineers
Contractor:	TBD

END OF SECTION 015813

SECTION 016000 - 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 012500 "Substitution Procedures" for requests for substitutions.
   2. Section 014200 "References" for applicable industry standards for products specified.

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. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractorof approval or rejection of proposed comparable product request within seven [7] days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

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, Architect 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 weathertight 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 017700 "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," Architect 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 Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect 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: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect 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 architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

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SECTION 017300 - 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. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. 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.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

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 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction 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. 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 Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. 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.

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 **local utility** and **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 Architect according to requirements in Section 013100 "Project Management and Coordination."

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 Architect 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 element 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 Architect when deviations from required lines and levels exceed allowable tolerances.

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, and pools. 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 Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. 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.

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. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. 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.

H. 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 Architect.**
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.

I. 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.

J. 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.

B. Temporary Support: Provide temporary support of work to be cut.

C. 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.

D. 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 **prevent** interruption to adjacent properties.

E. Cutting: 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.

F. 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.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

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.

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.

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.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 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 017300

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SECTION 017419 - 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. Recycling nonhazardous **demolition and construction** waste.
   2. Disposing of nonhazardous **demolition and construction** waste.

B. It is the intent of this section to comply with the MASS DEP Waste Disposal Ban Regulation, 310 CMR 19.017 effective July 1, 2006 and all current amendments.

C. Related Requirements:
   1. Section 015000- Temporary Facilities and Controls for environmental-protection measures during construction.
   2. Section 024116 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements.
   3. Section 311000 "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.

1.4 PERFORMANCE GOALS

A. Salvage/Recycle Goals: Salvage and recycle as much non-hazardous construction waste as possible including the following materials:
   1. Lumber.

2. Wood sheet materials.
3. Wood trim.
4. Metals.
5. Piping.
6. Electrical conduit.
7. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
   a. Paper.
   b. Cardboard.
   c. Boxes.
   d. Plastic sheet and film.
   e. Polystyrene packaging.
   f. Wood crates.
   g. Plastic pails.

1.5 QUALITY ASSURANCE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 IMPLEMENTATION

A. 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.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:

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.

3.3 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: Clean Cut-Offs of Lumber: Grind or chip into small pieces.

C. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

3.4 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.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

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SECTION 017700 - 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 015000- “Temporary Facilities and Controls” for rodent control requirements.
2. Section 017300 "Execution" for progress cleaning of Project site.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

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.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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 ten [10] 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 maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner and Architect. Label with manufacturer's name and model number where applicable.
   a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner’s signature for receipt of submittals.
3. Submit test/adjust/balance records.
4. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of ten [10] 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. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover of utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
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 ten [10] days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect 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 Architect, 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 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.
2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
3. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
4. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
5. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
6. Submit pest-control final inspection report.

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, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect 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 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect 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. Partial Occupancy: Submit properly executed warranties within fifteen [15] days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. 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 (215-by-280-mm) 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.

D. 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.

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

PART 3 - EXECUTION

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. 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.
    f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    g. Sweep concrete floors broom clean in unoccupied spaces.
    h. 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.
    i. Remove labels that are not permanent.
    j. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    k. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    l. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    m. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    n. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
    o. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in 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 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 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

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 preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
1. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.

2. T**hree** (3) paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

C. Initial Manual Submittal: Submit draft copy of each manual at least thirty [**30**] days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Final Completion .
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within fifteen [15] days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:
1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.

5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. Avoid placing loose, oversize drawings in binder pockets. Use reduced drawings or place folded drawings in labeled envelopes bound in manual.
   c. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
   2. Performance and design criteria if Contractor has delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.
   5. Operating logs.
   6. Wiring diagrams.
   7. Control diagrams.
   8. Piped system diagrams.
   9. Precautions against improper use.
   10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
   1. Product name and model number. Use designations for products indicated on Contract Documents.
   2. Manufacturer's name.
   3. Equipment identification with serial number of each component.
   4. Equipment function.
   5. Operating characteristics.
   6. Limiting conditions.
   7. Performance curves.
   8. Engineering data and tests.
   9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
   1. Startup procedures.
   2. Equipment or system break-in procedures.
   3. Routine and normal operating instructions.
   4. Regulation and control procedures.
   5. Instructions on stopping.
   6. Normal shutdown instructions.
   7. Seasonal and weekend operating instructions.
   8. Required sequences for electric or electronic systems.
   9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   4. Material and chemical composition.
   5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent,

and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of operation and maintenance manuals.
   2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

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SECTION 017839 - 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. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Requirements:
   1. Section 017300 "Execution" for final property survey.
   2. Section 017700 "Closeout Procedures" for general closeout procedures.
   3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

   1. Number of Copies: Submit one (1) set(s) of marked-up record prints.
   2. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal:
         1) Submit one (1) paper-copy set(s) of marked-up record prints.
         2) Submit PDF electronic files of scanned record prints and one of file prints.
         3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit PDF electronic files of scanned record prints and two (2) set(s) of prints.
         2) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy and scanned PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy and scanned 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.

PART 2 - PRODUCTS

2.1 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 Architect'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.

2.2 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. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy and scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 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 paper copy and scanned PDF electronic file(s) 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.

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 Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

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 instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Demonstration and training video recordings.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit **two** (2) copies within **seven** (7) days of end of each training module.
   1. Identification: On each copy, provide an applied label with the following information:
      a. Name of Project.
      b. Name and address of videographer.
      c. Name of Architect.
      d. Name of Construction Manager.
      e. Name of Contractor.
      f. Date of video recording.
   2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative or qualified employee of installer, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

B. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.
2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project record documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.
3. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.
4. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

5. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
6. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
7. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner and OPM fifteen (15) days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using draft operation and maintenance data submittals of finals are not complete.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

B. Video: Provide minimum 640 x 480 video resolution converted to **format file type acceptable to Owner**, on electronic media.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
   1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by **audio narration by microphone while** video recording is recorded. Include description of items being viewed.

END OF SECTION 017900

SECTION 024116 - STRUCTURE DEMOLITION

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. Demolition and removal of buildings and site improvements.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and abandoning in-place or removing site utilities.

B. Related Requirements:
1. Section 011000 "Summary" for use of the premises and phasing requirements.
2. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
3. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.
4. Section 0312300- Earthwork for coordination of excavation activities related to removal of below grade building and site elements.

1.3 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse in the Project.

1.4 MATERIALS OWNERSHIP

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

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize protection requirements.

4. Review procedures for noise control and dust control.

1.6 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before building demolition, Owner will remove the following items:
   a. Loose Equipment
   b. Furniture
   c. Loose site furnishings

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. On-site storage or sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning 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 demolition operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.
1. Arrange to shut off utilities with utility companies.
2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.

3. Cut off pipe or conduit a minimum of 24 inches (610 mm) below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
4. Identify location of abandoned utility on as-built drawing.
5. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PROTECTION

A. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

B. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.

a. Provide at least seven (7) days notice to occupants of affected buildings if shutdown of service is required during changeover.

C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and after flame-cutting operations; follow all permitting and regulations mandated by the Belmont Fire Department.
3. Maintain adequate ventilation when using cutting torches.

4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

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

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Below-Grade Construction: Demolish foundation walls and other below-grade construction unless noted otherwise.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely.

D. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures unless noted otherwise.

3.6 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site 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.

B. Do not burn demolished materials.

3.9 CLEANING

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

1. Clean roadways of debris caused by debris transport.

PART 4 - EXISTING CONDITIONS

4.1 EXISTING BATHHOUSE

A. Contractor shall remove existing bathhouse and all built in elements completely.

Existing Bathhouse

Existing Pool Fence and Decking

END OF SECTION 024116

SECTION 03 30 00- CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.02 DESCRIPTION OF WORK

A. Work Included: This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes. Cast-in-place concrete shall include, but not be limited to the following:

1. Foundations.
2. Structural slabs.
3. Equipment pads and bases.
4. Miscellaneous concrete for fills and encasement.

1.03 SUBMITTALS

A. Refer to Section 01 33 00, SUBMITTAL PROCEDURES for submittal provisions and procedures.

B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, water-stops, joint systems, curing compounds, dry-shake finish materials, and others if requested by the Architect or SER.

C. Shop drawings for reinforcement detailing, fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement.

1. All reinforcing shop drawings for concrete and masonry walls shall be shown on walls elevations with a scale of 1/4 in. = 1 ft. - 0 in.
2. Include special reinforcing required for openings through concrete structures.

D. Concrete mix design for each mix specified. Supporting test data shall be submitted if requested.

E. Proposed method of curing concrete and associated products.

F. Proposed precautions for hot weather and cold weather concreting.

G. Samples of materials as requested by Architect, including names, sources, and descriptions.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where requirements that are more stringent are shown or specified:

1. Massachusetts State Building Code, Eighth Edition.
2. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings".
3. ACI 318, "Building Code Requirements for Reinforced Concrete".
4. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".
5. Manual of Standard Practice for Detailing Reinforced Concrete Structures ACI 315.
6. ACI 308, "Recommended Practice for curing Concrete"
7. ASTM C 94, Ready-Mixed Concrete.

B. Inspection, Testing, and Quality Control

1. Materials and workmanship shall be subjected to inspection and testing in mill, shop, and/or field by the Architect and/or Testing Agency. Such inspection and testing shall not relieve the Contractor of his responsibility to provide his own inspection, testing, and quality control as necessary to furnish materials and workmanship in accordance with requirements of Contract Documents.
2. The General Contractor shall notify the Architect and the Testing Agency prior to start of any phase of concrete work so as to afford them reasonable opportunity to inspect the work. Such notification shall be made at least 24 hours in advance.

C. Project Data:

1. Concrete Curing and Protection: Submit to the Architect in accordance with the requirements of Contract Documents, detailed methods proposed for use for curing and protection prior to commencement of concrete work. This shall include winter protection and hot weather concrete methods.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products in accordance with Section 01 60 00, MATERIAL AND EQUIPMENT.

1. Reinforcing steel and other items to be embedded in cast-in place concrete which are stored at the project site shall be above ground on platforms, skids or other supports, protected from the elements by a waterproof covering ventilated to prevent condensation.

B. General Contractor shall provide and pay for all dumpster services during the entire construction period. Suppliers and Sub-Contractors to bring all rubbish and debris to the dumpster location daily. No costs are to be assessed to the suppliers or Sub-Contractors by the General Contractor for this service.

C. General Contractor, Sub-Contractors, and suppliers are all individually to furnish their own staging, scaffolding, and hoisting equipment necessary to get workers, material, and equipment from the point of delivery at the project site to the point of use or installation within the building and project site. All crane and rigging services required are the responsibility of each individual trade.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two (2) edges and one (1) side for tight fit.

C. Chamfer strips shall be wood, PVC or rubber strips.

D. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form release agent with rust inhibitor for steel form-facing materials.

2.02 METAL REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel, Refer to “Special Requirements for Architecturally Exposed Concrete” for required stainless steel wire.

C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. All welded wire fabric shall be supplied in flat sheets.

D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or II.

1. Use one (1) brand of cement throughout Project unless otherwise acceptable to Architect. Refer to Section 2.08, "Special Requirements for Architecturally Exposed Concrete"

B. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for Architecturally Exposed Concrete.

1. For Architecturally Exposed Concrete surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.

C. Water: Potable.

D. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

F. Water-Reducing Admixture: ASTM C 494, Type A.

2.04 RELATED MATERIALS

A. Water-stops: Provide flat, dumbbell-type or center-bulb-type water-stops at construction joints and other joints as indicated. Size to suit joints.

B. Polyvinyl Chloride Water-stops: Corps of Engineers CRD-C 572.

C. Sand Cushion: Clean, manufactured, or natural sand.

D. Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E 154, as follows:

1. Five-ply, nylon or polyester-chord-reinforced high-density polyethylene sheet, not less than 15 mils thick conforming to ASTM E 1745, Class B.

E. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

F. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Water proof paper.
2. Polyethylene film.
3. Polyethylene coated burlap.

G. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq. ft./gal.

H. Evaporation Control: Mono-molecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

I. Underlayment Compound: Free-flowing, self-leveling, pumpable, cement-based compound for applications from one (1) inch thick to feathered edges.

J. Bonding Agent: Polyvinyl acetate or acrylic base.

K. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.

L. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.05 PROPORTIONING AND DESIGNING MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least fifteen (15) days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect/SER

C. Structural Slabs, Miscellaneous Concrete: Proportion normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi
2. Maximum Slump: 3 inches at point of discharge (at the truck).
3. Slump may be increased to 6 inches with use of Mid-Range Water Reducing Admixture. (after Field verification of original slump limit)
4. Maximum water-cement ratio: 0.40

D. Exterior Walks, Aprons, Stairs and Ramps: Proportion normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi
2. Maximum Slump: 4 inches at point of discharge (at the truck).
3. Slump may be increased to 6 inches with use of Mid-Range Water Reducing Admixture. (after Field verification of original slump limit)
4. Air-entrained
5. Maximum water-cement ratio: 0.40

E. Under no conditions shall water be added to the concrete mixes at the site.

F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other

circumstances warrant, as accepted by SER. Laboratory test data for revised mix design and strength results must be submitted to and accepted by SER before using in Work.

G. All pumped concrete shall contain mid-range water reducing admixture or high range water reducing admixture (superplasticizer) added at the site. Maintain slumps as specified above

2.06 ADMIXTURES

A. Use mid-range water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for pumping, placement and workability.

B. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.

C. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:

1. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure: 5.0 percent (moderate exposure); 6.0 percent (severe exposure) for 3/4-inch maximum aggregate.

D. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.07 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to seventy-five 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to sixty (60) minutes.

PART 3 EXECUTION

3.01 GENERAL

A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

3.02 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal. Use 6 mil poly to cover rustication keyways to ensure easy removal without chipping concrete.

D. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

E. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.03 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports and as specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.

D. Place reinforcement to maintain minimum coverage as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install flat welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one (1) full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.04 JOINTS

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.

B. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

3.05 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.06 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, non-residual, low-VOC, form-coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

1. Coat steel forms with a non-staining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.07 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete", and as specified.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than twenty-four (24) inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the

machine. Place vibrators to rapidly penetrate placed layer and at least six (6) inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.

1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
3. Maintain reinforcing in proper position on chairs during concrete placement.

F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
3. Cover walls and slabs with thermal blankets. Provide poly tents with heat for twenty-four (24) hours when temperature is 40 degrees F or below.

G. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.08 FINISHING FORMED SURFACES

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and

defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

C. Smooth-Rubbed Finish: Provide smooth-rubbed finish on scheduled concrete surfaces that have received smooth-formed finish treatment not later than one (1) day after form removal.

1. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Grout-Cleaned Finish: Provide grout-cleaned finish on scheduled concrete surfaces that have received smooth-formed finish treatment.

1. Combine one part portland cement to one and one-half parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint. Blend standard Portland cement and white Portland cement in amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.
2. Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least thirty-six (36) hours after rubbing.

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

3.9 MONOLITHIC SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.

1. After placing slabs, finish surface to tolerances of F(F) 15 (floor flatness) and F(L) 13 (floor levelness) measured according to ASTM E 1155. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or thin-set quarry tile, paint, or another thin film-finish coating system.

1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 30 (floor flatness) and F(L) 25 (floor levelness) measured according to ASTM E 1155. Grind smooth any surface defects that would telegraph through applied floor covering system.
2. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 3/16 in.

D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.

E. Non-slip Broom Finish: Apply a non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

F. Non-slip Aggregate Finish: Apply non-slip aggregate finish to concrete stair treads, platforms, ramps, sloped walks.

1. After completing float finishing and before starting trowel finish, uniformly spread 25 lbs. of dampened non-slip aggregate per 100 sq. ft. of surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as specified.
2. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose non-slip aggregate.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.11 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than seven (7) days.

C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.

D. Provide moisture curing by the following methods:

1. Keep concrete surface continuously wet by covering with water.
2. Use continuous water-fog spray.
3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a four (4) inch lap over adjacent absorptive covers.

E. Provide moisture-retaining cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least three (3) inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

F. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:

1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within two (2) hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.
2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

G. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.

1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.12 REMOVING FORMS

A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for twenty-four (24) hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

3.13 REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Architect.

3.14 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than one (1) inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
2. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other

projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
2. Correct high areas in unformed surfaces by grinding after concrete has cured at least fourteen (14) days.
3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.
4. Repair defective areas, except random cracks and single holes not exceeding one (1) inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

D. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

E. Repair methods not specified above may be used, subject to acceptance of Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. An independent Testing Laboratory, chosen by the Owner, will be retained for this project to perform such laboratory services as are required. For all daily pours in excess of thirty-five (35) yards, the Owner will pay all laboratory charges, but for pours less than thirty-five (35) yards, the Owner will pay the laboratory charges and deduct said charges from any monies due the Contractor. The engagement of this laboratory will in no way relieve the Contractor of his responsibility to furnish materials and construction in conformance with the drawings and specifications.

B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
   a. Slump: ASTM C 143; one (1) test at point of discharge (at the truck before adding plasticizers) for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
   b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one (1) for each day's pour of each type of air-entrained concrete.
   c. Concrete Temperature: ASTM C 1064; one (1) test hourly when air temperature is 40 degrees F and below, when 80 degrees F and above, and one (1) test for each set of compressive-strength specimens
   d. Compression Test Specimen: ASTM C 31; one (1) set of four (4) standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
   e. Compressive-Strength Tests: ASTM C 39; one (1) set for each day's pour exceeding five (5) cu. yds. plus additional sets for each fifty (50) cu. yds. more than the first twenty-five (25) cu. yds. of each concrete class placed in any one (1) day; one specimen tested at seven (7) days, two specimens tested at twenty-eight (28) days, and one specimen retained in reserve for later testing if required.

2. When frequency of testing will provide fewer than five (5) strength tests for a given class of concrete, conduct testing from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used. When total quantity of a given class of concrete is less than fifty (50) cu. yds., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
4. Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

C. Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within twenty-four (24) hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at twenty-eight (28) days, concrete mix proportions and materials, compressive breaking strength, and type of break for both seven (7) day tests and twenty-eight (28) day tests.

D. Any material or workmanship that is rejected by the SER and/or the Testing Agency either at the plant or at the job site, shall be replaced promptly by the Contractor to the satisfaction of the SER at no expense of the Owner.

E. Non-destructive Testing: Impact hammer, sonoscope, or other non-destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

F. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION 03 30 00

SECTION 061000 - 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. Framing with engineered wood products.
3. Wood blocking, cants, and nailers.
4. Wood furring and grounds.
5. Wood sleepers.
6. Utility shelving.
7. Plywood backing panels.

B. Related Requirements:
1. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.
2. Section 061753 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.

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. 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.

1.4 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.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.

2. Engineered wood products.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.5 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. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

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.

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 concrete walls.
4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 19 percent for 2-inch nominal (38-mm actual) thickness or less.

B. Non-Load-Bearing Interior Partitions: Standard, Stud, or No. 3 grade of any species.

C. Exterior and Load-Bearing Walls: No.2 or No. 3 grade and any of the following species:

1. Hem-fir (north); NLGA.
2. Southern pine; SPIB.
3. Douglas fir-larch; WCLIB or WWPA.
4. Mixed southern pine; SPIB.
5. Spruce-pine-fir; NLGA.
6. Douglas fir-south; WWPA.
7. Hem-fir; WCLIB or WWPA.
8. Douglas fir-larch (north); NLGA.
9. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

D. Ceiling Joists (Non-Load-Bearing): No.2 or No. 3 grade of any species.

E. Joists, Rafters, and Other Framing Not Listed Above: Construction, Stud, or No. 3 grade and any of the following species:

1. Hem-fir (north); NLGA.
2. Southern pine; SPIB.
3. Douglas fir-larch; WCLIB or WWPA.
4. Mixed southern pine; SPIB.
5. Spruce-pine-fir; NLGA.
6. Douglas fir-south; WWPA.
7. Hem-fir; WCLIB or WWPA.
8. Douglas fir-larch (north); NLGA.
9. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.4 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Boise Cascade Corporation.
   b. Finnforest USA.
   c. Georgia-Pacific.
   d. Louisiana-Pacific Corporation.
   e. Pacific Woodtech Corporation.
   f. Roseburg Forest Products Co.
   g. Weldwood of Canada Limited; Subsidiary of International Paper Corporation.
   h. Weyerhaeuser Company.
   i. Or approved equal

B. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Weyerhaeuser Company.
   b. Or approved

2. Extreme Fiber Stress in Bending, Edgewise: 2900 psi (20 MPa) for 12-inch nominal-(286-mm actual-) depth members.
3. Modulus of Elasticity, Edgewise: 2,200,000 psi (15 100 MPa).

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.
7. Utility shelving.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Spruce-pine-fir; NLGA.
3. Hem-fir; WCLIB or WWPA.
4. Northern species; NLGA.

C. Utility Shelving: Lumber with 15 percent maximum moisture content of any of the following species and grades:

1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.

D. 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.

E. 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.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpine Engineered Products, Inc.
2. Cleveland Steel Specialty Co.
3. Harlen Metal Products, Inc.
4. KC Metals Products, Inc.
5. Simpson Strong-Tie Co., Inc.
6. Southeastern Metals Manufacturing Co., Inc.
7. USP Structural Connectors.

B. Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.

1. Thickness: 0.050 inch (1.3 mm)..

C. Bridging: Rigid, V-section, nailless type, 0.050 inch (1.3 mm) thick, length to suit joist size and spacing.

D. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch (25 mm) above base and with 2-inch- (50-mm-) minimum side cover, socket 0.062 inch (1.6 mm) thick, and standoff and adjustment plates 0.108 inch (2.8 mm) thick.

E. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

F. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

G. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Metal Framing Anchors: Install metal framing 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. 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.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

G. Sort and select lumber so that natural characteristics will 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.

H. Comply with AWPA 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.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

J. 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 between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD GROUND, SLEEPER, 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.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WALL AND PARTITION FRAMING INSTALLATION

A. General: Use advanced framing techniques to minimize the amount of stud wall framing lumber and to maximize the amount of insulation in the walls. Provide single top and bottom plates unless where noted on the plans using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction, unless otherwise indicated.

B. Construct corners and intersections using advanced framing techniques to maximize the amount of insulation and to provide required nailing surfaces.

C. Frame openings as shown on the plans and using advanced framing techniques to maximize insulation and to provide required nailing surfaces..

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 follows:

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 1/3 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.

H. Provide bridging of type indicated below, at intervals of 96 inches (2438 mm) o.c., between joists.

3.5 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

B. Rafters: Notch to fit exterior wall plates and[toe nail or] use metal framing anchors. 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.

C. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.6 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, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

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SECTION 061600 - SHEATHING

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.

B. Related Requirements:

   1. Section 061000 "Rough Carpentry" for plywood backing panels.
   2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.
   3. Section 07 30 01 Roofing and Flashing for roofing underlayment over roof sheathing.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural I sheathing.

   1. Span Rating: Not less than 16/0.
   2. Nominal Thickness: Not less than 1/2 inch.

2.2 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior, Structural I sheathing.

1. Span Rating: Not less than 16/0
2. Nominal Thickness: Not less than 5/8 inch.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

2.4 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 or ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

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. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:

a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
b. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION 061600

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SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

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 wood roof trusses.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
   1. Design Loads: As specified in the Massachusetts State Building Code
   2. Maximum Deflection Under Design Loads:
      a. Roof Trusses: Vertical deflection of 1/360 of span AND AS REQUIRED BY CODE TO SUPPORT THE LOAD FOR AN UNHEATED BUILDING.
      b. Roof Truss at West Bathhouse should assume an additional 2.5 PSF dead-load on the eastern side of the roof to accommodate potential future photovoltaic panels installed by others.
      c. Refer to Structural Drawings for specific connections and details related to the truss assemblies.

1.5 SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer. Shop Drawings are a delegated design and shall contain the stamp and signature of a professional structural engineer licensed in the Commonwealth of Massachusetts. Show fabrication and installation details for trusses.
   1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
   2. Indicate sizes, stress grades, and species of lumber.

3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
5. Show splice details and bearing details.
6. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.

D. 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 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Source Limitations for Connector Plates: Obtain metal connector plates from a single manufacturer.

D. Comply with applicable requirements and recommendations of the following publications:
1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

E. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.

2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 COORDINATION

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded 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. Provide dressed lumber, S4S.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Grade and Species: For truss chord and web members, provide dimension lumber of any species, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

C. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Division 6 Section "Rough Carpentry."

2.2 METAL CONNECTOR PLATES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpine Engineered Products, Inc.
2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
3. CompuTrus, Inc.
4. Eagle Metal Products.
5. Jager Building Systems, Inc.

6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
7. Robbins Engineering, Inc.
8. TEE-LOK Corporation; a subsidiary of Berkshire Hathaway Inc.
9. Truswal Systems Corporation.

C. General: Fabricate connector plates to comply with TPI 1.

D. Hot-Dip 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); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for interior locations where stainless steel is not indicated.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. 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.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below 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 per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.4 METAL TRUSS ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cleveland Steel Specialty Co.
2. Harlen Metal Products, Inc.
3. KC Metals Products, Inc.
4. Simpson Strong-Tie Co., Inc.

5. Southeastern Metals Manufacturing Co., Inc.
6. USP Structural Connectors.
7. or approved equal

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. 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, G60 (Z180) coating designation.

D. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of truss and fastens to both sides of truss, top plates, and one side of stud below.

E. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick. Clip is fastened to truss through slotted holes to allow for truss deflection.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.6 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in truss accessories according to manufacturer's fastening schedules and written instructions.

H. Securely connect each truss ply required for forming built-up girder trusses.

I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

J. Install wood trusses within installation tolerances in TPI 1.

K. Do not cut or remove truss members.

L. Replace wood trusses that are damaged or do not meet requirements.

3.2 REPAIRS AND 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, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

C. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

D. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.

1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION 061753

SECTION 062000 - FINISH CARPENTRY

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 and Interior trim.
2. Plywood siding panels on interior of buildings
3. Plywood soffits.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.

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.

1.4 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.

1.5 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.

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.

PART 2 - PRODUCTS

2.1 EXTERIOR AND INTERIOR TRIM

A. Lumber Trim for Semitransparent-Stained Finish:
1. Species and Grade: Hem-fir, pressure-preservative treated; 1 Common; NLGA, WCLIB, or WWPA.
2. Species and Grade: Southern pine, pressure-preservative treated; B & B SPIB.
3. Maximum Moisture Content: 19 percent.
4. Finger Jointing: Not allowed.
5. Face Surface: Surfaced (smooth).

B. Lumber Trim for Opaque-Stained or Painted Finish:
1. Species and Grade: Hem-fir, 1 Common NLGA, WCLIB, or WWPA.
2. Species and Grade: Eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods; Finish or 1 Common (Colonial) NeLMA, NLGA, WCLIB, or WWPA.
3. Maximum Moisture Content: 19 percent.
4. Finger Jointing: Allowed if made with wet-use adhesive complying with ASTM D 5572.
5. Face Surface: Surfaced (smooth).

2.2 WOOD SLAT CEILINGS

A. Lumber Trim for Semitransparent-Stained Finish:
1. Species and Grade: Hem-fir, pressure-preservative treated; 1 Common; NLGA, WCLIB, or WWPA.
2. Species and Grade: Southern pine, pressure-preservative treated; B & B SPIB.
3. Maximum Moisture Content: 19 percent.
4. Finger Jointing: Not allowed.
5. Face Surface: Surfaced (smooth).

2.3 LUMBER SIDING

A. Species and Grade: Grade A western red cedar; NLGA, WCLIB, or WWPA.

B. Pattern: Bevel siding, S1S2E, actual overall dimensions of 5-1/2 by 11/16 inch (140 by 17 mm) measured on the face and thick edge at 19 percent moisture content.

2.4 PLYWOOD SIDING AT INTERIOR SPACES

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 Building Products.
2. Hardel Mutual Plywood Corporation.
3. Stimson Lumber Company, Inc.
4. Or equal.

B. Plywood Type: APA-rated siding in panel sizes indicated.

1. Basis of Design: Georgia-Pacific Plytanium Panels

C. Thickness: 19/32 inch (15.1 mm).

D. Face Species: Manufacturer's standard

E. Pattern: Texture 1-11; grooves 4 inches (101.6 mm) o.c.

F. Surface: Scratch Sand.

2.5 PLYWOOD SIDING AT FILTER ROOM, STORAGE ROOM, AND JANITOR'S CLOSETS

A. Plywood Type: Exterior, Grade C-C, plugged and touch sanded.

B. Thickness: 1/2 inch (12.7 mm).

C. Face Species: Southern pine or Douglas fir.

D. Pattern: Plain

E. Surface: Smooth

2.6 PLYWOOD SOFFITS

A. Plywood Type: Exterior, Grade A-C.

B. Thickness1/2 inch (12.7 mm).

C. Face Species: Southern pine or Douglas fir.

D. Pattern: Plain.

E. Surface: Smooth.

2.7 MISCELLANEOUS MATERIALS

A. Fasteners for Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

1. For face-fastening siding, provide ringed-shank stainless steel siding nails.
2. For applications not otherwise indicated, provide stainless-steel fasteners.

B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

2.8 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches (125 mm), except members with ends exposed in finished work.

B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) 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 trim to be painted or stained, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Division 9 Section " Painting."

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.

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 (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
3. treads and risers within each flight.
4. Coordinate 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 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 (610 mm) long except where necessary.

1. Use scarf joints for end-to-end joints.
2. Stagger end joints in adjacent and related members.

C. Fit 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.

D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 SIDING INSTALLATION

A. Horizontal Lumber Siding: Apply starter strip along bottom edge of sheathing or sill. Install first course of siding with lower edge at least 1/8 inch (3 mm) below starter strip and subsequent courses lapped 1 inch (25 mm) over course below. Nail at each stud. Do not allow nails to penetrate more than one thickness of siding.

1. Leave 1/8-inch (3-mm) gap at trim and corners unless otherwise recommended by manufacturer, and apply sealant.
2. Butt joints only over framing or blocking, nailing top and bottom on each side and staggering joints in subsequent courses.

B. Plywood Siding: Install panels with edges over framing or blocking. Nail at 6 inches (150 mm) o.c. at panel perimeter and 12 inches (300 mm) o.c. at intermediate supports unless manufacturer recommends closer spacing. Leave 1/16-inch (1.5-mm) gap between adjacent panels and 1/8-inch (3-mm) gap at perimeter, openings, and horizontal joints unless otherwise recommended by panel manufacturer.

1. Seal butt joints at inside and outside corners and at trim locations.

C. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.

3.6 ADJUSTING

A. Replace 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 semiexposed 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 062000

SECTION 064000 – ARCHITECTURAL WOODWORK

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. Plastic-laminate cabinets.
   2. Plastic-laminate countertops.
   3. Solid Surfacing countertops.
   4. Counter Support System and Grommets

B. Related Sections include the following:

   1. Division 6 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

   2. Division 22 -Plumbing for coordination of faucets and drain assemblies.

1.3 DEFINITIONS

A. Architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories.

B. Product Data: For plywood, high-pressure decorative laminate, adhesive for bonding plastic laminate.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural woodwork.

D. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
   1. Plastic laminates.
   2. Solid Surface Material

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

A. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:

a. Formica Corporation.
b. Laminart.
c. Pioneer Plastics Corp.
d. Westinghouse Electric Corp.; Specialty Products Div.
e. Wilsonart International; Div. of Premark International, Inc.

C. Adhesive for Bonding Plastic Laminate: Contact cement.

D. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Avonite, Inc.
b. E. I. du Pont de Nemours and Company.
c. Formica Corporation.
d. Nevamar Company, LLC; Decorative Products Div.
e. Swan Corporation (The).
f. Wilsonart International; Div. of Premark International, Inc.
2. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

C. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

D. Counter Mounting Brackets: Provide RAAKS, EH 1818 Counter Support System or equal. Brakets. L-shaped bracket fabricated from aluminum T sections designed for supporting counters at a maximum spacing of 32 inches O.C.
   1. Material: Fabricate components from extruded aluminum sections complying with ASTM B221, 6063-T5 alloy and temper.
   2. Factory applied finishes: Exposed aluminum surfaces shall be free of scratches and other serious blemishes and be factory finished with aluminum mill finish.

E. Grommets: Provide 3 inch diameter grommets at no more than 24 inches OC. For all countertops. Provide Douglas Mocket XG Flip-Top® Series - 3" hole, or equal. Color to be selected by Architect.

2.3 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide Premium grade woodwork complying with the referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

D. Complete fabrication, including assembly and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

   1. Seal edges of openings in countertops with a coat of varnish.

2.5 PLASTIC-LAMINATE SUPPORTS AND SHELVING

A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.

B. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: HGS.
2. Vertical Surfaces: HGS.
3. Edges: HGS.

C. Materials for Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS
2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Provide Architect's selections from laminate manufacturer's full range of colors and finishes in the following categories:

   a. Solid colors.
   b. Patterns.

2.6 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.

B. Grade: Premium

C. High-Pressure Decorative Laminate Grade: HGS.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Provide Architect's selections from manufacturer's full range of colors and finishes in the following categories:

   a. Solid colors.
   b. Patterns.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: Particleboard or Exterior-grade plywood.

G. Core Material at Sinks: Exterior-grade plywood.

2.7 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Grade: Custom.

B. Solid-Surfacing-Material Thickness: 1/2 inch (13 mm) or 3/4 inch (19 mm) where indicated.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:

D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
   1. Fabricate tops with shop installed or loose backsplashes for field application.

E. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

E. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064000

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SECTION 066000 - FIBERGLASS REINFORCED PLASTICS (FRP) FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Engineer, Furnish, and fabricate (where necessary), and install all fiberglass reinforced plastic (FRP) items, with all appurtenances, accessories and incidentals necessary to produce a complete, operable and serviceable installation as shown on the Contract Drawings and as specified herein, and in accordance with the requirements of the Contract Documents. Items include:
   1. Grating and supports at pool pump pit.
   2. Trench Drain Grate and Frame at Shower Rooms

1.3 REFERENCES

A. The publications listed below (latest revision applicable) form a part of this specification to the extent referenced herein. The publications are referred to within the text by the designation only.

B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) Test Methods:
   1. ASTM D 635 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
   2. ASTM E 84 Surface Burning Characteristics of Building Materials

1.4 SUBMITTALS

A. Furnish shop drawings of all fabricated gratings and accessories in accordance with the provisions of this Section.

B. Furnish manufacturer's shop drawings clearly showing material sizes, types, styles, part or catalog numbers, complete details for the fabrication and erection of components including, but not limited to, location, lengths, type and sizes of fasteners, clip angles, member sizes, and connection details.

C. Submit the manufacturer’s published literature including structural design data, structural properties data, grating load/deflection tables, corrosion resistance tables, certificates of compliance, test reports as applicable, concrete anchor systems and their allowable load tables, and design calculations for systems not sized or designed in the contract documents.

1.5 QUALITY ASSURANCE

A. All items to be provided under this Section shall be furnished only by manufacturers having a minimum of ten (10) years experience in the design and manufacture of similar products and systems. Additionally, if requested, a record of at least five (5) previous, separate, similar successful installations in the last five (5) years shall be provided.

B. Manufacturer shall offer a 3 year limited warranty on all FRP products against defects in materials and workmanship.

C. Manufacturer shall be certified to the ISO 9001-2000 standard.

D. Manufacturer shall provide proof of certification from at least two other quality assurance programs for its facilities or products (UL, DNV, ABS, USCG, AARR).

1.6 PRODUCT DELIVERY AND STORAGE

A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken pallets, packages, containers, or bundles bearing the label of the manufacturer. Adhesives, resins and their catalysts and hardeners shall be crated or boxed separately and noted as such to facilitate their movement to a dry indoor storage facility.

B. Storage of Products: All materials shall be carefully handled to prevent them from abrasion, cracking, chipping, twisting, other deformations, and other types of damage. Adhesives, resins and their catalysts are to be stored in dry indoor storage facilities between 70 and 85 degrees Fahrenheit (21 to 29 degrees Celsius) until they are required.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Molded gratings and structural shapes shall be manufactured by
1. Fibergrate Composite Structures Inc. Dallas, Texas http://www.fibergrate.com.
2. Engineered Composite Systems, Belton, TX http://www.ecs-frp.com.
3. Strongwell, Bristol , VA http: http://www.strongwell.com.
4. Or equal

2.2 GENERAL- GRATING

A. All FRP items furnished under this Section shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.

B. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

C. Resins shall be VINYL ESTER or ISOPHTHALIC, with chemical formulations as necessary to provide the corrosion resistance, strength and other physical properties as required.

D. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

E. All pultruded structural shapes shall be further protected from ultraviolet (UV) light with 1) integral UV inhibitors in the resin and 2) a synthetic surfacing veil to help produce a resin rich surface.

F. All FRP products shall have a tested flame spread rating of 15 or less per ASTM E-84 Tunnel Test. Gratings shall also have a tested burn time of less than 30 seconds and an extent of burn rate of less than or equal to 10 millimeters per ASTM D635.

G. All grating clips shall be manufactured of Type 316SS (stainless steel).

2.3 PULTRUDED GRATING

A. Manufacture: Grating components shall be high strength and high stiffness pultruded elements having a maximum of 70% and a minimum of 60% glass content (by weight) of continuous roving and continuous strand mat fiberglass reinforcements. The finished surface of the product shall be provided with a surfacing veil to provide a resin rich surface which improves corrosion resistance and resistance to ultraviolet degradation. Bearing bars shall be interlocked and epoxied in place with a two piece cross rod system to provide a mechanical and chemical lock. Cross rods should be below the walking surface of the grating. Gratings with cross rods that are flush with the walking surface are excluded.

B. Non-slip surfacing: Grating shall be provided with a quartz grit bonded and baked to the top surface of the finished grating product.

C. Fire rating: Grating shall be fire retardant with a tested flame spread rating of 15 or less when tested in accordance with ASTM E 84. Manufacturer may be required to provide certification of ASTM E84 test on grating panels from an independent testing laboratory. Test data shall be from full scale testing of actual production grating, of the same type and material supplied on the project. Test data performed only on the base resin shall not be acceptable.

D. Resin system: The resin system used in the manufacture of the grating shall be {VEFR or ISOFR - choose one}. Manufacturer may be required to submit corrosion data from tests performed on actual grating products in standard chemical environments. Corrosion resistance data of the base resin from the manufacturer is not a true indicator of grating corrosion resistance and shall not be accepted.

E. Color: Gray or Yellow.

F. Minimum Depth: 1" deep load bars with a tolerance of plus or minus 1/32". Provide deeper load bars as required to meet span.

G. Load/Deflection: Grating shall meet manufacturers published safe recommended loadings with deflection not to exceed the following:

H. Uniform distributed load over a 48" span: 50 pounds per square foot, with a maximum deflection of 0.10".

2.4 GRATING FABRICATION

A. Measurements: Grating supplied shall meet the dimensional requirements and tolerances as shown or specified. The Contractor shall provide and/or verify measurements in field for work fabricated to fit field conditions as required by grating manufacturer to complete the work. When field dimensions are not required, contractor shall determine correct size and locations of required holes or cutouts from field dimensions before grating fabrication.

B. Layout: Each grating section shall be readily removable, except where indicated on drawings. Manufacturer to provide openings and holes where located on the contract drawings. Grating openings which fit around protrusions (pipes, cables, machinery, etc.) shall be discontinuous at approximately the centerline of opening so each section of grating is readily removable.

C. Sealing: All shop fabricated grating cuts shall be coated with vinyl ester resin to provide maximum corrosion resistance. All field fabricated grating cuts shall be coated similarly by the contractor in accordance with the manufacturer's instructions.

D. Hardware: Type 316 stainless steel hold-down clips shall be provided and spaced at maximum of four feet apart with a minimum of four per piece of grating, or as recommended by the manufacturer.

2.5 GENERAL- STRUCTURAL SHAPES:

A. All structural shapes are to be manufactured by the pultrusion process with a glass content minimum of 45%, maximum of 55% by weight. The structural shapes shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.

B. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

C. Resins shall be non-fire retardant isophthalic polyester; ISOFR, fire retardant isophthalic polyester or VEFR, fire retardant vinyl ester, (choose one)} with chemical formulation necessary to provide the corrosion resistance, strength and other physical properties as required.

D. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

E. All pultruded structural shapes shall be further protected from ultraviolet (UV) attack with 1) integral UV inhibitors in the resin and 2) a synthetic surfacing veil to produce a resin rich surface.

F. All FRP products shall have a tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test.

G. Pultruded structural shapes are to have the minimum longitudinal mechanical properties listed below:

Property	**ASTM Method**	**Value**	**Units**
Tensile Strength	D-638	30,000 (206)	psi (MPa)
Tensile Modulus	D-638	2.5×10^6 (17.2)	psi (GPa)
Flexural Strength	D-790	30,000 (206)	psi (MPa)
Flexural Modulus	D-790	1.8×10^6 (12.4)	psi (GPa)
Flexural Modulus (Full Section)	N/A	2.8×10^6 (19.3)	psi (GPa)
Short Beam Shear (Transverse)	D-2344	4,500 (31)	psi (MPa)
Shear Modulus (Transverse)	N/A	4.5×10^5 (3.1)	psi (GPa)
Coefficient of Thermal Expansion	D-696	4.4×10^{-6} (8.0×10^{-6})	in/in/°F (cm/cm/°C)
Flame Spread	E-84	25 or less	N/A

PART 3 - EXECUTION

3.1 INSPECTION

A. Shop inspection is authorized as required by the Owner and shall be at Owner's expense. The fabricator shall give ample notice to Contractor prior to the beginning of any fabrication work so that inspection may be provided. The grating shall be as free, as commercially possible, from

visual defects such as foreign inclusions, delamination, blisters, resin burns, air bubbles and pits. The surface shall have a smooth finish (except for grit top surfaces).

3.2 INSTALLATION

A. Contractor shall install gratings in accordance with manufacturer's assembly drawings. Fasten grating panels securely in place with hold-down fasteners as specified herein. Field cut and drill fiberglass reinforced plastic products with carbide or diamond tipped bits and blades. Seal cut or drilled surfaces in accordance with manufacturer's instructions. Follow manufacturer's instructions when cutting or drilling fiberglass products or using resin products; provide adequate ventilation.

END OF SECTION 06610

SECTION 072500 - 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 wrap over exterior wall sheathing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

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: Subject to compliance with requirements, provide products by one of the following:

      a. DuPont Building Innovations: E. I. du Pont de Nemours and Company.
      b. Pactiv Corporation.
      c. Raven Industries, Inc.
      d. Or equal

   2. Water-Vapor Permeance: Not less than **20 perms (1150 ng/Pa x s x sq. m)** per ASTM E 96/E 96M, Desiccant Method (Procedure A).
   3. Air Permeance: Not more than 0.001 cfm/sq. ft. at 0.3-inch wg (0.02 L/s x sq. m at 75 Pa) 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.

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 (13 mm) 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 (100-mm) 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.

END OF SECTION 072500

SECTION 07 30 01 – ROOFING AND SHEET METAL (FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 FILING SUB-BIDS

A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a separate sealed envelope with the Awarding Authority at a time and place stipulated in the Bidding Requirements.

1. The following should appear on the upper left hand corner of the envelope:

NAME OF BIDDER: _____

PROJECT: Veterans Memorial Pool
Bay Road, Patton Park
Hamilton, Massachusetts

SUB-BID FOR: Section 07 30 01 – ROOFING AND SHEET METAL

B. Every sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority, as required by Section 44F of Chapter 149 the General Laws as amended. Sub-Bid forms are included in this Project Manual or may be obtained at the office of the Architect.

C. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND, or CERTIFIED, TREASURER's, or CASHIER'S CHECK issued by a responsible bank or trust company payable to the *Town of Hamltont* in the amount of five percent of the Bid. A sub-bid accompanied by any other form of bid depository than those specified will be rejected.

D. Work to be done under this Section is shown on the Drawings:
1. A102, A201, A301, A601, A701, A112, A211, A311, A611, A612, A613, and A711
2. Work includes flashing and coordination with plumbing vents shown on Drawings P100, P101 and 102.
3. The listing of Contract Drawings above shall not limit the Subcontractors responsibility to determine the full extent of his work as required by all Contract Drawings.

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

F. Examine all other Sections of the Specifications for requirements, which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.2 SUB-SUB BID REQUIREMENTS:

A. None

1.3 SUMMARY:

A. This Section includes the following:
   1. Asphalt Shingle Roofing
   2. Sheet Metal Flashing and Trim
   3. Roof Accessories

B. Work of this section includes all scaffolding, staging, hoisting, and rigging required to perform the work.

C. Required sections: The following Sections contain requirements that are part of this Filed Sub-Bid Section:
   1. Section 07 31 13 – ASPHALT SHINGLE ROOFING
   2. Section 07 62 00 – SHEET METAL FLASHING AND TRIM

1.4 REFERNCES, DEFINITIONS, SYSTEM DESCRIPTION, SUBMITTALS,QUALITY ASSURANCE,DELIVERY, STORAGE, HANDLING, AND PROJECT CONDITIONS

A. Refer to individual Sections:
   1. Section 07 31 13 – ASPHALT SHINGLE ROOFING
   2. Section 07 62 00 – SHEET METAL FLASHING AND TRIM

PART 2 - PRODUCTS

2.1 GENERAL

A. Refer to individual Sections
   1. Section 07301 – ASPHALT SHINGLE ROOFING
   2. Section 07601 – SHEET METAL FLASHING AND TRIM

PART 3 - EXECUTION

2.2 GENERAL

A. Refer to individual Sections
   1. Section 07301 – ASPHALT SHINGLE ROOFING
   2. Section 07601 – SHEET METAL FLASHING AND TRIM

END OF SECTION 073001

SECTION 073113 - ASPHALT SHINGLES *(PART OF FILED SUB-BID SECTION 073001)*

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.

B. Related Sections:
   1. Division 6 Section "Sheathing" for roof sheathing.
   2. Division 7 Section "Sheet Metal Flashing and Trim" for flashings.

1.3 FILED SUB- BID

A. The Work of this Section is part of Filed Sub-Bid Section 073001 – ROOFING AND FLASHING

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 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of asphalt shingle, ridge and hip cap shingle, and ridge vent indicated.

   1. Include similar Samples of trim and accessories involving color selection.

C. Samples for Verification: For the following products, of sizes indicated, to verify color selected:

   1. Asphalt Shingle: Full size.
   2. Ridge and Hip Cap Shingles: Full size.
   3. Ridge Vent: 12-inch- (300-mm-) long Sample.
   4. Self-Adhering Underlayment: 12 inches (300 mm) square.

D. Qualification Data: For qualified Installer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.

F. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.

G. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain ridge and hip cap shingles from single source from single manufacturer.

C. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.

B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Manufacturing defects.
b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.

2. Material Warranty Period: Manufacturer's Lifetime Limited Warranty

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Asphalt Shingles: 100 sq. ft (9.3 sq. m) of each type, in unbroken bundles.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN

A. Basis of design: Design is based on Asphalt Fiber Glass Shingles manufactured by:

Certain Teed Coporation, Architectural Support Group
PO Box 860
Valley Forge, PA 19482
800-233-8990

1. CertainTeed Grand Manor: UL Certification of ASTM D3462; conforms to ASTM D3018 Type 1-Self Sealing, ASTM D3161-03b, Class "F" Wind Restistance (110-mph), ASTM D3161-991, 110-mph Wind Resistance.
2. Color and Blends: "Red" As selected by Architect from manufacturer's full range.

B. Products of other manufacturers equal to the basis of design shall be acceptable for use in the Work. Manufacturers include, but are not limited to:
a. Elk Premium Building Products, Inc.; an ElkCorp company.
b. GAF Materials Corporation.
c. IKO.
d. Owens Corning.

2.2 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 4869, Type II, asphalt-saturated organic felts, nonperforated.

B. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970, minimum of 40-mil-(1.0-mm-) thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carlisle Coatings & Waterproofing, Inc.

b. Grace, W. R. & Co. - Conn.
c. Henry Company.
d. Or equal

2.3 RIDGE VENTS

A. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. GAF Materials Corporation.
b. Obdyke, Benjamin Incorporated.
c. TAMKO Roofing Products, Inc.
d. Or equal

2.4 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum or stainless-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, barbed shank, 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. Provide a minimum of 6 nails per shingle per the Rhode Island State Building Code.

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.

2.5 METAL FLASHING AND TRIM

A. 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. 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 (9.6-mm) drip at lower edge.

B. 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 provision has 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 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. 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 roofing nails.

C. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated on Drawings, lapped in direction to shed 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.

3.3 METAL FLASHING INSTALLATION

A. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.

C. Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing.

D. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT SHINGLE INSTALLATION

A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. 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.

C. 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.

D. Ridge and Hip Cap 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 073113

SECTION 073129 - WOOD 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 wood shingles.

B. Related Sections include the following:

1. Section 061000 - Rough Carpentry for wood sheathing and wall underlayment.
2. Section 062000 – Finish Carpentry for wood trim.
3. Section 076200- Flashing and Sheet metal for wall flashing installed integrally with shingles.
4. Division 9 Section – Painting for Dipping and Field Finishing of shingles.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to 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.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Selection: For each type of wood shingle indicated.

1.5 QUALITY ASSURANCE

A. Grading Agency Qualifications: An independent testing and inspecting agency recognized by authorities having jurisdiction as qualified to label wood shingles for compliance with referenced grading rules.

B. Source Limitations: Obtain wood shingles through one source from a single manufacturer.

PART 2 - PRODUCTS

2.1 WALL SHINGLES

A. Cedar Wall Shingles: Rebutted and rejointed, smooth-sawn western red cedar shingles.

1. Grading Standards: CSSB's "Grading Rules for Certigrade Red Cedar Shingles."
2. Grade: No. 1 .
3. Finish: Natural.
4. Size: 16 inches (405 mm) long; 0.40 inch (10 mm thick at butt.

2.2 FASTENERS

A. Use stainless steel nails.

2.3 METAL FLASHING AND TRIM

A. Sheet Metal Flashing and Trim: Comply with requirements in Section 07620 Sheet Metal Flashing and Trim.

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 work. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 PREPARATION

A. All shingles shall be back-primed or dipped prior to installation. Coordinate application of back-priming or dipping operation with Section 09990 – Painting.

3.3 WALL SHINGLE INSTALLATION, SINGLE COURSED

A. Install wood wall shingles according to manufacturer's written instructions and recommendations in CSSB's "Design and Application Manual for Exterior and Interior Walls."

B. Install wood shingles, beginning at base of wall, with a double-layer starter course in a continuous straight line. Offset joints of double-layer starter course a minimum of 1-1/2 inches (38 mm).

C. Install first course of wood shingles over starter course. Install second and succeeding courses of wood shingles, offsetting joints between shingles in succeeding courses a minimum of 1-1/2 inches (38 mm).

1. Install shingles in continuous straight-line courses.
2. Fasten each shingle with 2 concealed nails spaced 3/4 to 1 inch (19 to 25 mm) from edge of shingle and 1 inch (25 mm) above butt line of subsequent course. For shingles wider than 8 inches (200 mm,) add 2 concealed fasteners to the center of shingle spaced 1 inch (25 mm) apart. Drive fasteners flush with top surface of shingles without crushing wood.
3. Maintain weather exposure of 4 ½ inches.

END OF SECTION 073129

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SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM
(PART OF FILED SUB-BID SECTION 07 30 01)

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 the following formed products:
   1. Formed roof drainage sheet metal fabrications.
   2. Formed low-slope roof sheet metal fabrications.
   3. Formed wall sheet metal fabrications.

B. Related Sections:

   1. Division 06 Section 06 10 00 Rough Carpentry for wood nailers, curbs, and blocking.
   2. Division 07 Section 07 31 13 Asphalt Shingles for installing sheet metal flashing and trim integral with roofing.

1.3 FILED SUB- BID

A. The Work of this Section is part of Filed Sub-Bid Section 07 30 01 – ROOFING AND SHEET METAL

1.4 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of special conditions.
7. Details of connections to adjoining work.

C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

D. Qualification Data: For qualified fabricator.

E. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

F. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to sheet metal flashing and trim.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
   1. Exposed Coil-Coated Finishes:
      a. Four-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat and clear coats. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   2. Color: As selected by Architect from manufacturer's full range.
   3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.2 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.

B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

C. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
      b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
      c. Henry Company; Blueskin PE200 HT.
      d. Or approved equal

D. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   a. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manualfor application, but not less than thickness of metal being secured.

F. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints only where necessary for strength.

G. Do not use graphite pencils to mark metal surfaces.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers,[gutter bead reinforcing bars,] and gutter accessories from same metal as gutters.

1. Gutter Style: SMACNA designation Half Round Gutter 4 inch
2. Expansion Joints: Lap type.
3. Accessories: Wire ball downspout strainer.
4. Gutters with Girth up to 15 Inches (380 mm): Fabricate from the following materials:
   a. Aluminum: 0.032 inch (0.81 mm)thick.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Fabricated Hanger Style: SMACNA figure designation round
2. Fabricate from the following materials:
   a. Aluminum: 0.024 inch (0.61 mm).

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates.

1. Joint Style: Lap, 4 inches (100 mm) wide.
2. Fabricate from the following materials:
   a. Aluminum: 0.050 inch (1.27 mm) thick

B. Base Flashing: Fabricate from the following materials:
1. Aluminum: 0.040 inch (1.02 mm) thick.

C. Counterflashing: Fabricate from the following materials:
1. Aluminum: 0.032 inch (0.81 mm) thick.

2.7 METAL FLASHING AND TRIM AT ASPHALT SHINGLES

A. 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. Step Flashings: Fabricate with a headlap of 2 inches (50 mm) and a minimum extension of 4 inches (100 mm) over the underlying asphalt shingle and up the vertical surface.
   2. Flashings: Fabricate with concealed flange extending a minimum of 18 inches (450 mm) beneath upslope asphalt shingles and 6 inches (150 mm)] beyond each side of roof tope equipment and 6 inches (150 mm)]above the roof plane.
   3. Drip Edges: Fabricate in lengths not exceeding 10 feet (3 mwith 2-inch (50-mm) roof-deck flange and 1-1/2-inch (38-mm) fascia flange with 3/8-inch (9.6-mm) drip at lower edge.

2.8 METAL FLASHING AT HORIZONTAL WALL TRIM AND SIDING

A. Horizontal Joint Flashing for Finish Carpentry Wall Trim, Siding, and Shingles: Preformed, **prefinished-aluminum**, Z-shaped flashing.
   1. Color to be selected by architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws, metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as shown and as required for watertight construction.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored straps spaced not more than 36 inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Loosely lock straps to front gutter bead and anchor to roof deck.
3. Anchor and loosely lock back edge of gutter to continuous cleat.
4. Anchor gutter with spikes and ferrules spaced not more than [24 inches (600 mm)] [30 inches (750 mm)] <Insert dimension> apart.
5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.
2. Provide elbows at base of downspout to direct water away from building.
3. Connect downspouts to underground drainage system indicated.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions,] and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with sealant. Secure in a waterproof manner by means of interlocking folded seam or blind rivets and sealant.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 079200 - JOINT SEALANTS

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:

B. This Section includes exterior and interior sealants. Work includes, but is not limited to:
1. General exterior joints of louvers, door frames, concrete, siding and all other joints not included otherwise.
2. Interior and exterior joints in slabs on grade, concrete sidewalks.
3. **Joint between all plumbing fixtures, counters in toilets rooms and staff areas, family changing, and their adjacent substrate**.
4. Joints between HDPE panels and adjacent surfaces in all showers.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the

end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

B. Additional Movement Capability: Where additional movement capability is specified in the Elastomeric Joint-Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

C. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Continuous-Immersion-Test-Response Characteristics: Where elastomeric sealants will be immersed continuously in water, provide products that have undergone testing according to ASTM C 1247, including initial six-week immersion period and additional immersion periods specified below, and have not failed in adhesion or cohesion when tested with substrates indicated for Project.

1. One additional four-week immersion period.
2. Two additional four-week immersion periods.
3. Three additional four-week immersion periods.

E. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
1. ping.

2.4 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, of type, size, and density to control sealant depth and otherwise contribute to producing optimum sealant performance recommended by sealant manufacturer.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 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, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
   a. Concrete.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
   a. Metal.
   b. Glass.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on 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 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.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type 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.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

E. Install sealants by proven techniques to 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 provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified 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.

3.4 CLEANING

A. Clean off excess sealants 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.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.6 ELASTOMERIC JOINT-SEALANT SCHEDULE

A. Low-Modulus Nonacid-Curing Silicone Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
1. Products
   a. 790; Dow Corning.

b. Silpruf SCS2000,GE Silicones.
c. 890; Pecora Corporation.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O. Use O substrates include ferrous metal, color anodic aluminum, aluminum coated with a high-performance coating, and galvanized steel,
6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
7. Applications: For general exterior joints of louvers, door frames, masonry, exterior and interior trim, and siding, and all other joints not included otherwise.

B. Mildew-Resistant Silicone Sealant: Where joint sealants of this type are indicated, provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:

1. Products:
   a. 786 Mildew Resistant; Dow Corning.
   b. Sanitary 1700; GE Silicones.
   c. 898 Silicone Sanitary Sealant; Pecora Corporation.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
6. Use O Joint Substrates include ceramic tile, vitrious china, plastic laminate, wood, and gypsum wall board.
7. Applications: Joint between all plumbing fixtures, counters in bath rooms and kitchens, and their adjacent substrate **(this is not noted on the drawings but required)**

C. Multi-component Urethane Sealant : Where joint sealants of this type are indicated, provide products complying with the following:

1. Products:
   a. Tremco; THC-901.
   b. Or equal
2. Type and Grade: M (multicomponent)
3. Class: 25.
4. Use Related to Exposure: T (traffic).
5. Uses Related to Joint Substrates: M, T and, as applicable to joint substrates indicated, O.
6. Applications: Horizontal joints in interior and exterior slabs on grade and concrete sidewalks.

END OF SECTION 079200

SECTION 08 15 00 - FIBERGLASS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work Includes: Fiberglass reinforced plastic doors and frames.

B. Related Work:
   1. Section 087100- Door Hardware for hardware.

1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Contract Documents.
   1. Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement and finish.
   2. Indicate door elevations and internal reinforcement.

1.4 DELIVERY, STORAGE AND PROTECTION

A. Deliver, handle and store doors and frames at the job site in such a manner as to prevent damage. Doors shall not be received before the building is enclosed. Only remove cartons upon arrival of doors at job site if cartons are wet or damaged. Doors shall be stored out of weather and/or extreme temperatures. The doors shall be stored in a vertical position on blocking, clear of the floor and with blocking between the doors to permit air circulation between the doors. All damaged or otherwise unsuitable doors and frames, when so ascertained, shall be immediately removed from the job site.

1.5 REGULATORY REQUIREMENTS

A. Install door and panel assembly conforming ANSI A117.1 specifications for handicap accessibility, ADA requirements, ANSI A151.1 Mod. swing cycle test in excess of 1,000,000 cycles.

B. unless operating conditions dictate otherwise.

C. Resins: Resins to meet with USDA and FDA standards for incidental food contact, if applicable to this project.

1.6 WARRANTY

A. To include one (1) year free from defects in materials and workmanship from date of shipment, and twenty (20) years from degradation or failure due to corrosion from date of shipment, provided that the structural integrity of the doors and frames have not been violated or compromised. (No unauthorized cuts, bores, or other structural alterations affecting the core of the door, or the structure of the frame.)

B. Normal wear and tear, or physical abuse of a specific installation is not part of this warranty.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN MANUFACTURERS

A. Products manufactured by Tiger Door, LLC, Greensburg, PA, 1-888-891-4416, www.tigerdoor.com.

B. This shall not limit the use of doors and frame by other manufacturers meeting the design and performance requirements specified in this Section.

2.2 DOORS

A. Door Fabrication FRP (Fiberglass Reinforced Plastic) Face Sheets

B. Face Sheets: Standard face sheets shall be manufactured using a corrosion resistant resin system with light stabilizing additives. The resin shall be reinforced with fiberglass, 40% by weight.

C. Face sheets shall be 0.070" to 0.125" in thickness. Standard being 0.120". Total door thickness to be a nominal 1-3/4".

D. Finish:
   1. Special gelcoat color to be selected by the architect
   2. 15 mils thick coverage, ±3 mils.
   3. Smooth, seamless finish

E. Internal Construction: Standard Polyurethane core. A 1-1/2" thick rigid block of polyurethane shall be laminated to the interior of the panels. The "R" factor shall be 11-12.

F. Stiles and Rails: Stiles and rails shall be 1-1/2" square pultruded fiberglass tubes. A polyester-based resin filled with 1/4" chopped glass strands and aerosil shall be used for reinforcements and corner blocks, etc. The bottom rail shall allow 1-1/4" inches of height alterability without loss of the panel's integrity. No metal or wood lumber reinforcements will be allowed.

G. Hardware Preparations
   1. Reinforcement Blocking;

a. Surface mounted hardware - non-swelling polymer blocking
b. Thru-bolted hardware - non-swelling polymer blocking
c. Mortise Hardware
d. Full mortise hinges - non-swelling polymer blocking
e. Exit devices - to suit template provided
f. All doors shall be mortised and reinforced to allow application of hinges and locks, in accordance with hardware schedule and manufacturer's templates. The hinges shall be attached by using stainless steel wood screws. Pilot holes shall be in strict accordance to manufacturer's recommendations.

H. Door Accessories
1. Astragals: Astragals for pairs of doors to be fabricated of FRP material of manufacturer's standard flat design.

2.3 FRAMES

A. Frame Fabrication FRP (Fiberglass Reinforced Plastic)
1. Jamb Depth: 5-3/4" standard.
2. Face Dimension: 2" standard jamb. 4 inch head.
3. Return: 7/16"
4. Stop: 5/8" Hospital stops
5. Rabbet: 1-15/16"
6. Corner Miter: Head and Jamb members shall be standard 45 degree miter, providing a neatly mitered corner connection, fabricated for Knocked Down (KD) field assembly.
7. Pultrusion: In compliance with pultrusion industry standards
8. Reinforcements and Braces/Supports
9. Corner Reinforcement: 4" x 4" x 5-3/8" x 1/4" thick pultruded fiberglass angle. Attached to head bar at factory using stainless steel screws or suitable polymer rivets.
10. Mortise Hinge Reinforcement: 1-1/2" x 7" x 1/4" thick polymer. Attached to frame by means of bonding and stainless steel countersunk screws.
11. Closer Reinforcement: Same as mortise hinge reinforcement, less screws.
12. Strike Reinforcement: 1-1/2" x 9" x 3/4" thick polymer material. Attached to frame by means of bonding and stainless steel countersunk screws or suitable polymer rivets.
13. Anchoring Systems
14. "T"-Strap or Wire Anchor for masonry construction

B. Finish: Gelcoat: 15 mils thick, ±3 mils on all exposed surfaces. Color to match door unless otherwise indicated.

2.4 FABRICATION

A. Fabricate FRP doors and frames as shown on the drawings and in accordance with best shop practices. Frames shall be rigid, neat in appearance and free from defects. Field measurements shall be taken as required for coordination with adjoining work.

B. Form exposed surfaces free from warp, wave and buckle, with all corners square, unless otherwise shown. Set each member in proper alignment and relationship to other members with all surfaces straight and in a true plane.

C. Reinforce members and joints with plates, tubes or angles for rigidity and strength.

D. Doors and frames shall be mortised and reinforced for hardware in accordance with the hardware manufacturer's instructions and templates. The reinforcing shall be designed to receive hinges, locks, strikes, closures, etc.

E. Mortar guard boxes shall be provided for hardware cutouts in frames.

F. Furnish at least three (3) metal anchors or polymer spacers in each jamb of frames up to 84" high and one (1) additional anchor for each 24" in height above 84", in shapes, sizes and spacing shown or required for anchorage into adjoining wall construction. Fabricate joint anchor of stainless steel.

G. Terminate bottom of frames at the indicated finished floor level.

H. Provide clearance for doors of 1/8" at jambs and heads; 1/4" clearance above threshold.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer shall examine the substrate and conditions under which fiberglass reinforced plastic work is to be installed and notify the General Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION

A. General: Install FRP doors, frames and accessories in accordance with final shop drawings. Installation to be similar to that of hollow metal doors and frames, and in accordance with FRP manufacturer's written instructions.

B. Frame Installation
   1. Place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged. Frame must not be drilled for brace supports as finish may be damaged.
   2. In masonry construction, locate three (3) wall anchors per jamb at hinge and strike levels. Frames may be grouted full of mortar at jambs and anchors shall be built into the joints as walls are laid up. A continuous bead of silicone sealant is to be applied between the head and jamb at the miter joint.

C. Door Installation

1. Fit FRP doors accurately in frames, within clearances specified in Paragraph 2.04H of this section.

3.3 TOLERANCES

A. Maximum Diagonal Distortion: 1/4" measured with a straight edge, corner to corner. Maximum measurable plane is 4'-0" x 7'-0".

3.4 ADJUSTING

A. At substantial completion, adjust all operable components to ensure proper installation and that they function smooth and freely.

3.5 CLEANING

A. Remove dirt and excess sealant from exposed surfaces. Follow the manufacturer's recommended cleaning techniques and procedures for cleaning all surfaces. Use only cleaning products that will not scratch or damage the surfaces, and are recommended by the manufacturer.

B. Remove debris from project site.

END OF SECTION 081500

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SECTION 083110 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Access doors and frames for walls and ceilings.

2. Contractor shall provide access doors and frames at all locations required to access valves, cleanouts, pull boxes, switches, devices that require monitoring, service and adjustment. Door and frame shall be sized to meet application.

3. Related Sections: Coordinate with plumbing, mechanical, and electrical work.

1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.

B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acudor Products, Inc.
2. Babcock-Davis; A Cierra Products Co.
3. Elmdor/Stoneman; Div. of Acorn Engineering Co.
4. J. L. Industries, Inc.
5. Karp Associates, Inc.
6. Larsen's Manufacturing Company.
7. Milcor Inc.
8. Nystrom, Inc.

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from stainless-steel sheet.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.060-inch- (1.5-mm-) thick sheet metal, set flush with exposed face flange of frame.
3. Frame: Minimum [0.060-inch- (1.5-mm-)] thick sheet metal with 1-inch- (25-mm) wide, surface-mounted trim.
4. Hinges: Continuous piano.
5. Latch: Cam latch operated by hex head wrench or pinned hex head wrench with interior release.

C. Exterior Flush Access Doors and Frames with Exposed Trim (For all Panels within Rink Space, Warming Lobby and Team Rooms): Weatherproof with extruded door gasket.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.040-inch- (1.0-mm-)thick, metallic-coated steel sheet; flush panel construction with manufacturer's standard 2-inch- (50-mm-) thick fiberglass insulation.
3. Frame: Minimum [0.060-inch- (1.5-mm-) thick extruded aluminum.
4. Hinges: Continuous piano, zinc plated.
5. Lock: Dual-action handles with key lock.

2.2 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 panels to types of supports indicated.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

3.2 ADJUSTING AND CLEANING

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 083110

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SECTION 085413 - FIBERGLASS 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 fiberglass-framed windows.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review, discuss, and coordinate the interrelationship of fiberglass windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 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 fiberglass 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. Samples: For each exposed product and for each color specified, 2 by 4 inches (50 by 100 mm) in size.

D. Samples for Selection: For units with factory-applied color finishes.

1. Include similar Samples of hardware and accessories involving color selection.

E. Product Schedule: For fiberglass windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Test Reports: For each type of fiberglass window, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating fiberglass windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

B. Installer Qualifications: An installer acceptable to fiberglass window manufacturer for installation of units required for this Project.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace fiberglass windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, and air infiltration.
c. Faulty operation of movable sash and hardware.
d. Deterioration of materials and finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: 10 years from date of Substantial Completion.
b. Glazing Units: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Fibertec Window and Door Manufacturing.
   2. Inline Fiberglass Ltd.
   3. Pella Corporation.
   4. Thermotech Windows Ltd.

B. Source Limitations: Obtain fiberglass windows from single source from single manufacturerSource Limitations: Obtain fiberglass 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.

B. Operating Types: Provide the following operating types in locations indicated on Drawings:
   1. Awning: Project out.
   2. Combination Slider/Fixed
   3. Slider

C. Frames and Sashes: Pultruded fiberglass complying with AAMA/WDMA/CSA 101/I.S.2/A440 and with exposed exterior fiberglass surfaces finished with manufacturer's standard enamel coating complying with AAMA 613..

D. Insulating-Glass Units: ASTM E 2190/

E. 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 fiberglass windows, and sized to accommodate sash weight and dimensions.

F. Projected Window Hardware:
   1. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches (1500 mm) above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches (1800 mm) above floor.

G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

2.3 INSECT SCREENS

A. General: 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, inside for project-out; Half, outside for single-hung 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-mmmesh 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: Black

2.4 FABRICATION

A. Fabricate fiberglass windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze fiberglass windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. 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 085413

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SECTION 08 62 00 -UNIT SKYLIGHTS

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 self-flashing unit skylights with integral curb.

B. Related Sections:
   1. Division 6 Section "Rough Carpentry" for wood framing and blocking at unit skylights.
   2. Division 7 Section “Roofing and Flashing for coordination with roofing installation.

1.3 SUBMITTALS

A. Product Data: For each type of unit skylight indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for unit skylights.

B. Shop Drawings: For unit skylight work. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.

C. Samples for Initial Selection: For unit skylights with factory-applied color finishes.

D. Product Schedule: For unit skylights.

E. Maintenance Data: For unit skylights to include in maintenance manuals.

F. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating unit skylights that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Source Limitations: Obtain each type of unit skylights from single source from single manufacturer.

1.5 COORDINATION

A. Coordinate unit skylight flashing requirements with roofing system.

B. Provide anchors and inserts to be placed in adjacent construction in proper sequence so as not to delay the Work.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 UNIT SKYLIGHTS

A. General: Provide factory-assembled unit skylights that include glazing, extruded-aluminum glazing retainers, gaskets, and inner frames and that are capable of withstanding performance requirements indicated.

B. Integral Curb: Manufacturer's standard self-flashing type.

C. Unit Shape and Size: As indicated.

D. Condensation Control: Fabricate unit skylights with integral internal gutters and nonclogging weeps to collect and drain condensation to the exterior.

E. Thermal Break: Fabricate unit skylights with thermal barrier separating exterior and interior metal framing.

2.2 GLAZING

A. Insulating Glass: Clear, sealed units that comply with Division 8 Section "Glazing," in manufacturer's standard overall thickness.
   1. Exterior Lite: 1/4-inch (6-mm) fully tempered glass.
   2. Interior Lite:
      a. Laminated glass; 2 plies of 1/8-inch (3-mm) clear heat-strengthened glass with 0.030-inch (0.762-mm) clear polyvinyl butyral interlayer.
      b. 1/4-inch (6-mm) Clear glass.
   3. Interspace Content: Air
   4. Low-Emissivity Coating: Manufacturer's standard.

2.3 INSTALLATION MATERIALS

A. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic, nominally free of sulfur and containing no asbestos fibers, formulated for 15-mil (0.4-mm) dry film thickness per coating.

B. Joint Sealants: As specified in Division 7 Section "Joint Sealants."

C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

D. Roofing Cement: ASTM D 4586, asbestos free, designed for trowel application or other adhesive compatible with roofing system.

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. Proceed with unit skylight installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.

B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights.

C. Install unit skylights level, plumb, and true to line, without distortion.

D. Anchor unit skylights securely to supporting substrates.

E. Where metal surfaces of unit skylights will contact incompatible metal or corrosive substrates, including preservative-treated wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.

F. Set unit skylight flanges in thick bed of roofing cement to form a seal unless otherwise indicated.

G. Where cap flashing is indicated, install to produce waterproof overlap with roofing or roof flashing. Seal with thick bead of mastic sealant except where overlap is indicated to be left open for ventilation.

3.3 CLEANING

A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes.

B. Remove excess sealants, glazing materials, dirt, and other substances.

C. Remove and replace glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.

END OF SECTION 086200

SECTION 087100 - DOOR HARDWARE

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. Mechanical door hardware for the following:
      a. Swinging doors.
   2. Cylinders for door hardware specified in other Sections.
   3. Padlocks for Fence Gates and Security Shutters

B. Related Sections:
   1. Section 081500 – Fiberglass Doors
   2. Section 10 71 13- Security Shutters
   3. Division 30 Section - Fencing

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Initial Selection: For plastic protective trim units in each finish, color, and texture required for each type of trim unit indicated.

C. Samples for Verification: For exposed door hardware of each type required, in each finish specified, prepared on Samples of size indicated below. Tag Samples with full description for coordination with the door hardware schedule. Submit Samples before, or concurrent with, submission of door hardware schedule.

D. Other Action Submittals:

   1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

      a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.

b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
c. Format: Use same scheduling sequence and format and use same door numbers] as in the Contract Documents.
d. Content: Include the following information:

1) Identification number, location, hand, fire rating, size, and material of each door and frame.
2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
5) Fastenings and other pertinent information.
6) Explanation of abbreviations, symbols, and codes contained in schedule.
7) Mounting locations for door hardware.
8) List of related door devices specified in other Sections for each door and frame.

2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

B. Source Limitations: Obtain each type of door hardware from a single manufacturer.

C. Accessibility Requirements: For door hardware on doors in an accessible route, comply with Massachusetts Architectural Access Board Regulations..

D. Keying Conference: Conduct conference at Project site . Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.6 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of doors and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three (3) years from date of Substantial Completion, unless otherwise indicated.
a. Manual Closers: Ten [10] years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Approval of manufacturers other than those listed shall be in accordance with paragraph below.

B. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.

ITEM	SCHEDULDED MANUFACTURER	ACCEPTABLE SUBSTITUTION
Hinges	Stanley (STA)	McKinney, Hager
Locksets, Latchsets, & Deadlocks	Schlage (SCH)	Sargent, Best
Cylinders & Keying	Schlage (SCH)	Sargent, Best
Closers	LCN (LCN)	Sargent
Flush Bolts & Dust-Proof Strikes	Glynn-Johnson (GJ)	Ives, DCI
Silencers	Glynn-Johnson (GJ)	Ives, Rockwood
Push & Pull Plates & Bars	Ives (IVE)	Hager, Rockwood
Kickplates	Ives (IVE)	Hager, Rockwood
Stops & Holders	Glynn-Johnson (GJ)	Ives, Rockwood
Thresholds	National Guard Products (NGP)	Pemko, Reese
Seals & Door Bottoms	National Guard Products (NGP)	Pemko, Reese

(All items listed above may not be included in the hardware sets)

C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

D. Where the exact types of hardware specified are not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having as nearly as possible the same operation and quality as the type specified, subject to Architect's approval.

2.2 MATERIALS

A. Fasteners
   1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
   2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including “prepared for paint” surfaces to receive painted finish.
   3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely.
   4. All hardware shall be installed with the fasteners provided by the hardware manufacturer.

B. Hinges
   1. The following is a guide for hinge type required for this specification:
      a. 1 3/4” doors up to and including 3’-0” wide:
         1) Heavy weight, ball bearing, bronze/stainless steel 4 1/2” high
      b. 1 3/4” doors over 3’-0” wide:
         1) Extra heavy weight, ball bearing, bronze/stainless steel, 5” high
      c. Quantity of hinges: Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30” of additional door height.
      d. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1) Steel Hinges: Steel pins
2) Non-Ferrous Hinges: Stainless steel pins
3) Out-Swing Exterior Doors: Non-removeable pins
4) Interior Doors: Non-rising pins

e. The width of hinges shall be 4" or as required to clear all trim.

C. Locks

1. Locks shall be ANSI A156.13, Grade 1 mortise locksets, manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handing.
2. Locks are to have a standard 2 3/4" backset with a full 3/4" throw 2-piece stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1" throw, constructed of stainless steel.
3. Lever trim shall be cast or forged in the design specified, with 2 1/8" diameter roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment.
4. Cylinders shall be removable core, or equivalent high security removable core key system.
5. Locks meeting this specification:
   a. Schlage L9000 series
   b. Sargent 8200 series
   c. Best 35H series

D. Closers

1. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall be 1 1/2" in diameter, and double heat treated pinion shall be 11/16" in diameter.
2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).
5. Closers shall not incorporate a pressure relief valve.
6. Closer cylinders and arms (and metal covers when specified) shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification. For exterior doors and doors that open directly to the parking garage, treat closers with SRI - special rust inhibitor.
7. Door closers meeting this specification:
   a. LCN 4010/4110 series
   b. Sargent 280 series (no PRV)

E. Push Plates: Push plates shall be 8" wide x 16" high x .050" thick. Where door stile does not allow 8" plates, 4" plates may be used.

F. Door Pulls & Push Bars: Pulls shall be 1" diameter solid bar stock, 10" center to center, with a projection of 2 1/2" and clearance of 1 1/2". Push bars shall be 1" diameter solid bar stock, of sufficient length to span from center to center of each stile.

G. Protective Plates: Provide kick, mop, or armor plates with four beveled edges. Furnish with machine or wood screws, finished to match plates. Sizes of plates shall be as follows:
   1. Kick Plates - 8” high x 2” lwod on singles, 1” lwod on pairs, or as scheduled
   2. Mop Plates - 4” high x 1” lwod on singles, 1” lwod on pairs
   3. Armor Plates - 34” high x 2” lwod on singles, 1” lwod on pairs

H. Door Stops and Holders
   1. It shall be the responsibility of the hardware supplier to provide door stops for all doors in accordance with the following requirements:
   2. Wall stops shall be used wherever possible.
   3. Where wall bumpers can not be used, provide dome type floor stops of the proper height.
   4. At any opening where a wall or floor stop can not be used, a heavy duty overhead stop will be required.

I. Thresholds and Gasketing: Thresholds shall be aluminum beveled type with maximum of height of ½”for conformance with ADA requirements. Furnish as specified and per details. Match finish of other items as closely as possible. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available. Where bar-type weatherstrip is used with parallel arm mount closers or overhead stops, install the weatherstrip first. Do not notch the weatherstrip around the closer shoe or the overhead stop. Where bar-type weather-strip is used with coordinators, install the weatherstrip before the coordinator.

J. Silencers: Furnish “push-in” type silencers for each hollow metal or wood frame, 3 for each single frame, 2 for each pair frame. Omit where gasketing is scheduled.

2.3 FINISHES AND MATERIAL

A. With the exception of all items listed below, the finish of all hardware shall be US32D - satin stainless steel.

B. Exceptions are as follows:
   1. Door Closers - Aluminum Powder Coat Finish
   2. Thresholds - Mill Finish Aluminum
   3. Weatherstrip - Mill Finish Aluminum
   4. Sweeps - Clear Anodized Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of any hardware, examine all doors, frames, walls and related items for conditions that would prevent proper installation of finish hardware. Correct all defects prior to proceeding with installation.

3.2 INSTALLATION

A. All hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance if necessary, installers may contact the manufacturer's rep for the item in question, as listed in the hardware schedule.

B. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.

D. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

F. All operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.

G. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint-Sealers."

3.3 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.

B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Clean adjacent surfaces soiled by hardware installation.

D. Instruct Owner's personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.

3.4 PROTECTION

A. Provide for the proper protection of all items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

3.5 HARDWARE SCHEDULE

A. Provide hardware for each door to comply with requirements of Section "Finish Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.

B. It is intended that the following schedule includes all items of finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, the preamble will be the deciding document.

C. Hardware Sets:

1. Set A: Padlocks (one at each security shutter, and fence gates).
   a. Heavy Duty Padlock with removable core, keyed to building system.

2. Set B: Privacy (Staff Toilet)
   a. Hinges:3 hinges
   b. Auxillary Lock: Provide additional auxillary lock at family changing; lock by key only, thumb turn unlocks at all times. Lock shall have occupied/unoccupied indicator.
   c. Push Plate
   d. Door Pool
   e. Closers: Pull side mounted
   f. Silencers: 3 per leaf
   g. Stops: Door mounted with integral robe hook

3. Set C: Single Utility (Storage, Storage, etc.)
   a. Hinges: 3 hinges
   b. Locksets: Storeroom Function with knurled handle
   c. Silencers: 3 per leaf
   d. Weather-stripping, rain hood and Sweeps in Exterior wall Applications
   e. Saddle: Provide door saddle at exterior wall applications.

4. Set D: Double Utility (Filter, etc.)
   a. Hinges: 6 hinges
   b. Lockset Active Leaf: Storeroom Function with knurled handle
   c. Flush Bolts (inactive leaf): 2 bolts at head and sill
   d. Astragal Continuous on Active Leave
   e. Door Armor: Interior Face of Doors
   f. Weather-stripping, rain hood and Sweeps in Exterior wall Applications
   g. Saddle: Provide door saddle at exterior wall applications.

5. Set E: (Lifeguard, Control, etc.)
   a. Hinges: 3 hinges
   b. Locksets: Office Function
   c. Silencers: 3 per leaf
   d. Weather-stripping, rain hood and Sweeps in Exterior wall Applications
   e. Saddle: Provide door saddle at exterior wall applications.
   f. Stops: Door mounted with integral robe hook

6. Set F: Men & Women's Room
   a. Hinges:3 hinges
   b. Auxillary Lock: Keyed from Exterior, ANSI Function E2171 deadbolt thrown by key only; key or thumbturn shall retract
   c. Push Plate
   d. Door Pull
   e. Closers: Push side mounted
   f. Weather-stripping, rain hood and Sweeps in Exterior wall Applications
   g. Saddle: Provide door saddle at exterior wall applications.
   h. Holder, Flip Down on base of door

7. Set G: ADA Restrooms Exterior
   a. Hinges:3 hinges
   b. Auxillary Lock: Keyed from Exterior, ANSI Function E2151 deadbolt thrown by key or thumbturn
   c. Auxillary Lock 2: Double Cylinder Deadlock ANSI Function E2141
   d. Push Plate
   e. Door Pull
   f. Closers: Push side mounted
   g. Weather-stripping, rain hood and Sweeps in Exterior wall Applications
   h. Saddle: Provide door saddle at exterior wall applications.
   i. Holder, Flip Down on base of door

8. Set H: ADA Restrooms Interior
   a. Hinges:3 hinges
   b. Auxillary Lock: Keyed from Toilet Room Side, ANSI Function E2151 deadbolt thrown by key or thumbturn
   c. Auxillary Lock 2: Double Cylinder Deadlock ANSI Function E2141
   d. Push Plate
   e. Door Pull
   f. Closers: Push side mounted

END OF SECTION 087100

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SECTION 089119 - FIXED LOUVERS

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. Fixed, extruded-aluminum louvers.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).

C. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

   1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
   2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

B. Windborne-debris-impact-resistance test reports.

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

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN MANUFACTURER-STANDARD LOUVER

A. Vertical, Wind-Driven-Rain-Resistant Louver

1. Greenheck EHH-401 Wind-Driven Rain Louver Horizontal Blade

2. Louver Depth: 4 inches (1000 mm) .
3. Frame Nominal Thickness: Not less than 0.063 inch (1.52 mm) frames.
4. Solid Blade Nominal Thickness: Not less than 0.040 inch blade.
5. Perforated Blade Nominal Thickness: Not less than 0.040 inch blade.
6. Acoustic Material: Fiberglass Type 703 Insulation @ 3.0 PFC Density

2.2 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening at ducted connections, Insect screening, at all other locations.

B. Secure screen frames to louver frames with stainless-steel machine screws spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.

D. Louver Screening for Aluminum Louvers:
1. Bird Screening: Stainless steel, 1/2-inch- (13-mm-) square mesh, 0.047-inch (1.19-mm) wire.
2. Insect Screening: Stainless steel, 18-by-18 (1.4-by-1.4-mm) mesh, 0.009-inch (0.23-mm) wire.

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Fasteners: Use types and sizes to suit unit installation conditions.
   1. Use Phillips flat-headscrews for exposed fasteners unless otherwise indicated.
   2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.

2.4 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide subsills made of same material as louvers.

F. Join frame members to each other and to fixed louver blades with concealed from view, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.5 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 50 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

   1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, 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. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION 089119

SECTION 09 99 01 - PAINTING (FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 FILING SUB-BIDS

A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a separate sealed envelope with the Awarding Authority at a time and place stipulated in the Bidding Requirements.

1. The following should appear on the upper left hand corner of the envelope:

NAME OF BIDDER: _____

PROJECT: Veterans Memorial Pool
Bay Road, Patton Park
Hamilton, Massachusetts

SUB-BID FOR: Section 09 99 01 – PAINTING

B. Every sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority, as required by Section 44F of Chapter 149 the General Laws as amended. Sub-Bid forms are included in this Project Manual or may be obtained at the office of the Architect.

C. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND, or CERTIFIED, TREASURER's, or CASHIER'S CHECK issued by a responsible bank or trust company payable to the *Town of Hamilton* in the amount of five percent of the Bid. A sub-bid accompanied by any other form of bid depository than those specified will be rejected.

D. Work to be done under this Section is shown on the Drawings:

1. A Series Drawings 001, 101, 102, 201, 301, 401, 501, 601, 701, 702, 111, 112, 211, 311, 511, 611, 612, 613, 712
2. The listing of Contract Drawings above shall not limit the Subcontractors responsibility to determine the full extent of his work as required by all Contract Drawings.

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

F. Examine all other Sections of the Specifications for requirements, which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following: surface preparation and field painting of the following:
   1. Exposed exterior items and surfaces.
   2. Exposed interior items and surfaces.
   3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
   1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
   1. Prefinished items include the following factory-finished components: Light Fixtures
   2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      a. Foundation spaces.
      b. Furred areas.
      c. Ceiling plenums.
      d. Utility tunnels.
      e. Pipe spaces.
   3. Finished metal surfaces include the following:
      a. Anodized aluminum.
      b. Stainless steel.
      c. Chromium plate.
   4. Operating parts include moving parts of operating equipment and the following:
      a. Valve and damper operators.
      b. Linkages.
      c. Sensing devices.
      d. Motor and fan shafts.
   5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections
   1. Section 062000 – Finish Carpentry for surface preparation.
   2. Section 074625 – Wood Shingles.
   3. Divisions 22, 23 and 26: Painting of all exposed to view plumbing, mechanical and electrical work is specified in Divisions 22, 23, and 26, respectively.

1.4 SCHEDULE OF PAINT TYPES

A. Exterior and interior paint types are scheduled at the end of this Section. The following types shall be used as follows:
   1. Exterior: (Interior of Buildings are considered exterior space)
      a. Concrete: Low Lustre
      b. Wood: Semi-Gloss, except where deep colors are required.
      c. Plywood: Low Lustre
      d. Ferrous Metal Typical: Exposed to View: Semi-Gloss
      e. Ferrous Metal Not Exposed to View: Low Lustre

1.5 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

   1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
   2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
   3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
   4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
   5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.6 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.

   1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
   2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
   3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

   1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
   2. Submit Samples on the following substrates for the Architect's review of color and texture only:

a. Stained or Natural Wood: Provide two 4-by-8-inch (100-by-200-mm) samples of natural- or stained-wood finish on actual wood surfaces.
b. Ferrous Metal: Provide two 4-inch- (100-mm-) square samples of flat metal and two 8-inch- (200-mm-) long samples of solid metal for each color and finish.

D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.7 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.

1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.

   a. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m) of wall surface.
   b. Small Areas and Items: The Architect will designate an item or area as required.

2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.

   a. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.

3. Final approval of colors will be from job-applied samples.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.

7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1.9 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
1. ICI Dulux Paints . (ICI).
2. Benjamin Moore & Co. (Moore).
3. PPG Industries, Inc. (PPG).
4. Sherwin-Williams Co. (S-W).

B. High Performance Coatings: Provide products of one of the following manufacturers that meet or exceed specified requirements; products of the Tnemec Company have been specified herein to establish minimum acceptable quality of coating(s). Products of other manufacturers name below shall be acceptable provided these products meet or exceed the specified performance criteria for each coating(s).
1. Tnemec Company, Inc.
2. The Dupont Co.
3. Carboline Co.
4. Or approved equal

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Match colors indicated by reference to manufacturer's color designations.

D. Colors: Provide color selections made by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze.

If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:
   1. Piping, pipe hangers, and supports.
   2. Tanks.
   3. Ductwork.
   4. Insulation.
   5. Motors and mechanical equipment.
   6. Accessory items.

G. Electrical items to be painted include, but are not limited to, the following:
   1. Conduit and fittings.
   2. Switchgear.
   3. Panelboards.

H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

J. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

C. Concrete: Provide the following finish systems over exterior concrete, stucco, and brick masonry surfaces:

   1. Low-Luster Acrylic Finish: 2 finish coats over a primer.

a. Primer: Alkali-resistant, exterior, acrylic-latex primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

1) ICI: 2000-xxxx Dulux Professional Exterior 100% Acrylic Latex Primer
2) Moore: SuperSpec Latex Exterior Primer #169.
3) PPG: 6-603 Speedhide Interior/Exterior Acrylic Latex Alkali Resistant Primer.
4) SW: Loxon Exterior Acrylic Masonry Primer A24 Series

b. First and Second Coats: Low-luster (eggshell or satin), exterior, acrylic-latex paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.3 mils (0.058 mm).
1) ICI: 2402-XXXX Dulux Professional Exterior 100% Acrylic Satin Finish
2) Moore: SuperSpec Low Lustre Latex House Paint #185.
3) PPG: 76 Line Sun-Proof Exterior House & Trim Acrylic Satin Latex.
4) SW: A100 Exteior Latex Satin A82 Series

D. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Low-Luster Acrylic Finish: 2 finish coats over a rust-inhibitive primer.

a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

1) ICI: 4120-XXXX Devguard All Purpose Metal & Galvanized Primer
2) Moore: IronClad Latex Low Lustre Metal & Wood Enamel #363
3) PPG: 7-858/852 Industrial Rust Inhibitive Steel Primer.
4) SW: Kem Kromik Universal Metal Primer B50Z Series

b. First and Second Coat: Low-sheen (eggshell or satin), exterior, acrylic-latex paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).

1) ICI: 2402-XXXX Dulux Professional Exterior 100% Acrylic Satin Finish
2) Moore: Superspec Low Lustre Latex House Paint #185
3) PPG: 76 Line Sun-Proof Exterior House & Trim Acrylic Satin Latex.
4) SW: DTM Acrylic Coating Semi-gloss B66-200 Series

2. Semi-gloss, Acrylic-Enamel Finish: 2 finish coats over a rust-inhibitive primer.

a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

1) ICI: 4120-XXXX Devguard All Purpose Metal & Galvanized Primer
2) Moore: IronClad Latex Low Lustre Metal & Wood Enamel #363.
3) PPG: 7-858/852 Industrial Rust Inhibitive Steel Primer.
4) SW: Kem Kromik Universal Metal Primer B50Z series/

b. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) ICI: 2406-XXXX Dulux Professional Exterior 100% Acrylic Semi-gloss Finish
2) Moore: Superspec Low Lustre Latex House Paint #170
3) PPG: 78 Line Sun-Proof Semi-Gloss Acrylic Latex House and Trim Paint.
4) SW: DTM Acrylic Coating Semi-gloss B66-200 Series

3. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.

a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

1) ICI: 4120-XXXX Devguard All Purpose Metal & Galvanized Primer
2) Moore: : IronClad Latex Low Lustre Metal & Wood Enamel #163
3) PPG: 7-858/852 Industrial Rust Inhibitive Steel Primer.
4) S-W: Kem Kromik Universal Metal Primer B50Z series

b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.0 mils (0.076 mm).

1) ICI: 4308-XXXX Devguard Alkyd Industrial Gloss Enamel.
2) Moore: Impervo Alkyd High Gloss Metal & Wood Enamel #133.
3) PPG: 7-8xx Industrial Interior/Exterior Gloss-Oil Enamel.
4) S-W: Industrial Enamel B-54Z Series.

4. Deep-Color, Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.

a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).

1) ICI: 4120-XXXX Devguard All Purpose Metal & Galvanized Primer.
2) Moore: IronClad Latex Low Lustre Metal & Wood Enamel #163.
3) PPG: 7-858/852 Industrial Rust Inhibitive Steel Primer.
4) S-W: Kem Kromik Universal Metal Primer B50Z series.

b. First and Second Coats: Deep-color, full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.7 mils (0.094 mm).

1) ICI: 4308-0400 Devguard Alkyd Industrial Gloss Enamel.
2) Moore: SuperSpec Gloss House Paint #175
3) PPG: 7-8xx Industrial Interior/Exterior Gloss-Oil Enamel.
4) S-W: SWP Exterior Gloss Paint A-2 Series.

E. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:

1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a galvanized metal primer.

a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) ICI: 4120-XXXX Devguard All Purpose Metal & Galvanized Primer.
2) Moore: M04 Acrylic Metal Primer
3) PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
4) SW: DTM Acrylic Primer/finish B66W1 Series

b. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) ICI: 2406-XXXX Dulux Professional Exterior 100% Acrylic Semi-gloss Finish.
2) Moore: SuperSpec Latex House & Trim Paint #170
3) PPG: 78 Line Sun-Proof Semi-Gloss Acrylic Latex House and Trim Paint.
4) SW: DTM Acrylic Semigloss B66-200 Series

2. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a galvanized metal primer.

a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) ICI: 4120-XXXX Devguard All Purpose Metal & Galvanized Primer.
2) Moore: IronClad Latex Low Lustre Metal & Wood Enamel #163
3) PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
4) S-W: Galvite Paint B50WZ30/

b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) ICI: 4308-XXXX Devguard Alkyd Industrial Gloss Enamel.
2) Moore: Impervo Alkyd High Gloss Metal & Wood Enamel #133.
3) PPG: 7-8xx Industrial Interior/Exterior Gloss-Oil Enamel.
4) S-W: Industrial Enamel B-54 Series VOC complying.

F. Semitransparent Acrylic Stain Wood and Siding: Factory-formulated acrylic-resin-based semi-transparent wood stain applied at spreading rate recommended by manufacturer.

1. Benjamin Moore: Moorwood Acrylic Semi-Transparent Stain 0093.
2. Dulux Paint: 2610-XXXX Woodpride Exterior Waterborne Semi-Transparent Stain.

3. Pittsburgh Paints: 77-460 Rez Exterior Semi-Transparent Latex Stain.
4. Sherwin-Williams: WoodScapes House Stain Exterior Polyurethane Semi-Transparent Stain A15 Series.

G. Solid-Color Acrylic Stain (Exterior Wood Trim): Factory-formulated acrylic-resin-based solid-color stain applied at spreading rate recommended by manufacturer.

1. Benjamin Moore: Moorcraft Super Spec Acrylic Exterior Stain No. 179.
2. Dulux Paint: 2600-XXXX Woodpride Exterior Waterborne Solid Color Stain.
3. Pittsburgh Paints: 77-400 Series Pittsburgh Paints Exterior Solid Color Acrylic Latex Stains.
4. Samuel Cabot: O.V.T. Solid Color Acrylic Stain 0600 Series.
5. Sherwin-Williams: WoodScapes House Stain Exterior Acrylic Solid Color A15 Series.

a. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) ICI: 1406-XXXX Dulux Professional Acrylic Semi-gloss Wall & Trim Enamel.
2) Moore: SuperSpec Latex Semi-Gloss Enamel #276.
3) PPG: Speedhide 6-500 Series Acrylic Latex Semi-Gloss Enamel.
4) SW: DTM Acrylic Latex Semigloss B66-200

6. Full-Gloss, Acrylic-Enamel Finish: 2 coats over a primer.

a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) ICI 4120-XXXX Devguard All Purpose Metal & Galvanized Primer.
2) Moore: M04 Acrylic Metal Primer.
3) PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
4) S-W: Galvite Paint B50W3.

b. First and Second Coats: Full-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).

1) ICI: 3028-XXXX Dulux Interior/Exterior Acrylic Gloss Enamel.
2) Moore: Impervex Latex High Gloss Metal & Wood Enamel #309.
3) PPG: 51 Line Brilliant Reflections Interior/Exterior Latex Gloss Enamel.
4) S-W: DTM Acrylic Gloss B66-100 Series.

H. Woodwork and Siding In Non-Wet Humid Areas: Provide the following paint finish systems over new, interior wood surfaces:

1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoater.

a. Undercoat: Alkyd- or acrylic-latex-based, interior wood undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) ICI 3210-XXXX Ultra-Hide Aquacrylic Gripper Stain Killer Primer-Sealer.
2) Moore: SuperSpec Latex Enamel Undecoater & Primer Sealer #253 .
3) PPG: Speedhide 6-855 Interior Latex Water-Based Undercoater.
4) SW: PrepRite Classic Interior Latex Primer 28-101

b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

1) ICI: 1406-XXXX Dulux Professional Acrylic Semi-gloss Wall & Trim Enamel.
2) Moore: Superspec Latex Semi-Gloss Enamel #276
3) PPG: Speedhide 6-500 Series Acrylic Latex Semi-Gloss Enamel.
4) SW: ProMar 200 Interior Acrylic Latex Semigloss B31W201

2. Semigloss, Alkyd-Enamel Finish: 2 finish coats over a primer.

a. Primer: Alkyd or latex-based, interior enamel undercoater applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

1) ICI 3210-XXXX Ultra-Hide Aquacrylic Gripper Stain Killer Primer-Sealer.
2) Moore: SuperSpec Alkyd Enamel Undecoater &Primer Sealer #245
3) PPG: Speedhide 6-855 Interior Latex Water-Based Undercoater.
4) S-W: ProMar Classic Interior Primer B28-101.

b. First and Second Coats: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).

1) ICI: 1507-XXXX Dulux Ultra Traditional Interior Alkyd Semi-Gloss Wall & Trim Emanel.
2) Moore: SuperSpec Alkyd Semi-Gloss Enamel #271
3) PPG: Speedhide 6-1110 Alkyd Semi-Gloss Interior Enamel.
4) S-W: Pro Classic H.S. Interior Alkyd Semi-Gloss Enamel B-34 Series.

3. Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoater.

a. Undercoat: Alkyd- or acrylic-latex-based, interior wood undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.1 mils (0.028 mm).

1) ICI 3210-XXXX Ultra-Hide Aquacrylic Gripper Stain Killer Primer-Sealer.
2) Moore: SuperSpec Alkyd Enamel Undecoater &Primer Sealer #245
3) PPG: 17-255 Quick-Drying Enamel Undercoater.

4) S-W: Kem Kromik Universal Metal Primer B50Z series.

b. First and Second Coats: Full-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).

1) ICI: 3028-XXXX Dulux Interior/Exterior Acrylic Gloss Enamel.
2) Moore: Impervex Latex High Gloss Metal & Wood Enamel #309
3) PPG: Speedhide Interior 100% Acrylic Gloss Enamel, Series 6-8534.
4) S-W: ProMar 200 Interior Latex Gloss Enamel B21W201.

I. Wood Siding and Wood Trim at Family Changing Rooms, Individual Toilet Rooms, and Men's and Women's rooms

1. Moderate to Severe Atmospheric Conditions:
   a. System Type: Acrylic.
   b. Surface Preparation: Clean and dry.
   c. Primer: Series 180 W.B. Tneme-Crete. DFT 4.0 to 8.0 mils.
   d. Finish Coat: Series 180 W.B. Tneme-Crete . DFT 4.0 to 8.0 mils.
   e. Total DFT: 8.0 to 16.0 mils.
   f. Finish Color: As selected by Architect from manufacturer's standard colors.

END OF SECTION 099901

SECTION 104100 – SIGNAGE- BUILDING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 SUMMARY

A. Work included: provide labor, materials and equipment to complete the work of this Section including but not limited to the installation of
   1. Panel signs.
   2. Signage accessories.

1.3 SUBMITTALS

A. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

   1. Provide message list for each room identification sign required.
   2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
   3. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.

C. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

   1. Samples for verification of color, pattern, and texture selected and compliance with requirements indicated:
      a. Dimensional Letters: Provide full-size representative samples of each dimensional letter type required, showing letter style, color, and material finish and method of attachment.

1.4 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

1.5 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 PANEL SIGNS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. Manufacturers of Panel Signs:
      a. ABC Architectural Signing System.
      b. APCO Graphics, Inc.
      c. ASI Sign Systems, Inc.
      d. Best Manufacturing Company.
      e. Mohawk Sign Systems.

B. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

   1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

C. Material: Provide Teldar and polycarbonate face adhered to 1/8 inch acrylic back plate. Material shall be suitable for indoor/outdoor application.

D. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

E. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

F. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
   1. 6 inch wide by 8 inch high for signs with text, symbol and type 2 braille.
   2. 8 inch wide by 2 inch high for signs with text and type 2 braille.
   3. Color: White text on black field.
   4. Frame color: Black

G. Required Signage:
   1. MEN, with international male and accessible symbol and Type 2 braille at door to each entrance to Men's Locker Room (Total 1)
   2. WOMEN, with international female and accessible symbol, text, and Type 2 braille at door to each Women's locker room (Total 1)
   3. UNISEX FAMILY CHANGING With international male, female, and accessible symbol, text, and type 2 braille. (Total 4)
   4. UNISEX TOILET With international male, female, and accessible symbol, text, and type 2 braille. (Total 1)
   5. LIFEGUARD OFFICE with text and type 2 Braille (Total 1)
   6. CONTROL with text and type 2 Braille (Total 1)
   7. FIRST AID with text and type 2 Braille (Total 1)
   8. FILRATION with text and type 2 Braille (Total 1)
   9. STORAGE with text and type 2 Braille (Total 2)
   10. UTILTIY with text and type 2 Braille (Total 2)
   11. VENDING with text and type 2 Braille (Total 1)
   12. STAFF ONLY with text and type 2 Braille (Total 3)
   13. NO SMOKING, with international symbol, text, and Type 2 braille at each Men's and Women's Room, and in Open Deck area. (Total 6)

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
   1. Frame Mounting. Attach the frame with fasteners and anchors suitable for secure attachment to the substrate. Attach panel sign units to the plate using the method specified above.

3.2 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 101400

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SECTION 102113 – TOILET AND SHOWER COMPARTMENTS

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. Solid-polymer toilet compartments configured as toilet enclosures, urinal screens and shower stalls
   2. Solid-polymer panels used as wall finish within shower areas.

B. Related Sections:
   1. Section 061000 "Rough Carpentry for blocking.
   2. Section 102800 "Toilet Accessories" for toilet tissue dispensers, grab bars, and similar accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

   1. Show locations of cutouts for compartment-mounted toilet accessories.
   2. Show locations of reinforcements for compartment-mounted grab bars.
   3. Show locations of centerlines of toilet fixtures.

C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

   1. Each type of material, color, and finish required for units, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.
   2. Each type of hardware and accessory.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

B. Regulatory Requirements: Comply with applicable provisions in ICC/ANSI A117.1, including Connecticut Supplements, for toilet compartments designated as accessible.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).

C. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.2 SOLID-POLYMER UNITS

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. Comtec Industries/Capitol Partitions.
   2. Hadrian Manufacturing Inc.
   3. Santana Products, Inc.
   4. Or approved equal

B. Toilet-Enclosure Style: Overhead braced.

C. Shower-Changing Compartments: Overhead braced.

D. Urinal-Screen Style: Wall hung

E. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges,[no-sightline system,] and with homogenous color and pattern throughout thickness of material.
   1. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.

2. Color and Pattern: One color and pattern as selected by Architect from manufacturer's full range.

F. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.

G. Brackets (Fittings):
1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum.

H. Overhead Cross Bracing for Ceiling-Hung Units: As recommended by manufacturer and fabricated from solid polymer.

I. Overhead Cross Bracing at Shower-Changing Compartments: Provide with integral shower curtain track and hooks.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Chrome-plated zamac, or Stainless steel.
2. Hinges: Manufacturer's standard continuous, helixtype that swings to a closed or partially open position] [continuous, spring-loaded type.
3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Mildew-Resistant Silicone Sealant at Wall Panel Applications: Where joint sealants of this type are indicated, provide products formulated with fungicide that are intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes, and that comply with the following:
1. Products:
   a. 786 Mildew Resistant; Dow Corning.
   b. Sanitary 1700; GE Silicones.
   c. 898 Silicone Sanitary Sealant; Pecora Corporation.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.
6. Use O Joint Substrates include ceramic tile, vitrious china, plastic laminate, wood, and gypsum wall board.
7. Applications: Joint between all wall panels.

C. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 or ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

D. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

E. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 WALL PANELS

A. Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges,[no-sightline system,] and with homogenous color and pattern throughout thickness of material.

B. Fasteners: Stainless steel screws with finish washers.

2.5 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
   1. Maximum Clearances:
      a. Pilasters and Panels: 1/2 inch (13 mm).

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 INSTALLATION AS WALL PANELS

A. Cut panels as indicated and to minimize vertical seams.

B. Ensure that solid blocking exists at all fastening points.

C. Apply a bed of construction sealant to wall framing prior to installation.

D. Fasten directly to wood framing using screws with finish washers. Predrill pilot holes in panels prior to installation.

E. Insert sealant in pilot hole prior to inserting screw; wipe away excess sealant.

F. Apply full bead of sealant between panels and panels and adjacent substrates.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

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SECTION 10 28 00-TOILET 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. This Section includes:
   1. Toilet and bath accessories
   2. Infant Care Products

B. RELATED SECTIONS
   1. Section 061000 –Rough Carpentry for wood blocking provisions at all toilet accesories.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Samples: For each accessory item to verify design, operation, and finish requirements.
   1. Approved full-size Samples will be returned and may be used in the Work.

C. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.

E. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
   1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:

   1. Toilet Accessories:
      a. Bobrick Washroom Equipment, Inc.
      b. Bradley Corporation.
      c. McKinney/Parker Washroom Accessories Corp.
      d. Kimberly Clark Professional
   2. Infant-Care Products:
      a. American Infant Care Products Inc.
      b. American Specialties, Inc.
      c. Brocar Products, Inc.
      d. Koala Corporation.
      e. Safe-Strap Company, Inc.
   3. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, No. 4 finish (satin), 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Brass: ASTM B 19, ASTM B 16 (ASTM B 16M), or ASTM B 30 castings.

C. Sheet Steel: ASTM A 366/A 366M, 0.0359-inch (0.9-mm) minimum nominal thickness.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).

E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.

G. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

H. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

J. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

A. **TBA – 1A, 1B, & 1C** Grab Bars : As follows:
   1. Material: Stainless steel, 0.05 inch (1.3 mm) thick.

2. Mounting: Concealed
3. Gripping Surfaces: Slip-resistant texture.
4. Outside Diameter: 1-1/2 inches (38 mm) for heavy-duty applications.
5. Basis of Design: B-490 Series or approved equal.
   a. TBA-01A: Toilet 42-inch.
   b. TBA-01B: Shower 24 by 42-inch.
   c. TBA-01C: Shower 30 by 30-inch.

B. **TBA-2** - Toilet Tissue Dispenser: Where this designation is indicated in an accessible toilet stall, provide accessible toilet tissue dispenser complying with the following:
1. Products: Bobrick model B-27466, or approved equal.
2. Type: Vandal-resistant heavy -duty dual exposed rolls.
3. Mounting: Surface mounted with exposed anchorage.
4. Material: Cast aluminum, satin finish with high-impact plastic splindles.
5. Operation: Non-control delivery with mfr's theft-proof spindle
6. Capacity: Designed for maximum 6 inch diameter rolls.

C. **TBA-3A** - Sanitary Napkin Disposal
1. Unit WALL MOUNTED : As follows:
   a. Basis-of-Design Product: Bobrick B-270 “Contura, or approved equal.
   b. Mounting: Surface.
   c. Material: Stainless steel.
   d. Door or Cover: Self-closing.
   e. Receptacle: Removable and reusable.
   f. Basis of Design: Bobrick B-270 “Contura”, or approved equal.

D. **TBA-3B** - Sanitary Napkin Disposal
1. PARTITION MOUNTED : As follows:
   a. Basis-of-Design Product: Bobrick B-4354 “Contura, or approved equal.
   b. Mounting: Back to Back through partition
   c. Material: Stainless steel.
   d. Door or Cover: Self-closing.

E. **TBA-4A**- Deck Mounted Soap Dispenser: Corrosion resistant soap dispenser with vandal-resistant locking cover and free-turning spout. Body and shank shall be high-impact-resistant ABS plastic with a shatter-resistant polyethylene container
1. Products: Bobrick model B-8226 or approved equal.
2. Cover spacer: Rigid impact resistant polyester
3. Escutcheon: Chrome plated high impact resistant ABS
4. Soap type: liquid.
5. Mounting: Deck Mounted mounted.
6. Capacity: 34-fl.oz.

F. **TBA-4B** - Wall Mounted Soap Dispenser :
1. Products: Bobrick model B-2221 or approved equal.
2. Liquid Soap Dispenser: Vertical tank liquid soap dispensers with hinged filler-top and un-breakable refill window.
3. Mounting: Wall mounted.
4. Material: Stainless Steel
5. Capacity: 40 fl. Oz.

G. **TBA- 5 & 5A**- Wall Mounted Mirrors:
1. Basis-of-Design Product: Bobrick Model B-1556-2436
2. Description: Polished Stainless Steel Mirrors

3. Surface: 22-gauge (0.8mm), type-430 stainless steel with bright polished finish. Mirror has 1/4" (6mm) return
4. Backing: ¼ tempered Masonite backing.
5. Finish: Satin Finish with Vertical Grain
6. Size: 24 by 30 inches.

H. **TBA-6** Shower Curtain Assembly: Where shower curtain rods are indicated, provide the following:
1. Basis of Design Product (Rod): Bobrick model B 207
   a. Description: 18-8, type 304, 20 gage stainless steel tubing with satin finish. 1-inch diameter.
2. Basis of Design Products (Curtain): Bobrick model 204-2
   a. Description: 72 inch high by 42 inch wide opaque white vinyl shower curtain.
3. Basis of Design Products (Hooks: Bobrick model B 204-1
   a. Description: 18-8, type 304, 0.09 inch thick diameter stainless steel.
   b. Provide quantity required to support curtain.

I. **TBA –7** Folding Seat: Where this designation is indicated, furnish the following:
1. Basis-of-Design Product: Bobrick model B-517 or 518 depending on handing, or approved equal.
2. Description: Padded Folding Shower Seat
3. Description: 1 ½ inch thick, closed cell foam padding mounted on ½ thick marine-grade plywood. Covering shall be white, water resistant, reinforced vinyl fabric.
4. Frame: 18-8 S, type 304 stainless steel with satin finish.

J. **TBA- 8** - Diaper-Changing Station: (PROVIDE TOTAL OF THREE- TO BE LOCATED IN THE FIELD)
1. Basis of Design Products: Bobrick (Koala Kare) model KB100-00 (CREAM, or approved equal.
2. Horizontal, Surface-Mounted Unit: Diaper-changing station with surface-mounted, mildew-resistant, molded polyethylene body that folds horizontally against wall when not in use; projects not more than 4 inches (100 mm) from wall when closed; and is engineered to support a minimum of 250-lb (113-kg) static weight when opened. Provide unit with pneumatic shock-absorbing operating mechanism and built-in dispenser for sanitary liners.

K. **TBA-9** -Basis of Design: Paper Towel Dispenser: Where this designation is indicated, provide the following**: (PROVIDE 6)**
1. Products: Bobrick model B-262, or approved equal.
2. Type: Stainless Steel Surface Mounted Towel Dispenser.
3. Operation: C-fold or multi-fold paper towels without adjustment or use of adapters.
4. Paper Capacity: 400 c-fold or 525 multi-fold paper towels.

L. **TBA-10** - Robe Hook: (PROVIDE 18, LOCATIONS TO BE DETERMINED IN THE FIELD WITH ARCHITECT)
1. Basis-of-Design Product: Bobrick B-671
2. Construction: Stainless steel with bright polished finish.
3. Mounting: concealed
4. Projection: 2 inches

M. **TBA- 11** - Mop and Broom Holder:
1. Basis of Design Product: Bobrick B-224 x 36 or approved equal.
2. 36-inch- (914-mm-) long unit fabricated of minimum nominal 0.05-inch- (1.3-mm-) thick stainless steel with shelf; support brackets for wall mounting; three hooks for wiping rags; four spring-loaded, rubber hat, cam-type, mop/broom holders mounted

on front of shelf; and approximately 1/4-inch- (6-mm-) diameter, stainless-steel rod suspended beneath shelf for drying rags.

N. **TBA – 12** – Recessed Waste Receptacle for 4 inch walls.
   1. Basis-of-Design: Bobrick B-3644
   2. Cabinet: 18-8 Type 304 Stainless Steel with satin finish
   3. Waste Receptacle: 18-8, Type 304-Stainless Steel with satin finish
   4. Capacity: 12-gallon

O. **TBA – 13** – Soap Dish As follows:(PROVIDE 6, ONE AT EACH SHOWER-NOT SCHEDULED ON DRAWINGS)
   1. Construction: Extra heavy One Piece Brass Casting with bright polished chrome plated finish..
   2. Mounting: Exposed countersunk screws.
   3. Projection: 3 inches

END OF SECTION 102800

SECTION 10 44 13 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. This Section includes three (3) fire extinguishers to be field located.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
   1. Fire Extinguishers: Include rating and classification.

1.4 REFERENCES

A. American Architectural Manufacturers Association
   1. AAMA 607.1-1977: Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum

B. American Society for Testing and Materials
   1. ASTM A 366/A 366M-96: Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
   2. ASTM A 480/A 480M-96: Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
   3. ASTM B 209-95: Specification for Aluminum and Aluminum-Alloy Sheet and Plate
   4. ASTM B 221-96: Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
   5. ASTM C 1048-92: Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass
   6. ASTM E 814-94b: Test Method for Fire Tests of Through-Penetration Fire Stops

C. National Association of Architectural Metal Manufacturers
   1. Metal Finishes Manual for Architectural and Metal Products.

D. National Fire Protection Association
   1. NFPA 10-94: Standard for Portable Fire Extinguishers

E. Association Publications

1. Factory Mutual. Approval Guide—Fire Protection: A Guide to Equipment Materials & Services Approved by Factory Mutual Research Corporation for Property Conservation. Norwood, MA: FM,
2. National Fire Protection Association. NFPA 1: Fire Prevention Code. Quincy, MA: NFPA,
3. Underwriters Laboratories Inc. Fire Protection Equipment Directory. Northbrook, IL: UL, 2000

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.

1.6 COORDINATION

A. Coordinate size of cabinets to ensure that type and capacity of fire extinguishers are accommodated.

1.7 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Portable Fire Extinguishers:
   a. J.L. Industries, Inc.
   b. Larsen's Manufacturing Company.
   c. Potter-Roemer; Div. of Smith Industries, Inc.
   d. Or equal

1.8 PRODUCT REQUIREMENTS

A. Products Descriptions: Subject to compliance with requirements, provide products that meet the descriptive requirements specified in the Fire-Protection Schedule at the end of Part 3.

1.9 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1.10 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply

with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine roughing-in for hose valves, hose racks, and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing fire-protection specialties.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

2.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. Refinish or replace cabinets and doors damaged during installation.

C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

2.4 FIRE-PROTECTION SCHEDULE

A. Fire extinguishers and cabinets are based on products from Larsen's Manufacturing Company to establish type, size, and appearance. This shall not limit the use other manufacturer's products.

1. Type 1
   a. UL Rating: 4A-60B:C
   b. Bracket mount: L-shaped wall bracket with two metal retaining straps with quick release clasps.
   c. 4 x 18 inch high performance plastic sign "FIRE EXTINGUISHER" with Vertical directional arrow. Seton Identification Products number M8636.
   d. Quantity: Provide 3 to be located in the field by the Architect

END OF SECTION 104413

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SECTION 10 71 13 – SECURITY SHUTTERS

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 exterior overhead coiling security shutter two Control room windows

B. Related Sections:
   1. Section 087100: Furnishing lock cylinder.

1.3 SUBMITTALS

A. Procedure: Comply with requirements of Section 013300: Submittal Procedures.

B. Product Data: Submit manufacture is complete product data for all specified components, including specifications, finish information and installation instructions.

C. Shop Drawings: Submit shop drawings showing layout, sizes and types, product materials, components and accessories, fabrication data, operation and wiring diagrams for motor driven operators, finishes, rough-in dimensions, anchorage and installation requirements and details.

D. Samples: Manufacturer's standard array of colors for selection by Architect.

E. Quality Assurance Submittals:
   1. Test Reports: Certified test reports showing compliance with specified requirements.
   2. Certificates: Manufacturer's certification that design criteria meets specified requirements.
   3. Operating and Maintenance Instructions: Submit detailed maintenance requirements and operating instructions.
   4. Warranty: Submit specified warranty documents

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Use only manufacturer's factory trained installers or qualified licensed installers approved by shutter manufacturer.

B. Regulatory Requirements:
   1. Comply with all local and governing code requirements.
   2. Unless required otherwise, fabricate to withstand wind loads that have the same rating as component and cladding of walls.

C. Pre-Installation Conference: Conduct a pre-installation meeting to verify project installation and coordination requirements, field conditions and manufacturer instructions.

1.5 DELIVERY STORAGE & HANDLING

A. Deliver components in manufacturer's original, unopened, undamaged containers with identification labels intact. Store components protected from harmful weather conditions and damage from other construction activity.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements of openings by field measurements before fabrication. Show recorded measurements on shop drawings

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide security screen from QMI Security Solutions or a comparable product from another manufacturer.
QMI Security Solutions
1661 Glenlake Avenue
Itasca, IL 60143
(800)446-2500
FAX: (630)980-6364

2.2 SHUTTER COMPONENTS

A. Aluminum Singled Wall Slats.
1. Extruded Slats: Aluminum, 6063-T5 alloy.
2. Solid
3. Color to be selected from manufacturer’s full range.
Bottom Bar: Extruded aluminum, 6063-T5 alloy, 0.050 inch wall thickness.

B. Operation: Manual with , gear and crank handle.

C. End Caps: Die Cast aluminum, 4 sided, in color to match slats.

D. Box Housing; 0.040 roll formed aluminum, 4 sided, in color to match slats.

E. Side Track: Aluminum extrusion, 6063-T5, lined with insulation woven polypropylene runners. Color to match slats

F. Mounting: recess

G. Stormbar Assembly: Aluminum extrusion.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conditions of substrates to determine if acceptable for shutter installation in accordance with manufacturer's instructions. Correct all unsatisfactory conditions prior to commencing shutter installation.

3.2 INSTALLATION

A. Install track and all shutter components to comply with project shop drawings and manufacturer's written instructions.
After installation test and adjust shutter to operate properly and free from distortion.

3.3 CLEANING

A. Clean installed components in accordance with manufacturer's instruction prior to acceptance. Remove all debris remaining, due to installation, from this installation

3.4 PROTECTION

A. Comply with manufacturer's recommendations and protect completed shutter installations from damage during remaining construction so as not to void warranty

END OF SECTION 107113

SECTION 131500 - GENERAL PROVISIONS FOR SWIMMING POOL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Coordination of excavation for swimming pool construction, piping, and related equipment. Hand trimming of excavation as required.

B. Construct pool tank including stairs and other appurtenances. Pool tanks are a delegated design item.

C. Complete perimeter recirculation skimmer system including all piping and returns

D. New High Rate Sand Filtration System including pumps, piping, gages, valves, and chemical control equipment.

E. Permanent and portable swimming pool deck and safety equipment specified in the Documents

F. Final engineering and design of pool filtration and recirculation equipment.

G. The Contractor shall arrange and pay all costs associated with filling the pool. This includes connecting to a municipal source that can be metered or trucking in water for the initial fill fo the pool. Contractor shall provide all pool chemicals as needed for start-up, testing the system, and training, until Substantial Completion. The chemicals used for start-up shall not be included in the inventory of chemicals being provided to the Owner as part of the Contract. The Contractor shall provide the following Chemicals at Substantial Completion. Ten (10) containers of chlorination pellets, four (4) full cylinders of CO2, and all other chemicals required to operate the pool for a period of four weeks after Substantial Completion. Pool staff training as required and is specified elsewhere in the contract documents.

H. Refer to the following Sections for detailed descriptions of the Work required for this Contract.
   1. 131510 –Swimming Pool Recirculation and Filtration Equipment
   2. 131520 – Swimming Pool Construction
   3. 131530- Swimming Pool Deck Equipment

1.3 REFERENCES:

A. The following references are made related to the Swimming Pool work:
   1. NSF: National Sanitation Foundation
   2. NSPI: National Spa and Pool Institute.

3. ANSI: American Nation Standards.
4. APSP: The Association of Pool & Spa Professionals
5. ASTM: American Society for Testing and Materials.
   a. ASTMC-581
   b. ASTM Specification D-2150.
6. NEC: National Electric Code (NFPA 70)
7. UL: Underwriters Laboratories.
8. 105 CMR 435: Minimum Standards for Swimming Pools (State Sanitary Code: Chapter V)

1.4 SUBMITTALS

A. Refer to requirements as specified in Sections 131510, 131520, and 131530.

1.5 QUALITY ASSURANCE

A. The swimming pool subcontractor must normally perform swimming pool construction and maintenance with his own employees.

B. The Swimming pool Sub-contractor must have at least five (5) years experience in the construction of the type of swimming pool and equipment herein specified."

C. The Swimming Pool Sub-contractor must list at least five (5) municipal (public) pools. Provide references and phone numbers for verification that the pools have been completed and are operating in a satisfactory manner.

D. The Swimming pool Sub-contractor must maintain an in-house service organization to provide pre and post-construction service and design consultation. This Contractor must be staffed with people knowledgeable in the areas of pool equipment filtration system operations and maintenance, have a demonstrable expertise in pool water chemistry. This Company must maintain and inventory of commonly needed spare parts. This Swimming Pool Sub-contractor must have available a system to monitor the effectiveness of the operator's handling of the filtration and chemical equipment, including facilities for water analysis and on-site observation of the operator's methods and competence. The Swimming Pool Sub-contractor shall furnish complete evidence that he has the facilities, equipment, personnel and financial capability to complete all phases of this section."

E. Other requirements pertaining to Equipment Quality Assurance are specified in Sections 131510, 131520, and 131530.

1.6 DELIVERY STORAGE & HANDLING, PROJECT CONDITIONS, WARRANTY, AND EXTRA MATERIALS

A. Refer requirements specified in Sections 131510, 131520, and 131530.PRODUCTS

1.7 POOL EQUIPMENT

A. Refer requirements specified in Sections 131510, 131520, and 131530.

1.8 STARTUP AND ENGINEERING SERVICES

A. Provide the services of an experienced swimming pool operating instructor for a period of not less than one day during the initial start-up. During this period, the Owner's designated representatives shall be thoroughly instructed in all phases of the swimming pools' operation.

B. The Contractor performs the first season start-up and shall train the Owner in conjunction with this start-up. The Contactor shall perform the initial fall shut-down of the swimming pool and train the Owner in conjunction with this shut-down.

C. Videotaping: Training shall be video recorded to capture the demonstration and training. Record each training session separately. It is not the intent of the Project to require a professional videographer; a Contractor employee capable of taking clear, in focus videos can perform the task.
   1. Provide adequate lighting.
   2. Provide narration.
   3. Video shall be converted and submitted on a DVD to the Owner.

1.9 CLOSEOUT

A. Prior to the completion of the Work, submit written certification from the Owner's designated representative acknowledging that the instruction period has been completed and all necessary operating information provided.

B. Contractor shall deliver three complete sets of maintenance procedures with printed instructions on the procedures for startup operations and winterization procedures bound in a 3 ring loose leaf binder for all swimming pool equipment, water features, piping, appurtenances and maintenance of pool finishes. If products ordered in advance are included in Project, insert a schedule below. See Evaluations for information and a sample schedule.

PART 2 - EXECUTION

A. Refer requirements specified in Sections 131510, 131520, and 131530.

END OF SECTION 131500

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SECTION 131510 – SWIMMING POOL RECIRCULATION AND FILTRATION 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. Delegated Design: This Section requires the final design and engineering of the pool filtration and recirculation system including accessory water features specified in other Division 13 sections. Sizes indicated within Division 13 drawings and specifications are to be construed as preliminary sizing and must be confirmed by Contractor.

B. Work includes complete filtration and recirculation systems for the Family Pool and Lap Pool including recirculation system for the water features and water slide.

C. Provide all swimming pool filtration/recirculation equipment, and necessary work to completely install the specified equipment as indicated on the Drawings and specified herein, including:
   1. Filter systems with all required components
   2. Circulating pumps and motors
   3. Piping and valves
   4. Main Drains for filtration and seasonal drain down connection.
   5. Automatic Chemical Controller
   6. CO2 manifold assembly
   7. Chlorinator
   8. Chlorine and pH feed system
   9. Automatic water level control chambers
   10. Assembly and installation of all equipment
   11. Specialty start-up chemicals
   12. Pipe labels and permanent mounted pool and filter diagrams
   13. Start-up service
   14. Training
   15. First Season Shut Down and Winterization (including training).

D. Coordinate bonding for all equipment within the pool tanks as specified in Section 26 00 00.

E. Coordinate emergency shut-off of pumps with work specified in Section 26 00 00.

F. Design, furnish, and install all required piping to make complete and operable systems.

G. Furnish 3 (three) Sets of Operation/Maintenance Manuals of all equipment and systems. Manuals shall include proper start-up and shutdown procedures. Clearly identify elements associated with the Lap Pool and the Recreation Pool.

H. Provide framed and mounted diagram of filter systems, operation and backwash procedures, and piping. Furnish and install numbere equipment plates, valve tags, and pipe labels to correspond to instructions.

I. Startup Service and Winterization Service with instruction to the Owner's shall be given the first season the pool is placed into operation. Training shall be videotaped.

J. Provide complete and coordinated filtration room design based on specific filter system submitted.

K. Shelving and mounting boards made of durable materials required for pool equipment and accessory installation.

L. Coordinate plumbing connection of fresh water line to pool make-up equipment.

M. Provide sidewall drain, valve with "tee" handle and pipe connected from pools to storm to provide off-season run off of rain and snow melt.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workman who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. The filter system to be furnished under this Section shall be a pressure type, high rate rapid flow sand system and the product of a manufacturer regularly engaged in the fabrication of filters for at least ten years. The filters shall bear the National Sanitation Foundation (NSF) seal of approval, Standard #50 for sand type filters, and be designed to produce a turnover rate of four (4) hours in the pool.

C. The filter manufacturer shall have factory technicians or factory authorized representatives to provide technical support, service, and maintenance on the filter.

D. The filter system shall be supplied complete by the manufacturer and shall include internals, face piping and valves, gauge panel with tubing and petcocks, sight glass, air relief connection, bottom drain connection with internal strainer.

E. The high rate sand filter system shall be fabricated and fully assembled at the manufacturer's plant for pressure testing and dimensional verification. System shall be knocked down for shipping purposes in sub-assemblies for minimum field assembly. Internals shall be knocked down for assembly in field.

F. Main Drains shall conform to the entrapment protection standards of the ASME/ANSI A112.19.8 performance standard, or any successor standard regulating such swimming pool drain covers

1.4 PROPRIETARY NAMES

A. Due to the specialized nature of certain components required for this Project, the Specifications, in some instances, refer to various components by trade or manufacturers name.

B. Whenever a proprietary (trade) name is used within this Specification Section, it is used for informational purposes to describe a standard of required function, dimension, appearance and quality. References to materials by trade name, make or model number shall not be construed as limiting competition. It is the intent of the Work to be in full compliance with M.G.L. c.30, 39M (b).

1.5 EXAMINATION OF DOCUMENTS

A. The bidder is expected to examine and be thoroughly familiar with all Contract documents and with the conditions under which the work will be carried out. The Town and designer will not be responsible for errors, omissions and/or charges for extra work arising from the Contractor's failure to familiarize themselves with the Contract Documents.

1.6 QUALITY ASSURANCE

A. All work in conjunction with this Project as specified herein shall be done under the supervision of a single Contractor who shall have ultimate overall responsibility for the project.

B. Perform work in strict accordance with manufacturer's instructions.

C. The work of this Section is to be performed by a Contractor having a minimum of five (5) years documented experience installing filtration equipment and associated piping and systems for swimming pools having a minimum capacity of 175,000 gallons or more. The Contractor shall submit a list of at least three (3) references for Projects that are similar to the Work of this contract in size, scope and materials. The references shall include the project title, description of work performed, contact person, telephone number and contract amount.

D. Without additional cost to the Town, provide such other labor, materials and equipment as are required to complete the Work of this Contract in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials, equipment and associated labor are called for elsewhere in the Documents.

E. The Contractor shall furnish a competent Project Superintendent satisfactory to the Town who shall supervise all Work under this Contract and who shall remain on duty at the site throughout the Contract period while Work is in progress. The Contractor shall arrange for inspection and/or supervision by manufacturer's representatives as required.

1.7 DELEGATED DESIGN SHOP DRAWING(S)

A. Furnish shop drawing(s) in sufficient detail to show design criteria, calculations, fabrication, installation, and anchorage. Drawing(s) shall include filter room layout, piping diagrams, power wiring diagram and control wiring diagrams for equipment. Drawing(s) shall be stamped by a Professional Engineer licensed by the Commonwealth of Massachusetts.

B. At the conclusion of the work, the Contractor shall provide to the Town (2) opaque hard copies and a (2) copies in pdf format on a CD or thumb-drive, of the final delegated design shop drawings including all of the changes and additions to reflect the work as actually installed.

C. Originals, changes and/or additions to the drawing(s) referenced in "A" and "B" above, shall conform to generally accepted engineering drawing practices.

1.8 SUBMITTALS

A. Filter, Recirculation, and Chemical Control and Feed Equipment
   1. Catalog cuts and product data for each item.
   2. Shop drawings of the items of equipment being provided, indicating the dimensions, material and welding characteristics of the filter tanks, lining, exterior face piping, internal manifolds and laterals, filter media and recirculation system components.
   3. Operating instructions, embracing the operational functions and recurring maintenance processes involved in connection with the complete filtration and chemical treatment system.

1.9 MANUALS AND INSTRUCTIONS

A. A total of three copies of an Operations and Maintenance Manual shall be furnished to the Town. The manual shall be in an indexed loose-leaf notebook and also provide on compact disk in an identical PDF Version in digital format. The cover page shall indicate the Contract Title, the Contract Number, and the Site Location. The manual shall include all approved shop drawings and details as well as complete instructions relative to the care and operation of all equipment supplied under this Contract.

B. The manual shall include the following:
   1. Table of contents
   2. Complete schematic drawings of all systems.
   3. Complete wiring diagrams of all electrical/electronic systems.
   4. Start-up and shut-down procedures.
   5. Winterization Procedures
   6. Maintenance, cleaning and replacement of components, filters, trainers, etc.
   7. Required lubrication
   8. Systems troubleshooting chart(s)
   9. Recommended list of spare parts
   10. Complete parts list
   11. List of manufacturers, along with names, addresses and telephone numbers of recommended repair and service companies.
   12. Manufacturer data, indicating where multiple model type and size listings are included, clearly and conspicuously indicate those that are pertinent to this Contract.

1.10 GUARANTEES and WARRANTIES:

A. The Filter System equipment supplier shall guarantee that the equipment to be furnished under this Contract is of the correct capacity, that the various parts are designed to operate correctly and in conjunction with each other, that if the installation is made in accordance with their

drawings and operated in accordance with their instructions, the system will perform the prescribed functions correctly. The water entering the pool will be clear, bright, free from suspended matter visible to the unaided eye, will not produce any toxic effect or impart undesirable taste, odors or colors and will be judged sanitary to the satisfaction of all authorities having jurisdiction.

1. Filter manufacturer shall guarantee that backwashing requirements (except during initial start-up and conditioning cycle) shall not be more frequent than once in seven days if the system is operated in accordance with the manufacturers published instructions.

B. Upon completion of the work of this Section, and as a condition of its acceptance, deliver the following warranties to the Town:
   1. Recirculation piping system: One (1) year warranty.
   2. Filter tank internals, valves and accessories: Three (3) year guarantee.
   3. Pool pumps and motors: One (1) Year guarantee.
   4. Filter tanks: Fifteen (15) year limited non-prorated warranty.

C. In the event of failure of any part or parts during the guarantee periods the affected part or parts shall be replaced promptly upon written notice by the Town at no expense.

D. The "EQUIPMENT SUPPLIER" shall guarantee that the equipment to be furnished is of the correct capacity, that the various parts are designed to operate correctly and in conjunction with each other, that if the installation is made in accordance with the project drawings and operated in accordance with the suppliers instructions, the system will perform the prescribed functions correctly, the water entering the pool will be clear, bright, free from suspended matter visible to the unaided eye, and will be sanitary to the satisfaction of all authorities having jurisdiction.

1.11 HOISTING, SCAFFOLDING AND PLANKING

A. The work to be done under this Section of the specifications shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, scaffolds, staging, and planking as required for the work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis- of- Design: Documents are based on equipment of Neptune Benson, Inc. and is used for informational purposes to describe a standard of required function, dimension, appearance and quality.

B. Acceptable Filtration Equipment Manufacturers are:
   1. Neptune Benson, Inc. Coventry, RI 800-832-8002
      http://www.neptunebenson.com
   2. Paddock Pool Equipment, Rock Hill, SC 800-324-1111
      http://www.paddockindustries.com
   3. Whitten Commerical Pool Equipment (ADG) Cohoes, NY 518-458-9283
      http://www.aquaticgroup.com

4. EPD USA, Inc., Banning, CA 866-299-5929
   http://www.epdivision.com
5. Nemato Corp, Whitby OT 800-361-5025
   http://nemato.com/products/hfilters.html
6. Stark, Division of Pentair, LaGrangeville, NY 845-463-7245
   http://www.pentaircommercial.com

2.2 FILTER SYSTEM REQUIREMENTS

A. The system shall be supplied complete by the manufacturer and shall include: internals, face piping and valves, gauge panel with tubing and petcocks, sight glass, air relief connection, bottom drain connection with internal strainer.

B. System shall be fabricated and fully assembled at the manufacturer's plant for pressure testing and dimensional verification. System shall be knocked down for shipping purposes in subassemblies for minimum field assembly. (Vertical) Underdrain manifold shall be factory installed and shipped in place, lateral piping is intended to be assembled in the field. (Horizontal) Underdrain manifold and lateral piping manifold shall be factory installed and shipped in place.

2.3 FILTER SYSTEM CAPACITY

A. Family Pool: The filter system shall consist of two filter tanks, vertically stacked, with a total effective area of 19.6 square feet. Filtration rate shall not exceed 15 gallons per square foot of filter area. System flow rate shall be 291 gpm in order to turn over a capacity of 70,000 gallons within a four (4) hour turnover period. System is based on Neptune-Benson Model 3478SHFFG single Tank Configuration,

2.4 HORIZONTAL FIBERGLASS FILTER TANKS

A. The equipment described herein shall be products of a manufacturer regularly engaged in the fabrication of pressure vessels for at least 10 years.

B. The filter tank shall be suitable for 50 psi working pressure, hydrostatically tested to 1.1 x working pressure and designed with a 4:1 safety factor.

C. Saddle style bases (2) shall be provided for tank support. Systems which incorporate stacked tanks shall include similar bases and mounting saddles for the upper vessel. Access to the tank shall be provided by a 14” x 18” manhole with a two bolt, 4 point yoke. Manhole seal shall be complete with one piece ¼” neoprene gasket and positioned so that internal pressure from the filter will augment the seal.

D. Drain out system shall consist of one (1) 3/4" fiberglass coupling mounted to the tank bottom. Each coupling to be fitted with a slotted PVC sand retainer. Air relief connection shall be one (1) 3/4" coupling provided on top of the tank.

E. Each filter tank shall be equipped with the necessary flanges and connections for the internal and external piping. Connections shall be comprised of 1" minimum thickness fiberglass flanges with ANSI standard 150 lb. bolt pattern.

F. The resin used shall be a commercial grade, premium corrosion resistant vinylester that has been evaluated in a laminate by test in accordance with ASTM C-581 in service comparable to the intended service and recommended for this service by the manufacturer.

G. Ultraviolet absorbers shall be added to the exterior surface for improved exterior resistance.

H. Chopped strand mat shall be constructed from commercial grade E- type glass strands bonded together using a binder. The strands shall be treated with a sizing that is chemically compatible with the resin system used. Continuous roving shall be a commercial grade of E-type glass fiber with a sizing that is chemically compatible with the resin system used.

I. The inner surface exposed to the corrosive environment shall be followed with a layer composed of vinylester resin, reinforced only with non continuous glass fiber strands applied to a minimum thickness of 0.100 inches. The combined thickness of the inner surface and interior layer shall be 0.110 to 0.130 inches and in no case less than 0.100 inches. The exterior laminate shall consist of filament winding and unilateral construction so as to create a modulus of elasticity to maintain no more than 0.1% strain in any direction.

J. Resin used in these layers shall be Hetron 922 incorporating a Cobalt/MEKP cure system or equal as recommended by the manufacturer.

2.5 FILTER PIPING - INTERNAL

A. The internal distribution system shall be a horizontal header/lateral arrangement. The header shall be Schedule 80 PVC construction, capped on one end and flanged on the other end. Lateral connections shall be spaced no more than 6" on the centers and shall be 1½" FPT connections.

B. Underdrain laterals shall consist of 1½" Schedule 80 PVC pipe with .012” wide machined double slotted openings on 1/8" centers. Machined openings shall be designed to retain all media particles as small as .30 mm particle size. Each lateral shall be fabricated complete with a socket cap on one end and male adapter on the other. Both fittings to be solvent welded to the slotted pipe. Laterals shall be designed and sized at the factory so as to be installed in the field and cover the entire cross sectional area of the filter. Laterals shall be fitted with a rubber 0-ring to allow for proper positioning of the machined openings.

C. Overdrain laterals shall consist of 1½" Schedule 80 PVC pipe with 1/2" wide machined slotted openings on 1 1/4" centers. Overdrain laterals shall be designed and sized at the factory so as to provide uniform distribution and unrestricted flow during filter and backwash cycles.

D. All hardware in wetted areas shall be stainless steel or non-metallic.

2.6 FACE PIPING

A. External face piping shall be Schedule 80 PVC pipe and fittings. Flanges shall be located so as to allow for easy dismantling of face piping. All fittings shall be solvent cemented.

B. Piping shall be drilled and tapped where necessary to accommodate gauge tubing connectors.

C. All valves 3” – 12” shall be constructed with cast aluminum ASTM S12A housing and fully coated with Rilsan on all interior and exterior surfaces. Internal components include EPDM resilient lining,

D. Rilsan coated ductile iron disc and T304 stainless steel shaft. Valves 14” and larger shall be constructed with cast iron housing epoxy coated and with nylon coated ductile iron disc.

E. Standard accessory items shall include sight glass rated for 50 psi with polycarbonate glass, remote mounted gauge panel with two 4½" diameter pressure gauges, ¼" petcocks, ¼" poly vent tubing with PVC compression adapters.

F. Face piping shall be fully factory assembled, knocked down and crated for shipment. The warranty of the face piping shall be provided by the filter manufacturer. Field gluing or assembly of the face piping by anyone other than the filter manufacturer will not be accepted.

2.7 AUTOMATIC AIR RELIEF VALVE

A. 1" valve shall be provided to automatically and continuously release air in the filter. The valve shall be fabricated of plastic with Buna-N seals. A plumbing kit shall be provided with two (2) PVC ball valves to allow manual air relief and isolation of the automatic valve. Valves fabricated of cast iron bronze or stainless steel shall not be acceptable.

2.8 THREE (3)-WAY VALVE CONTROL ASSEMBLY

A. A mechanical linkage shall connect two (2) valves in order to create simultaneous movement.

B. Connecting pieces shall vary with the size of face piping in order to operate with suitable mechanical advantage.

C. All linkage parts shall be T304 stainless steel.

D. Linkage shall be designed so that filter and backwash cycles can be accomplished by repositioning a pair of valves.

E. Each pair of valves shall be operated as specified with lever, gear or electric actuation.

F. All linkage components shall be grit blasted to a 1-2 mil profile. Blast media shall be completely non-ferric.

G. All linkage components shall be finish coated with 3-4 mils DFT of Type 316 pigmented stainless steel paint.

2.9 LEVER OPERATORS DOMINION

A. Valves shall be provided with 6 position latch lock handles.

B. Latch lock handles shall be constructed of epoxy coated cast aluminum and shall include a spring loader lever for position lock.

C. Lever shall be capable of holding the disc in any of the locking positions with no movement up to the full pressure rating of the valve.

2.10 GEAR OPERATORS

A. Valves shall be provided with infinite position gear operators.

B. Gear case (body) shall be constructed of cast iron painted internally and externally for maximum protection.

C. Enclosure shall be sealed to IP65 and maintenance free.

D. Self locking gearing shall be capable of holding the disc in any position with no movement up the full pressure rating of the valve.

E. Gear operator shall provide 90° of travel with ± 5° adjustment in closed position.

F. Gear operator shall include a non-corrosive sealed indicator for remote visibility.

G. Gear operator shall include manual adjustment capabilities.

2.11 MEDIA

A. Gravel support media of a hard coarse aggregate with a subangular grain shape with a particle size of 1/8" x 1/4" shall be used on the inside of the bottom head to the elevation where the filter media commences. The specific gravity shall not be less than 2.5. Support media shall be placed by hand to avoid damage to the underdrain system and leveled before the addition of the upper layer of filter media. Concrete underfill is not recommended. Support gravel shall be delivered and stored in 100 pound bags (approximately one cubic foot) for ease of handling and elimination of possible contamination. Media shall be free from minerals which may precipitate onto pool surfaces.

B. Sand shall be a carefully selected grade of hard, uniformly graded silica material. Media shall be naturally rounded particles of silica or milled angularly shaped particles of silica quartz. Sand shall have a particle size between .45mm and .55 mm.(#20). No more than 1.5% shall be allowed to pass through a #40 sieve (.0164”). Uniformity coefficient shall not exceed 1.53. Specific gravity to be not less than 2.5. Filter shall contain a minimum bed depth as shown on the drawings. Systems which do not provide a minimum bed depth as shown on the drawings will not be acceptable. Sand shall be delivered and stored in 100 pound bags (approximately one cubic foot) for ease of handling and elimination of possible contamination. Media shall be free from minerals which may precipitate onto pool surfaces.

2.12 FILTER SYSTEM PACKAGING

A. All filter piping and valves shall be factory assembled and knocked down into sub-assemblies for shipment.

B. The components shall be carefully packaged in a totally enclosed wooden crate to prevent damage during transport.

2.13 SINGLE TANK/CELL BACKWASH

A. The backwash system shall be capable of backwashing one filter at a time through sequencing of butterfly valves.

2.14 CIRCULATING PUMPS AND MOTOR FOR POOL

A. Pumps General:
1. The pump casing shall be ASTM 48, class 30, cast iron capable of hydrostatic test @ 150% of maximum discharge pressure and have replaceable suction wear rings(s). The interior of the pump casing including the influent and effluent connections shall be sandblasted to near white metal per ISO 8501-SaZ.5. The pump casing shall be preheated and lined with Scotchkote 134.
2. The impeller shall be enclosed, single piece cast bronze casting, completely machined on all outside surfaces and statically balanced at time of pump assembly. The impeller shall be keyed to the shaft and securely fastened with a vibration resistant lock screw and washer.
3. The mechanical shaft seal shall have carbon/ceramic mating faces for leak free operation, with stainless steel internal parts.
4. The motor shall be close-coupled type. Motor power supply is 208/230 volt 3-phase. The motor bearing shall be selected to withstand thrust loads and have a minimum life of 100,000 average B-10 hours. Motor shall meet or exceed the minimum full load efficiencies as per NEMA MG-1 Table 12-11.
5. The motor shall be heat treated carbon steel, turned and ground, protected by a bronze sleeve secured to the shaft to prevent rotation. The maximum allowable no-load shaft run-out shall be .002.
6. The impeller shall not contact the suction wear ring under any operating load condition.
7. The pump and motor shall be connected by an ASTM 48, Class 30, cast iron bracket incorporating a full isolating shield with a slinger to prevent moisture from entering.
8. Pump shall carry NSF standard 50 listing.

B. Lap Pool Circulating Pump
1. Furnish and install the horizontal close coupled, centrifugal pump, of bronze fitted construction as manufactured by Griswold Pump Company Model #NB411SC20 described for the following conditions:
   a. Horsepower: 10hp
   b. Design Capacity 291 GPM
   c. Design Total 70 Head Ft.
   d. Maximum 950 RPM
2. Provide Neptune Benson Green Drive VFD 12460 with 6 inch B&W Schedule 80 Pipe Digital Flowmeter

3. Provide Pump base equal to NB 12012615-75 HP Adjustable between 12 and 24 inches, with Type B powder coat finish.

2.15 FIBERGLASS OR COMPOSITE HAIR AND LINT STRAINER

A. Provide composite or fiberglass hair and lint strainers at each pump meeting the following requirements:
   1. Unit shall be a single molded unit equal to
      a. Lap Pool: Neptune Benson Model: NBBSK08EP with strainer basket 150NBFG85ER1
      b. Family Pool: Neptune Benson Model: NBBSK08EP with strainer basket 150NBFG85ER1
   2. Have opposing flanged connections for piping
   3. Strainer lid shall be 1" thick transparent acrylic machined to eliminate sharp edges and house securing assemblies. Lid shall be grooved to house rubber gasket. Lid shall be seated with a 1/8", thick full face 40 durometer neoprene rubber gasket. (0-ring gaskets will not be permitted)
   4. Provide one (1) stainless steel basket and one (1) spare per each Basket Type Strainer provided. Basket shall be constructed of heavy gage T304 stainless steel frame and mesh with 5/32 INCH perforations and not less than 62% open area. The strainer housing shall be equipped with a valved bottom drain for winterization purposes.
   5. Strainer basket shall have a welded intermediate curved baffle to reinforce the basket and capture extra debris to reduce cleaning frequency.
   6. Unit shall include a minimum of four (4) securing assemblies to permit easy opening and closure of strainer lid without the use of tools.

2.16 GAGES AND CONTROLS

A. Backwash sight glass: Furnish a full pipe type sight glass for installation on the pipeline carrying backwash water to waste. Such sight glass shall be constructed of corrosion proof materials and capable of withstanding pipeline water pressure without leakage.

B. Gages: Provide 3 ½ inch gauges mounted to identify pump vacuum, pump pressure, filter influent and filter effluent pressure for each pump.

C. Provide flowmeters in filtered water return lines to pools. Meters shall be direct reading analog type calibrated to read in gallons per minute. Flowmeters shall be equal to Signet analog type.

2.17 OPTION 1: CAT 4000 – WIRELESS WATER CHEMISTRY CONTROLLER, Disinfection, pH and Miscellaneous Equipment: Provide One for Each Pool:

A. The following specifications are intended to set a quality of performance standard needed by the Town. Any units proposed shall meet or exceed the performance standards outlined below in the opinion of the Town and its designer. Equipment not meeting these technical standards shall not be accepted. All major instrument components shall be of a single source of manufacture so that instruction, service and warranty can be under single responsibility.

B. The selected unit shall provide a completely integrated electronic system to continuously monitor and control the necessary requirements of swimming pool water chemistry in the following areas. The control system shall be capable of monitoring and controlling pH values and free available chlorine residuals.
   1. pH level
   2. Chlorine Residual.

C. Water Chemistry Controller Package – A microprocessor based water chemistry controller shall be provided to automatically monitor and adjust water chemistry based on pH and ORP electrodes. The system will include a controller, pH, and ORP sensors, flow cell, and flow sensor pre-mounted on a PVC backboard. The controller shall be capable of continuous data logging, and alarm notification without PC based software or telephone line connection. The controller shall be provided in wall mountable, corrosion-proof cabinet with key lockable, windowed door. The system shall be a CAT 4000 as manufactured by CAT controllers, Inc. (800-657-2287) or approved equal which meets or exceeds all these bid specifications. Alternate suppliers are:1. Stranco, Inc. 2. Chemtrol, Division of Santa Barbara Control Systems.
   1. Inputs - All inputs to the controller shall be made by connectors permanently mounted on the unit. No user access to the inside of the housing is required to connect sensors during installation. The pH sensor input will cover the range 0-14 pH with .1 resolutions. Controller shall be capable of activating chemical feeders to increase and decrease pH based on set point. ORP sensor input will cover the range 0-1000 mV with resolution and accuracy of 1mV. Controller shall be capable of activating chemical feeders to increase sanitizer levels. No calibration of ORP is allowed. In event of a loss of stream flow, controller shall place all chemical feed on standby. Controller shall be equipped with a internal solid-state feed alert: Circuit that shall disable the appropriate chemical feeder(s) and energize an alarm in the event of:
      a. Electrode or electrical failure.
      b. Chemical feeder malfunction.
      c. Improper valving of recirculation system.
      d. Manual over-ride of automatic control by untrained personnel.
      e. Depletion of chemical supply.
   2. Display - All controller programming and functions shall be displayed on an alphanumeric display of 2 lines by 20 characters vacuum florescent display. The vacuum florescent display provides a bright blue-green light emitting display easily read in indoor installations.
   3. Operating Menu – Daily operating parameters are accessible on a single menu level from the front panel and include: pH feed mode, pH set point, pH calibrate, ORP feed mode, and ORP set point.
   4. Configuration Menu – Setup features are accessible by a second menu level and include: pH control mode, pH priority, pH feed, pH high and low alarm points, pH overfeed timeout, ORP feed, ORP high and low alarm points, ORP overfeed timeout, Display system information, System Reset, Restore factory defaults, 3rd relay programming
   5. Alarms - Audible, visual and email alarm notifications will be provided for all alarm conditions and will be enumerated on the controller display.
   6. Sensors - Heavy-duty long life combination pH and ORP sensors will be provided with a minimum warranted life expectancy of 2 years.
   7. Package - The controller, flow cell, and flow sensor will come pre mounted on a 16”x18” white PVC backboard to facilitate installation. 30’ of 3/8” OD flexible tubing and ¼” NPT connectors will be provided for installation.

8. Data logging & Communications - The controller shall log pH and ORP values hourly and transmit them to the Poolcomm web site (www.poolcomm.com) daily without a telephone line connection or PC based software. The web-based application will provide for secure log in to view all past data and adjust pH, ORP, and alarm set points remotely. Alarm notifications will be automatically sent via email to any number of recipients on all programmed alarm events.
9. Warranty - The controller shall be housed in a non-metallic NEMA 12X rated enclosure suitable for outdoor use. The controller will be warranted for 5-years.
10. CSA & UL certifications – The controller shall be tested and labeled with UL and CSA compliance.
11. Monitoring service – The installer will provide 1 year of remote data logging and Poolcomm web interface service.
12. Documentation - Technical Data Sheets, Shop Drawings, and Installation instructions will be provided in print or digital formats to designer, builder, installer, and operator.

D. Gages: The instrument gauges shall be direct reading type. One for pH and one for chlorine residual gage shall read in millivolts, or ORP (oxidation-reduction potential) as well as parts per million (PPM) cholrine.

E. Flowstreams: Sample stream shall consisit of a sampling cock with shut-off valves and union disconnects on both the influent and effluent pipes. A clear length of pipe shall be installed to provide visual flow verification. An injection nozzle connection shall be included for the point of acid (probe cleaning) solution input.

F. Work shall include the wiring, and control connections between the automatic chemical controller and chlorine systems, CO2 systems, controls, starters and switches.

2.18 OPTION 2: DCM 500- ProMINENT FLUID CONTROLS Pittsburgh PA 412-788-7900

A. The controller shall automatically activate the appropriate chemical feeders in order to maintain the sanitizer level within +/ 0.1 parts per million (PPM) or +/ 10 mV (millivolts) of Oxidation Reduction Potential (ORP) and the pH within +/ 0.1 pH unit of the setpoints selected by the operator. All setpoint and calibration levels shall be adjustable with a numeric keypad mounted on the front panel of the unit.

B. The controller shall be capable of actuating all outputs in the following operator selectable modes: off, manual, automatic, proportional and PID control. The controller must be able to interface pulse output chemical feed pumps for true PID control to ensure chemical conservation. The controller shall have ORP, pH, temperature, and free and total chlorine probe for indoor applications. The controller must be capable of controlling a UV systems based on a combined chlorine alarm.

C. The controller must utilize both ORP and PPM control. Controllers that do not have the ability to control simultaneously to ORP and PPM control points shall not be considered. For indoor applications units MUST incorporate probes for real time combined chlorine readings and control of supplemental UV equipment.

D. The controller shall have the capability to operate a UV system via combined chlorine real time readings. Controller shall be programmable to turn UV on and off or ramp power up and down based on combined chlorine reading and programmable alarm settings. Controllers that utilize

DPD testing or do not control based on real time combined chlorine levels shall not be considered equal.

E. The controller shall include a temperature sensor and automatic control of the heater

F. The controller shall include standard a flowswitch incporporated into the sample line for chemical probes to ensure shut down of chemical feed should there be a no flow conditionstop in the recirculation lines. The system must also display via remote communication the status of flowwitch and its run time for a 24-hour period.

G. The controller shall continuously calculate and display the Langelier Saturation Index and Ryznar Index using either sensor data and/or manual input for TDS, total alkalinity and calcium hardness.

H. The controller shall be contained in a NEMA Type 4X (rain and splash proof) lockable injection molded cabinet with an lockable enclosure.

I. The controller shall include programmable high and low alarm levels for all sensor inputs and control functions with operator-selectable feed lockout and alarm buzzer. A Remote Alarm relay shall be included in parallel with alarm buzzer for operator-selectable voltage or dry contact output. The controller shall be standard with e-mail out alerts on alarm activation. The controller shall also email out a user-defined notification if any automatic control feature is deactivate or changed at the site by an operator. Controllers without email notifications shall not be considered equal.

J. The controller shall have standard real-time monitor and control via a smartphone, ipad or tablet device using a 10-base t Ethernet jack, or wifi router. The HTML server shall be an integral part of the controller. Controllers not having an integral HTML server or interface shall not be considered. The controller shall also be capable of utilizing 3G internet access with optional EVDO provided interface. All communication functions shall function with standard internet browsers. Controllers needing additional software installed shall not be considered.

K. The controller shall have real time monitoring of the heat exchanger corrosion rates and alarm out should corrosion rates exceed standard mil/year erosion rates when supplied with optional LogR package.

L. The controller shall come standard with no less than 7 fully configurable digital inputs

M. The controller shall have 10 configurable analog inputs.

N. The controller shall have a minimum of 5 fully assignable relays. <u>Controllers with less than 5 assignable relays shall not be considered an equal.</u>

O. The controller shall have a minimum of 4 fully assignable digital outputs.

P. The controller shall be supplied at factory on Acrylic backboard.

Q. The controller shall include an optional conductivity sensor.

R. The controller shall include recirculation flow rate via paddle wheel flowensor. Flow~~r~~sensor to be supplied by chemical controller manufacture.

S. The control shall have flashing LED status indication with flashing light notification when in alarm status.

T. The flowcell shall incorporate both a flow switch and flow meter to indicate flow through cell. Controllers not having flow indication shall not be considered.

U. The controller shall come standard with remote monitoring software for both auto polling no less that following:
   1) Routine checking of alarms with e-mail out on alarm detection
   2) Periodic auto downloading of stored data in controller

V. Warranty
   1. The controller shall be covered by a standard manufacturer warranty of five (5) years. Special extensions of more limited warranties shall not be considered acceptable. pH and ORP probes shall be covered by a 2 year warranty all other sensors will be covered by a standard one (1) year warranty. All other ancillary parts and consumables supplied shall be covered by their own manufacturer's warranty or one year whichever is greater. The controller shall not require a service technician for annual calibration, seasonal start up, or whenever chemicals supplier or type are changed.
   2. The manufacturer shall supply a complete instruction, operating and maintenance manual. Check-out of installation, start up, and instruction of operating personnel shall be performed by an authorized and properly trained manufacturer representative.

2.19 LIQUID CHLORINATOR EQUIPMENT FOR POOLS

A. Provide Double Wall Storage Tanks;
   a. 550 gallon
   b. 48 inch diameter by 98inches high
   c. Molded High Density Polyethylene (HDPE), Molded
   d. FDA approved
   e. 8 inch cap.
   f. Manufactured by Bailiff Enterprises: https://plasticstoragetanks.com

B. Complete exterior fill and vent assemblies for each tank:
   1. Piping
      a. Provide piping for the new fill and vent lines between the street and the chlorine storage tank.
      b. Piping: The piping which connects the chlorine storage tank and street level shall be of polyvinyl chloride (PVC) piping, Class 200, Schedule 80, NSF approved.
      c. Pipe Fittings: All fitting shall be heavy weight Class 200 , of the same manufacturer as PVC pipe used by the Pool Contractor. Provide hangers or stands where required. Provide threaded fittings.
      d. The Contractor shall furnish and install new piping and fittings as shown on the drawings and images included as part of the work.
      e. The Contractor shall furnish all other material and parts necessary to complete the installation.
      f. Cutting of Pipe: Shall be done in a neat and workmanlike manner without damage to the pipe. Cutting shall be done by means of mechanical cutter.

g. Placing and Laying: Before installation, pipe shall be inspected for defects. The interior of the pipe shall be thoroughly cleaned of foreign matter and shall be kept clean during layout operation.

h. Threaded Joints: After cutting and before threading pipe shall be reamed and shall have burrs removed. Screw joints shall be made with graphite inert filler and oil or with an approved graphite compound applied to male threads only. Threads shall be full-cut and not more than three threads on the pipe remain exposed. Caulking of threaded joints to stop or prevent leaks will not be permitted. Unions will be permitted where access is provided.

i. Testing: After piping is installed, the piping shall be subjected to a hydrostatic pressure for a period of two hours.

j. A water test shall be applied to a gravity drain piping systems, either in their entirety or in sections. All openings shall be tightly plugged and each system filled with water and tested with at least a 10 foot head of water. The water shall be kept in the system, or in the portion under test for at least 15 minutes before the inspection starts. The system shall then be proved tight at all joints.

2. Fittings

a. Provide all fittings and accessories required for a complete installation.

3. Fill Assembly.

a. Ball Valve: Provide Threaded, Schedule 80 Industrial Ball Valve, 2 inches to match fill line. PVC resin per 12454 ASTM·D 1784. Internal components shall include EPDM resilient lining, PTFE anti-friction rings and stainless steel shaft.

b. Camlock Fitting: Provide 2-inch polypropylene camlock fitting; a female coupler x MPT thread. Equal to Global Industrial Stock No. WGB187189, or equal.

c. Dust Cap: Provide 2-inch polypropylene camlock fitting, threaded dust cap. Equal to Global Industrial Stock No. WGB187039, or equal

4. One (1) Pulsatron Series ET chemical metering feeder for chloride solution, or approved equal. Capacity from 5 to 500 GPD.

2.20 AUTOMATIC MAKE-UP WATER LEVEL CONTROLLER--WLC-100- CHAMBER

A. Pool water level shall be maintained by an automatic make-up level controller Model WLC-100.

B. Controller package shall consist of a PVC chamber to house stainless steel probes. The electronics are housed in the Command Center.

C. Water level shall be controlled by the use of a three-probe electrode system, one for high level, one for low level and one ground. Electrodes shall be T316 stainless steel connected to a UL approved probe holder. A mechanical linkage or float operated system will not be acceptable.

D. Probes and holders shall be housed in a PVC chamber consisting of an 8", schedule 80 PVC pipe. Chamber shall be sized to accommodate desired range of water level variation and shall be complete with removable cover and adjustable collar suitable for deck level installation. A 1½", equalizing line shall be connected from the bottom of the chamber to the pool wall.

E. Probes shall be mounted on a readily removable Lexan disk within the chamber. Probe connectors shall be protected with 90° molded plastic holders.

F. Wiring from the probes shall be connected to a UL approved relay mounted within the Control Panel.

2.21 MAIN DRAIN SUMPS - FIBERGLASS

A. Main drain sumps two (2 Required), Shall conform to the entrapment protection standards of the ASME/ANSI A112.19.8 performance standard, or any successor standard regulating such swimming pool or drain cover. Contractor shall provide the Town with manufacture's certificate of compliance with current Federal and State regulations. Main drain sumps shall be all fiberglass body as manufactured by Neptune-Benson, Inc.. Main drains to be sized as shown on the drawings.

B. Main drain body shall include a 3" stainless steel waterstop flange and 2" threaded hydrostatic relief valve fitting. Hydrostatic relief valves and collector tubes shall be provided with the drains.

C. Flanged connections shall be provided for pipe sizes required to accommodate design flow rate ad applicable codes.

D. Main drain grate shall be pultruded fiberglass t-bar grating with stainless steel tamper proof hardware. Main drains shall be provided with under drain collector assemblies and hydrostatic relief valves.

2.22 PIPING:

A. Filer Connection Piping: The piping which connects the filter to the filter pump and to the recirculation piping, backwash piping and other drain piping shall be of polyvinyl chloride (PVC) piping, class 200, schedule 80, and galvanized steel for vent piping, as required with matching fittings. PIPE FITTINGS: All PVC pipe fittings shall be heavy weight class 200, of the same manufacturer as PVC piping used by the Pool Contractor. Provide hangers and stands where required.

B. Pool Drain Piping: The main drain piping for the pool shall be AWWA Class 22 cement lined mechanical joint cast iron pipe with similar fittings or NSF approved Schedule 80 PVC.

C. Filter Connection Piping: The piping which connects the filter to the filter pump and to the recirculation piping, backwash piping and other drain piping shall be of polyvinyl chloride (PVC) piping, Class 200, Schedule 80 and galvanized steel as required with matching fittings.

D. Chlorine Solution Lines: Shall be of plastic and of a type recommended by the chlorinator manufacturer. Chlorine lines which are run underground shall be carried in PVC conduit.

E. Pipe Fittings: Wherever plastic pipe is used, all fitting shall be heavy weight Class 200 , of the same manufacturer as PVC pipe used by the Pool Contractor. Provide hangers or stands where required.

2.23 CO2 FEED SYSTEM - DUAL TANK

A. Unit shall be a dual tank C02 metering system and take nominal 800 psi pressure from direct reading pressure gauges. One gauge shall read tank pressure. The other shall read regulated by a T-bar. Unit shall be wall mounted and shall connect to C02 cylinders by 3/16" I.D. braided tubing rated for not less than 1000 psi. Discharge from unit shall be through thick watt 3/8" OD polyethylene tubing to the feed unit.

B. C02 from the pressure reducing valve shall be brought to the feed unit in thick watt 3/8", OD polyethylene tubing. Feed system shall include 120 volt AC solenoid operated valve for remote on/off control of C02 feed. C02 feed unit shall also include rate adjusting flow meter scaled from 0-30 SCFH and have a pressure rating of 100 psi.

C. C02 from feed unit shall be injected through ½" NPT fitting. Unit shall cause C02 to be totally diffused and made to go fully into solution without evidence of C02 bubbling at any point where water is open to atmosphere. Unit must be equipped with a check valve to prevent the flow of water into the feed unit.

2.24 VALVES

A. Small Valves: Valves up to and including two (2) inches in size shall be Gate Valves, all brass with treaded ends for ferrous pipe. They shall be 125 lb. non-rising stem type.

B. Large Valves: Valves three (3) inches and larger shall be iron-body bronze mounted, and shall conform to AWWA Standard C-500. Valves shall have a flanged or mechanical joints ends as required for the piping in which they are installed. Valves shall be designed for a minimum water working pressure of 125 lb. per square inch.

C. Wafer Valves: As shown on the plans shall be butterfly-wafer valves equal to Centerline Series A, bronze disc, meehanite iron body stainless steel stem, Buna N seat gear or lever operated as shown.

D. Throttling Valves: Provide gear operated butterfly valves.

E. All below grade, below slab, and all valves within surge pit shall be provided with extension rods to the deck surface. Steel deck access sockets with drop-in covers shall be provided for each extension.

2.25 VALVES - GENERAL - DOMINION

A. All valves 3" and larger shall be constructed with cast aluminum ASTM S12A housing and fully coated with Rilsan on all interior and exterior surfaces. Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and T304 stainless steel shaft. Valves shall be rated for 150 psi bubble tight shutoff.

B. Valves shall be Dominion butterfly valves and shall be provided for strainer isolation, filter bypass, backwash throttling, filtered water return and balance tank connections.

C. Valves shall be suitable for chlorinated water, freshwater and submerged applications

2.26 VALVES GENERAL VICEROY

A. All valves 2 ½" and larger shall have a body & disc constructed of PVC resin per 12454 ASTM·D 1784. Internal components shall include EPDM resilient lining, PTFE anti-friction rings and stainless steel shaft. Valves up to 10" shall be rated for 150 psi bubble tight shutoff. 12” valves shall be rated for 115 psi bubble tight shutoff.

B. Valves shall be Viceroy™ valves and shall be provided for strainer isolation, filter bypass, backwash throttling, filtered water return and balance tank connections.

C. Valves shall be suitable for chlorinated water, freshwater and submerged applications.

2.27 SURFACE SKIMMERS-INDOOR POOL

A. Basis of Design Manufacturer: Hayward SP10712.

B. Non-corrosive, large capacity automatic surface skimmer with round, tamperproof access cover, self-adjusting 8-inch weir with stainless steel spring, duel outlet and threaded internal connections. Maximum flow rate between 10 to 55 GPM.

2.28 FILTERED WATER RETURN FITTINGS- BOTH POOLS

A. Basis of Design: Pentair Products: 542423 & 540028

B. Provide 2 inch slip body for Schedule 40 PVC, white. Provide 1 1/2inch threaded directional eyeball fitting , 1 inch opening white .

2.29 TEST KIT

A. Provide and use a DPD test kit for measuring the concentration of chlorine and an appropriate test kit for measuring pH, alkalinity, and cyanuric acid levels at each swimming pool. Provide one (1) Taylor No. 1765 tester for measuring FAC chlorine residuals and pH. Include sufficient reagents for one year's testing. Furnish in carrying case with separate slides for pH and chlorine. Also provide WB test with extra reagents and a Dalite slide mount for viewing.

2.30 SPECIALTY START-UP CHEMICALS

A. The contractor is responsible to supply and dose the pool with all necessary chemicals to balance the water to the following levels:
   1. pH 7.2 - 7.8
   2. Alkalinity 50 - 150 (ppm)(mg/l)
   3. Residual Chlorine: 1.0-3.0 Free, 0.0 to 0.2 combined

B. All chemicals shall be USP listed and mineral free.

C. Initial shock treatment shall be performed with a non-chlorine oxidant and shall be administered prior to balancing.

D. Chemicals necessary to prevent staining and discoloration (sequestering agents) shall be introduced prior to shock treatment.

E. All chemical tests must meet Owner satisfaction and filter manufacturer's standards. Contractor shall obtain owner approval prior to any chemical dosage.

F. Cost of providing Chorine for testing of the system verification process is the responsibility of the Contractor. Contractor shall provide 1,000 gallons or (2) two full tanks of chlorine at time of final acceptance to the Town from the current state supplier of pool chemicals." "Arrange for the Owner's service contractor to provide CO_2 tanks. Pay for the first four CO_2 tanks at Substantial Completion for use by the Town."

2.31 MISCELLANEOUS MATERIALS

A. Valve Tags: Round, 2 inch diameter, stamped .025 stainless steel tag, with No. 16, solid brass jack chain connection to valve. Available from Seton Identification Products, Branford, CT., (800) 243-6624, or equal.
   1. Tag: Seton M4540, Black filled numbers.
   2. Chain: Seton Style No. 16182

B. Piping Labels: Pressure sensitive vinyl markers complying with OSHA and ANSI specifications for background and colors. Provide one label at 6 feet O.C. for length of exposed pipe. Provide Seton Opti-Code Pipe Markers, or approved equal. Provide labels in size required for piping. Color code label types using white letters on green, red, yellow, and blue fields. Text with directional arrows may include:
   1. Chlorine
   2. Cold Water
   3. Discharge
   4. Drain
   5. Filtered Water
   6. Return
   7. Suction
   8. Supply
   9. Waste

C. Equipment Labels: Custom Facility Labels. 4 mil pressure-sensitive labels. Background color shall be white, print color shall be blue. Labels available from Seton Identification Products. Provide 1 label for each piece of pool equipment, including, but not limited to:
   1. Pumps
   2. VFD's
   3. Filters
   4. Chlorinators and chlorinator pumps.
   5. CO2 manifolds
   6. Control equipment
   7. Sensors
   8. Probes
   9. Sample stream assemblies.
   10. Other component that requires easy identification in the pool filtration room.

D. Plywood Backing Material and Miscellaneous Shelving:

1. Backing Boards: 3/4 inch thick, exterior grade plywood, A/C facing. Sand smooth all exposed edges. Plywood shall be sealed with three (3) coats of water-based polyurethane prior to installation.
2. Shelving: Cellular PVC Boards: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized, rigid material.
    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1) AZEK Building Products, Inc.
        2) CertainTeed Corporation.
        3) Fypon Ltd.
        4) Kleer Lumber, LLC.
        5) Ply-Trim, Inc.

E. Plexiglas for diagram mounting: GE's Lexan Margard MR-5 polycarbonate sheet, or approved equal.

F. Diagrams: The pool filtration diagrams shall be on a permanent media that is not subject to fading or deterioration.

G. Shelf Hardware: Stanley Utility Shelf Brackets, baked gray enamel; sized to meet shelf size. Provide stainless steel wood screws to fasten brackets to wall.

PART 3 - EXECUTION

3.1 INSPECTION

A. The Contractor shall examine all work prepared by others which is to receive the work of this Section and shall report any noted defects effecting this work of this Section to the Town in Writing.

B. All contractors, subcontractors, and sub-subcontractors are cautioned to clearly understand the limits of responsibility of each other. Prior to a work start by those trades effecting the work of this Section, a meeting will be held at the jobsite among all contractors, subcontractors, sub-subcontractors and the Engineer to coordinate these Specifications and establish work limits, job schedules and liaison between the trades to insure a coordinated construction process.

3.2 INSTALLATION

A. The Pool Sub-contractor shall assemble and install all filtration system and pool equipment, piping and accessories in accordance with the intent of these specifications and as indicated on the project drawings, as indicated on the approved shop drawings and as recommended by the Pool Manufacturer."

3.3 PIPING AND VALVES

A. The Contractor shall furnish and install new piping and fittings as shown on the Project Drawings and contractor shop drawings.

B. The Contractor shall furnish all other material and parts necessary to complete the installation.

C. All pipes and fittings for pool filtration system shall be Schedule 80 PVC, with the exception of potable fresh water feeds and backflow preventer, copper piping for the eye wash station and hot water heater connections which work shall be performed by a licensed plumber. The plumber shall make final connections to waste which shall be ductile iron in accordance with State Plumbing Code. Connections between copper and PVC shall be flanged.

D. Piping arrangement shall be in accordance with approved shop drawings.

E. The Contractor shall provide all the concrete bases under the pumps and elsewhere as indicated on the drawings.

F. All chemical feed equipment, tubing, piping and chemical control sample streams shall be installed in strict accordance to the manufacturer’s installation instructions.

3.4 INSTALLATION OF PIPING

A. Pipe openings shall be closed with caps or plugs during installation. Equipment and pool fittings shall be tightly covered and projected against dirt, water and chemicals or mechanical injury. At the completion of the work, the fittings, materials and equipment shall be thoroughly cleaned and adjusted for proper operation.

B. Handling: Pipe and accessories shall be handled in such a manner as to insure delivery to the trench in sound, undamaged condition.

C. Cutting of Pipe: Shall be done in a neat and workmanlike manner without damage to the pipe. Cutting shall be done by means of mechanical cutter.

D. Placing and Laying: Before installation, pipe shall be inspected for defects. The interior of the pipe shall be thoroughly cleaned of foreign matter and shall be kept clean during layout operation. Pipe shall not be laid in water or when trench or weather conditions are not suitable for the work. Water shall be kept out of the trench until pipe is installed. When work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substance will enter the pipes or fittings.

E. Threaded Joints: After cutting and before threading pipe shall be reamed and shall have burrs removed. Screw joints shall be made with graphite inert filler and oil or with an approved graphite compound applied to male threads only. Threads shall be full-cut and not more than three threads on the pipe remain exposed. Caulking of threaded joints to stop or prevent leaks will not be permitted. Unions will be permitted where access is provided.

F. Solvent Welded Joints: Shall be made in accordance with the manufacturer's recommendations. However, the following directions are considered when applying cement. The outer surface

area of pipe and inner wall of fitting shall be clean and dry. Thinner is to be applied to the outer surface of the pipe and to the inner surface of the fitting.

1. Cement is to be applied to the outer surface of the pipe, or on the male sections of the fittings only. When the outside surface are of the pipe is satisfactorily covered with cement, allow ten seconds open time to elapse before inserting pipe end into fitting. After full insertion of pipe into fitting, turn fitting about the pipe end approximately 1/8 to 1/4 turn. Wipe off excess cement at the joint in a cove bead. Use only approved cement and thinners for making joints.
2. All joints shall remain completely undisturbed for a minimum of ten minutes from time of joining the pipe and fitting. If necessary to apply pressure to newly made joints, limit to 10% of rated pipe pressure, four hours after joining. Do not exceed this level for the first 24 hours after the joint has been made.
3. Carefully handle all pipe and move as little as possible for 24 hours after joining.
4. Protect plastic pipe from exposure to aromatic hydrocarbons, halogenated hydrocarbons, esters and ketones that attack the material. Protect pipe from mechanical damage and long exposure to sunlight during storage.

G. Testing: After piping is laid, the joints completed and the trench partially backfilled, leaving joints exposed for examination, the newly laid line shall be subjected to a hydrostatic pressure for a period of two hours.

1. A water test shall be applied to a gravity drain piping systems, either in their entirety or in sections. All openings shall be tightly plugged and each system filled with water and tested with at least a 10 foot head of water. The water shall be kept in the system, or in the portion under test for at least 15 minutes before the inspection starts. The system shall then be proved tight at all joints.

3.5 SYSTEM OPERATION INSTRUCTION AND ENGINEERING SERVICES

A. An authorized representative of the “EQUIPMENT SUPPLIER” shall provide the supervisory services of an installation engineer for at least one day to fully instruct designated personnel in the operation, care and maintenance of the entire purifying, sterilizing and recirculating system.

B. All system components shall be operational prior to scheduling operator training.

3.6 ELECTRICAL WORK

A. Design, furnish and install all wiring for pool equipment for final connection to existing electrical supply. The electrical sub-contractor shall furnish and install disconnects located to close proximity to the pool pump motors. Furnish and install all required electrical circuits for the filter control system.

B. All electrical wiring and other similar devices installed in the filter room under this contract shall be suitable for use in high humidity/wet environments, and shall be in accordance with the requirements of the National Electrical Code.

C. Contractor to install and emergency stop switch with cover on the face of the filter building in a location to be identified by the Town. Chlorine Pump to be wired to turn off in the event of a power failure or when emergency top button is depressed.

D. Refer to electrical specification and plans for additional information.

3.7 POOL FILLING

A. Contractor shall provide independent laboratory analysis of existing water supply. Based on the results, the pool Subcontractor shall recommend start-up chemical use and dosage. Take multiple water samples at periodic times in order to establish a range.

B. All chemical tests must meet Owner satisfaction and filter manufacturer's standards. Contractor shall obtain Owner approval prior to any chemical dosage.

3.8 INSTALLING EQUIPMENT

A. For equipment specified in this Section, install in strict accordance with the manufacturer's recommendations, anchoring firmly into position. Make all required hookups prior to start of equipment operation, and put all items through at least five complete cycles of operation.

B. Verify that each item is properly installed and properly operating. Make required adjustments to achieve optimum operation.

3.9 INITIAL WATER BALANCE

A. Upon completion of the installation, chlorinate, acidulate, and properly balance the pH content of the water. Initial water balance shall be as follows:

1.	pH	7.5 - 7.16
2.	alkalinity	80 - 120 PPM
3.	calcium hardness	200 - 350 PPM
4.	chlorine	1.0 PPM

3.10 MISCELLANEOUS FILTER AREA EQUIPMENT

A. Install stainless steel valve tags and piping labels according to manufacturer's recommendations.

B. Mount the following between plywood and Plexiglas on the filtration room wall.
   1. Diagram of filter and backwash operation. Diagram shall be cross-referenced to electrical controls, pump equipment, valve tag numbers and piping labels. Diagrams shall be color coded to match decals.
   2. Pool piping diagrams of entire system.

C. Install plywood shelving to support pool equipment and accessories. Shelving brackets shall be fastened to wood framing members. Prior to installation, apply three coats of polyurethane to shelving.

3.11 STARTUP AND ENGINEERING SERVICES

A. Refer to Section 131500.

3.12 CLOSEOUT

A. Refer to Section 131500.

END OF SECTION 010000

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SECTION 13 15 20 - SWIMMING POOL CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

A. Reinforced pneumatically applied concrete pool structures, including but not limited to:
   1. Final hand trimming of crushed stone and gravel fill
   2. Delegated Design of pool structure
   3. Formwork
   4. Reinforcing Steel
   5. Dry or wet mix Shotcrete structure.
   6. Plaster Pool finish
   7. Tile pool markings
   8. Installation of anchorage for deck equipment within the pool tank.
   9. Warranties.

1.3 DEFINITIONS

A. Shotcrete: Mortar or Concrete pneumatically projected onto a surface at high velocity.

B. Dry-Mix Shotcrete (Gunite): Shotcrete with most of the water added at the nozzle during placement.

C. Wet-Mix Shotcrete: Shotcrete where water is introduced and mixed before introduction into delivery hose.

D. Flash Coat: Thin shotcrete coat applied from a distance greater than normal for use as final coat or for finishing.

E. Ground Wire: Small-gage, high-strength steel wire used to establish line and grade for shotcrete work. Also known as alignment wire, screed wire, or shooting wire.

F. Gun Finish: Undisturbed final layer of shotcrete as applied from nozzle without hand finishing.

G. Nozzelman: Worker on shotcrete crew who manipulates the nozzle, controls consistency with the dry process, and controls final disposition of the material.

H. Rebound: Shotcrete material leaner than the original mixture which ricochets off the receiving surface and falls to the ground.

1.4 REFERENCES

A. ACI Standards (American Concrete Institute)
   1. ACI-301-10 Specifications for Structural Concrete
   2. ACI 305R-10 Hot Weather Concreting.
   3. ACI 306.1-90 Cold Weather Concreting.
   4. ACI 318-92 Building Code Requirements for Reinforced Concrete.
   5. ACI 506R-95 Guide to Shotcrete
   6. ACI 506.2-90 Specifications for Materials, Proportioning, and Application of Shotcrete

B. ANSI – American National Standards Institute
   1. ANSI A108.1B - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
   2. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
   3. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
   4. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar.
   5. ANSI A118.6 - American National Standard Specifications for Ceramic Tile Grouts.

C. ASTM C 242 - Standard Terminology of Ceramic Whitewares and Related Products.

D. ASTM Standards (American Society for Testing Materials)
   1. A-615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   2. A-36/A /A36M Standard for Carbon Structural Steel
   3. A 307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod
   4. C33-94 Standard Specifications for Concrete Aggregates.
   5. C42-13 Standard Method of Obtaining and Testing Drilled Cores or Sawed Beams of Concrete.
   6. C94-14 Standard Specifications for Ready-Mixed Concrete.
   7. C143-12 Standard Test Method for Slump of Portland Cement Concrete.
   8. C150-07 Standard Specification for Portland Cement.
   9. C260-06 Standard Specification for Air Entraining Admixtures for Concrete.
   10. C494-05 Standard Specification for Chemical Admixtures for Concrete.

E. TCA (HB) – Tile Council of America
   1. Handbook For Ceramic Tile Installation; Tile Council of America.

1.5 SYSTEM DESCRIPTION

A. Pool Contractor shall be responsible for preparation of swimming pool delegated design shop drawings, engineering reports and applications and submitting this data as necessary to obtain approval and permits from appropriate authorities having jurisdiction prior to start of construction.

B. Pool tank shall be designed as a single monolithic unit.

1.6 SUBMITTALS

A. Shop Drawings: Submit six (6) copies of shop drawings for the swimming pool system and all its components, including typical details of pool shell, equipment anchors, and floor and wall markings drawn at large scale. Include the following:
   1. Details of fabricating, bending, and placing reinforcement.
   2. Support and anchor details
   3. Number and location of splices
   4. Special reinforcement required for openings, transitions in pool floor, gutter assembly
   5. Smaller scale drawings of the overall plan and sections. Include:
      a. Piping and wiring diagrams for recirculation, filtration and chemical treatment systems. Assemble shop drawings into one (1) coordinated submittal.
   6. Drawings shall be stamped by a structural engineer licensed in the Commonwealth of Massachusetts.

B. Design mixes: For each shotcrete mix.

C. Material Test Reports: For each Shotcrete ingredient

D. Material Certificates: For material item, signed by manufacturer

E. Field quality test reports

F. Qualification Data: For Installer and nozzlemen

G. Maintenance Manuals: Submit three (3) copies of bound maintenance manual for swimming pool structure and finish, dewatering instructions and parameters.

1.7 QUALITY ASSURANCE

A. Pool Subcontractors Qualifications:
   1. Qualifications of the swimming pool subcontractor are specified in Section 131500 – GENERAL PROVISIONS FOR SWIMMING POOL

B. Nozzlemen shall have a minimum of 5 years' experience in the application of pneumatically applied concrete for swimming pools.

C. All pool tile work shall be performed by mechanics skilled in these trades, with 3 years minimum experience.

D. Owner will engage the services of an independent testing agency to perform reinforcing steel inspection and test field samples of pneumatically applied concrete.

1.8 PROJECT CONDITIONS

A. Cold Weather Shotcreting: Protect Shotcrete work from physical damage or reduced strength caused by frost, freezing, or low temperatures according ACI 306.1.

1. Materials used must be able to keep Shotcrete in a 40 degree F and rising state until in place Shotcrete can be protected. Hot water may be required.
2. Do not use frozen materials or materials containing ice and snow
3. Do not place Shotcrete on frozen surfaces or surfaces containing frozen materials.
4. Do not use calcium chloride, salt, or other materials containing antifreeze agents

B. Hot Weather Shotcreting: Mix, Place, and protect Shotcrete according to ACI 205R when hot-weather conditions and high temperatures would seriously impair quality and strength of Shotcrete.
1. Cool ingredients before mixing to maintain Shotcrete temperature at time of placement below 100 degrees F for dry mix and 90 degrees F for wet mix.
2. Reduce temperature of reinforcing steel receiving surfaces below 100 degrees F before shotcreting.

1.9 WARRANTIES

A. Pool Shell: Pool Contractor shall guarantee the dry mix shotcrete pool shell and piping under pool to be free from defects which causes leaks for a minimum period of five (5) year after beneficial occupancy. If such defects occur, contractor shall repair such in thirty (30) days after notification in writing by the Owner.

PART 2 - PRODUCTS

2.1 POOL STRUCTURES- GENERAL

A. General: The pool structures shall consist of a reinforced pneumatically applied concrete ready to receive a painted finish and tile markings. Pneumatically applied concrete shall be wet-mix or dry-mix Shotcrete at Contractor's option.

2.2 FORM MATERIALS

A. Forms: Form-facing panels that will provide continuous, straight smooth, concrete surfaces. Furnish panels in largest sizes practical to minimize the number of joints.

2.3 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615A. Grade 60, deformed.

B. Supports: Bolsters, chairs, spacers, ties and other devices for spacing, supporting, and fastening reinforcing steel in place according to CRSI's "Manual of Standard Practice".

C. Reinforcing Anchors: ASTM A 36/A, unheaded rods or ASTM A 307, Grade A (AST< F568M, Property Class 4.6), hex-head bolts, carbon steel; and carbon-steel nuts. Finish shall be plain, uncoated.

D. Steel Reinforcement shall be tied at every other intersection of steel. There should not be in any location 2 spots in a row without a reinforcement tie. Splices should be tied at least three times.

2.4 SHOTCRETE MATERIAL

A. Portland Cement: ASTM C150, Type I/II, gray. Cement may be supplemented with the following:
   1. Fly ash: ASTM C 618, Class F or C.

B. Normal-weight Aggregates: ASTM C33, from a single source, and as follows:
   1. Aggregate Gradation: ACI 506R, Graduation No. 2 with 100 percent passing ½ inch sieve.
   2. Coarse Aggregate: Washed crushed stone 3/8 to ½ inch in size.

C. Water: Potable, complying with ASTM C94, free from deleterious materials that may affect color stability, setting, or strength of Shotcrete.

D. Guide Wire: High-strength steel wire, 0.8 to 1mm in diameter.

2.5 CHEMICAL ADMIXTURES

A. General: ASTM C 1141, Class A or B, but limited to the following admixture materials. Provide admixtures for Shotcrete that contains not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.
   1. Air Entraining Admixture: ASTM C260
   2. Water-Reducing Admixture: ASTM C494, Type A
   3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D
   4. Water-Reducing and Accelerating Admixture: ASTM C494, Type E
   5. High Range, Water Reducing Admixture: ASTM C494, Type F
   6. Accelerating Admixture: ASTM C 494 , Type C

2.6 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighting approximately 9 oz. /square yard dry.

B. Moisture-Retaining Cover: AST C 171, polyethylene film or white burlap-polyethylene sheet.

C. Potable Water

D. Clear, Waterborne, Membrane-forming Curing Compound:
   1. Aquron Curing Products, http://www.aquron.com/our-products/concrete-protection-and-waterproofing/
   2. or approved equal.

2.7 WATERSTOPS

A. Non-Expanding Plastic Adhesive Waterstop: Manufactured rectangular or trapezoidal strip, single-component, self-sealing adhesive compound, for adhesive bonding to concrete, 5/8 by 1 ½ inch.
   1. Synko-Flex SF302, Henry Corporation with Synko-Flex SF311 Solvent Based Primer
   2. LOCKSTOP, by Sika Greenstreak with Lockstop Primer
   3. Or approve equal.

2.8 SHOTCRETE MIXTURES GNENERAL

A. Prepare design mixes for each type and strength of Shotcrete

B. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.

C. Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
   1. Fly-ash ; 25 percent

D. Admixtures: When included in Shotcrete design mixes, use admixtures and retarding admixtures according to manufacturer's written instructions.

E. Design-Mix Adjustments: Subject to compliance with requirements, shotcete design-mix adjustments may be proposed when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

2.9 SHOTCRETE MIXTURES

A. Proportion dry materials by field test data methods and wet mixtures according to ACI 222.1 and ACI 301, using materials to be used on the Project, to provide Shotcrete with the following properties:

B. Compressive Strength: 4000 PSI (28-days)

C. Add air-entraining admixtures at manufacturer's prescribed rate to result in normal-weight, wet-mix Shotcrete having an air content before pumping of 8 percent with a tolerance of plus or minus 1 ½ percent.

D. When fly-ash is used in combination with Portland cement in dry-mix Shotcrete, fly ash and Portland cement shall be proportioned and blended prior use.

2.10 SHOTCRETE EQUIPMENT

A. Mixing Equipment: Capable of thoroughly mixing Shotcrete materials in sufficient quantities to maintain continuous placement.

B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water injection system for directing even distribution of water to aggregate-cement mixture. Air pressure used for conveying dry mix material must be capable of delivering at least 600 DFM. Should any other pneumatic devices be operated in conjunction with the conveying of material then, a larger CFM compressor or second compressor must be used.
   1. Provide uniform, steady supply of lean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.
   2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.

C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously. Air pressure used for the Shotcrete nozzle must be capable of delivering at least 210 CFM. Should any other pneumatic devices be operated in conjunction with the conveying of material then, a larger CFM compressor or second compressor must be used

2.11 BATCHING AND MIXING

A. Dry-Mix process: Measure mix proportions by weight batching according to ASTM C 94 or by volume batching complying with ASTM C 685 requirements.
   1. In volume batching, adjust fine-aggregate volume for bulking. Test fin-aggregate moisture content at least once daily to determine extent of bulking.
   2. Prepackaged Shotcrete materials may be used at Contractor's option. Pre-dampen prepackaged Shotcrete materials and mix before use.
   3. When ready mix trucks are used plant must be within a 25 minute drive of jobsite to allow for sufficient offload time.
   4. Volumetric batching based on ACI 304.6R-09 is an acceptable and preferred alternative to ready mix.

B. Wet-Mix process: Measure, batch, mix and deliver Shotcrete according to ASTM< C94 and furnish batch ticket for information and record.
   1. Comply with ASTM C685 when Shotcrete ingredients are delivered dry and proportioned and mixed on-site.
   2. When ready mix trucks are used plant must be within a 25 minute drive of the job site to allow for sufficient offload time.
   3. Volumetric batching on ACI 304. 6R-09 is an acceptable and preferred alternative to ready mix.

2.12 SHOTCRETE FINISH

A. It is the intent of the work to provide a plaster and tile pool finish. Provide a surface acceptable to receive plaster.
   1. Pool Plaster: The pool finish shall consist of two coats of plaster finish. The two coats of pool plaster shall together equal three-eighths (3/8) to one-half (1/2) inch thickness and shall be applied by hand troweling method to a smooth, dense, impervious surface.

2. Plaster mix shall be submitted to the Architect for approval prior to application. Plaster shall be graded gray aggregate and cement. Contractor must provide adequate curing time for plaster prior to painting.

2.13 POOL TILE MARKINGS

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials".

C. All tiles shall be 2x2 inch ceramic tile. Tile shall be certified for use in pools. .Provide products from:
   1. American Olean Tile Company
   2. Dal Tile
   3. United States Ceramic Tile
   4. Lone Star Ceramics
   5. or approved equal.

D. Mortar and Grout Materials: Provide products from one of the following manufacturers:
   1. American Olean Tile Company.
   2. Boiardi Products Corporation.
   3. Bonsal: W.R. Bonsal Company.
   4. Laticrete International, Inc.
   5. Mapei Corporation.
   6. Southern Grouts & Mortars, Inc.

E. Tile size and color shall be based on the following American Olean products:
   1. Unglazed porcelain Ceramic Mosaics; 2 x 2 inch with abrasive finish.
   2. Tile Colors: Colors to be selected by Architect from "A" price Group (American Olean) or premium price group (3) (Daltile).
      a. Type 1: Pool Scum Line, Peninsula and Gutter tiles: Glazed ceramic mosaic tile; 2x2 inch. Color: TBD
      b. Type 2: Stair nostings, lane markings wall targets and: Unglazed porcelain Ceramic Mosaics; 2 x 2 inch with abrasive finish. Color: TBD
      c. Type 2R Pool break line at 5' depth: Unglazed porcelain Ceramic Mosaics; 2 x 2 inch with abrasive finish. Color: Red D017.

F. Mortar Bond Coat: Dry-set mortar or latex Portland cement mortar on a cured bed to conform with ANSI A108.5

G. Grout: Non sanded latex-Portland cement grout conforming with ANSI A118.6

2.14 TILE SAFETY MARKINGS AND GRAPHICS

A. Tiles with Marking at Graphics: Provide tiles manufactured by Tile Specialties, Spring Hill, Florida 904-686-8670 or approved equal. www.tilespecialties.com

B. Deck Level *No Diving* Tiles: 6” x 12”, flat, skid resistant tile. 6” black letters “NO DIVING” on white tile with international graphic for “no diving”. At locations indicated on drawings.

1.

Type 1

C. Deck Level Depth Marking Tiles: 6” x 6”, flat, skid resistant tile. 4” black letters “x ft, x in” on white tile. At locations indicated on drawings. Provide “At Drain” tiles at sides and end of each pool.

1.

Type 2

2.

Type 2D

D. In Pool Depth Marking Tiles: 6” x 6”, flat, smooth tile. 3” black letters “x ft, x in” on white tile. At locations indicated on drawings.

1.

Type 3

2.15 RACING LINE AND ROPE FLOAT ANCHORS

A. Basis of Design: Standard Bronze Company Model 5454, 4 inch square Rope Anchor with 3/8 inch stainless steel BAR CPB.

2.16 CEMENT GROUT

A. Cement Grout: Portland Cement and fine aggregates; Non-metallic, non-shrink: Grout shall be Sika Grout 212 as manufactured by Sika Corporation or equal. Mixing shall be done in accordance with manufacturers guidelines.

PART 3 - EXECUTION

3.1 COORDINATION OF EXCAVATION

A. Prior to the start of the pool construction, the site shall be properly prepared to an elevation of that is equal to the floor finish less the thickness of the pool bottom.

B. Swimming pool Contractor shall be responsible for hand shaping of the pool shell.

C. The Contractor shall control rough grading beyond the pool contract limits so that ground is pitched to prevent water running into the excavated area of the pool.

3.2 POOL TANK LAYOUT

A. Swimming pool subcontractor shall mark off grades and elevations and stake out finished pool shape and elevation prior to start of excavation.

B. Placement Guides:
   1. Provide an adequate header form to assure proper placement and installation of the gutter system.
   2. At all straight sections including the pool bottom, walls, and ramps, install ground wires for accurate cutting of the interior face of the pneumatically applied concrete.

3.3 POOL FORMWORK

A. General: Design, erect, support, brace and maintain forms, according to ACI 301, to support Shotcrete and construction loads and to facilitate shotcreting. Construct forms so Shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.
   1. Fabricate forms to be readily removable without impact, shock or damage to shotcete surfaces and adjacent materials.
   2. Construct forms to required sizes, shapes, lines, and dimensions using guide wires to obtain accurate alignment, location, and grades in finish pool structures. Construct forms to prevent mortar leakage while allowing air to escape and rebound during shotcreting. Provide openings, offsets, blocking, screeds, anchorages, inserts, and other features required for the Work.

B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations for trades providing such items. Accurately place a securely support items built into the forms.

3.4 POOL REINFORCING AND PLACMENT OF EQUIPMENT

A. General: Comply with CRSI's "Manual of Standard Practice: for fabricating, placing and supporting reinforcement.

B. Reinforcing Steel:
   1. All reinforcing steel shall be in place before pneumatically applied concrete work is placed and positioned and of the sizes indicated on the approved shop drawings.
   2. Reinforcing steel shall be free from rust, dirt, oil, paint, or mill scale, earth, ice and other materials that weaken shotcrete bonding.
   3. Reinforcing steel shall be supported with metal chairs, runners, bolsters, spacers and hangers to prevent displacement before or during placement of shotcrete.

4. Accurately position, support, and rigidly secure reinforcement against displacement by formwork, construction, or shotcreting.
5. Place reinforcement to obtain minimum coverage for shotcrete protection. Arrange, space, and securely tie bar supports to hold reinforcement in position during shotcreting. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.
6. Reinforcement should be tied at every other intersection to bars or more. Rows of bars shall be adequately tied to prevent vibration during shotcrete application.
7. Wall and slab steel shall be securely wired together at all points where bars cross, and shall not lap less than 40 bar diameters.

C. Placing Fittings: Place, before commencing shotcrete work, all necessary pool fittings and anchors that are to be embedded and be responsible for their positioning.

D. Bonding: All reinforcing steel and metallic fittings and equipment within the pool tank shall be properly bonded according to National Electrical Code. Coordinate with Section 260000 – Electrical.

3.5 JOINTS

A. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is needed. Continue reinforcement through construction joints, unless otherwise indicated on the approved shop drawings.

B. Thoroughly clean join immediately after creating it to remove any material rebound. In the wet mix process power wash the joint before commencing with the next shotcrete application.

3.6 WATERSTOPS

A. Waterstops: Provide in joint between wall and floor. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions. Prevent displacement during shotcrete application.

3.7 ALIGNMENT CONTROL

A. Guide Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

B. Provide adequate markings by tape of marking paint to identify wire and prevent accidental damage or lost position by construction personnel.

3.8 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.9 APPLICATION

A. Only experienced foremen, gunmen, and nozzlemen meeting the minimum experience standards specified in Part 1 of these Specifications shall be employed.

B. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact form nozzle stream.

C. Moisten wood forms immediately before placing shotcrete where form coatings are not used.

D. Apply shotcrete according to ACI 506.2

E. Apply dry-mix shotcrete materials within 25 minutes after pre-dampening and wet-mix shotcrete materials within 90 minutes after batching.

F. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and delaminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.
   1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.
   2. Rebound and overspray shall not be used for any application.

G. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray and prevent build-up against front face during shotcreting.

H. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.

I. Do not permit shotcrete to sag, slough, or dislodge.

J. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.

K. Do not disturb shotcrete surfaces before beginning finishing operations.

L. Remove ground wires or other alignment control devices after shotcrete placement.

M. Shotcrete Core Grade: Apply shotcrete to achieve mean core grades exceeding 2.5 according to ACI 506.2 with no single core grade exceeding 3.0.
   1. (1.7.2) Grade 2: Shotcrete specimens are solid; there are not laminations, sandy areas or voids. Small air voids with a maximum diameter of 1/8 inch and maximum length of ¼ inch are normal and acceptable. Sand pockets, or voids behind continuous reinforcing steel are unacceptable. The surface against the form or bond plans shall be sound, without a sandy texture or void.
   2. (1.7.3)Grade 3: Shotcrete specimens shall have no more than two laminations or sandy areas with dimensions exceeding 3/16 inch thick by ¼ inch long, or one major void, sand pocket, or lamination containing loosely boned sand not to exceed 5/8 in. thick and 1 ¼ in width. The surface against the form or bond plane may be sandy with voids containing overspray to a depth of 1/16 inch.

3. *(1.7.7) The mean grade of 2.5 or less is acceptable unless otherwise specified. Individual shotcrete cores with a grade greater than 2 are unacceptable.*

N. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117R, increased by a factor of 2.

3.10 SURFACE FINISHES

A. General: Finish shotcete according to descriptions in ACI 506R and Part 2 Article above.

3.11 CURING AND PROTECTION OF DRY MIX SHOTCRETE

A. General: Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.

B. Start Initial curing as soon as free water has disappeared from shotcrete surface after placing and finishing.

C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:
   1. Moisture Curing: Keep surface continuously moist for at least seven days with water, continuous water-fog spray, water-saturated absorptive covers, or moisture retaining covers. Lap and seal sides and ends of covers.
   2. Chemical Curing: Provide application of curing compound in strict accordance with manufacturer's written recommendation. Basis of Specification Product:
      a. Kurez Wvox by Euclid Chemical Company
         1) Water based wax emulsion curing compound
         2) White opaque liquid that dries clear
         3) Percent Solids: 15%
         4) Zero VOC
         5) ASTM C 309, Type 1, Class A
         6) AASHTO M 148, Type 1, Class A & B
         7) USDA compliant
      b. Or equal.

D. Shotcrete surface shall be protected against frost and rapid drying, and kept moist for at least seven days after placing. During this period, concrete shall be maintained above forty (40) degrees Fahrenheit for a least five (5) days and shall conform to ACI 305R and ACI 306R. Protect from rapid drying in warm weather in accordance with ACI 205R.

3.12 FORM REMOVAL

A. Forms not supporting weight of shotcrete may be removed after curing at no less than 50 degrees F for 24 consecutive hours after gunning provided the shotcrete is hard enough to avoid damage by form removal operations and provided curing and protection operations are maintained.
   1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.

3.13 CEMENT GROUT

A. Shall be composed of one volume of Portland cement to two volumes of fine aggregates.

B. The material shall be mixed dry and water added just sufficient to make the mixture flow under its own weight.

C. For dry tamp cement grout, a minimum of water shall be added to the mix so that when wet sample is squeezed hard in the hand, surface moisture but no free water shall appear on the sample.

D. All ceramic tiles shall be set in full beds of cement grout prior to plastering.

3.14 TILE INSTALLATION

A. Tiles shall be installed using TCA Method P601TB-11, thin-set swimming pool installation.
   1. Cementitious Bond Coat: ANSI- A118.4 or better.
   2. High performance epoxy grout, non-sag formula.
   3. Grout shall be installed according to ANSI- A118.3.
   4. Basis of Specification Grout: SPECTRALOCK® PRO Premium Grout
      a. LATICRETE International, Inc., http://www.laticrete.com.
      b. Color shall be white.
      c. Or approved equal.

3.15 EQUIPMENT INSTALLATION

A. Coordinate the pool construction with pool gutter, piping and equipment specified in Section 131510.

B. Coordinate the pool construction with pool deck equipment specified in Section 131530.

3.16 ELECTRICAL

A. All equipment within the pool structure and the pool structure itself shall be properly bonded according to the NEC, Massachusetts Electric Code; latest edition. Coordinate with Section 260000-ELECTRICAL.

3.17 FIELD QUALITY CONTROL

A. Testing and Inspecting; Owner shall engage a qualified independent testing agency to sample materials, visually grade cores, perform tests, monitor all shotcrete operations and submit reports during construction.

B. Air Content: ASTM C173, volumetric method or ASTM C231, pressure method; one (1) test for each compressive strength test for each mix of air-entrained, wet mix shotcete measured before pumping.

C. Shotcrete Temperature: ASTM C1064; One (1) test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and 1 test for each set of compressive strength specimens.

D. Test Panels: Test panels shall be taken every day or every 50 yards of material whichever is less. Test panels should be cored from the test panel yielding cores not less than 3 ½ inches in diameter. Three test samples shall be cored from each panel for test breaks at 7, 14, and 28 days.
   1. Dry mix panels shall be shot on the ground with no box needed: nozzlemen should build-up a 24 by 24 inch test panel at least 8 inches thick.
   2. Wet mix test panels should be an 8 inch deep box 24 by 24 inches square built on site.

E. In-Place Shotcrete: If samples indicate unsatisfactory shotcrete, and only if directed by the Owner, OPM and Architect, non-destructive testing shall be performed on the structure followed by coring if still deemed necessary.
   1. Take a set of 3 unreinforced cores for each mix for each workday or for every 50 cubic yards of shotcrete placed; whichever is less. Test cores for compressive strength according to ACI 506.2 and ASTM C42. Do not cut steel reinforcement.

F. Strength of Shotcrete will be considered satisfactory when mean compressive strength of each set of 3 unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of compressive strength.
   1. Mean compressive strength of each set of three (3) unreinforced cubes shall equal or exceed design compressive strength with no individual cube less than 88 percent of specified compressive strength.

3.18 REPAIRS

A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.
   1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs. Chip or scarify areas to be repaired to extend necessary to provide sound substrate. Cut edges square and ½ inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope in cavity to eliminate square shoulders. Apply concrete patch by one of the following methods:
      a. Dampen surfaces and apply new shotcrete
      b. Apply bonding agent per manufacturer's recommendations. Use concrete patching mortar t repair defect.

B. Repair core holes from in-place testing according to repair provisions in ACI 301 and match adjacent finish, texture and color. Apply bonding agent per manufacturer's recommendations. Use concrete patching mortar to repair defect matching the strength of the shotcrete.

END OF SECTION 131520

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SECTION 131530 - SWIMMING POOL DECK 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. The Contractor shall provide all labor, materials and equipment to install the pool deck equipment outlined below complete and in place around the proposed pool perimeters, within the pool deck surfacing as shown on the plans, or listed within the specifications.

B. Work includes, but is not limited to:
   1. Starting Platform and sockets.
   2. Recall and Back Stroke Stanchions and Sockets
   3. Pool Ladders
   4. Assist rails at steps
   5. Barrier Rails at Deck to prevent access to “peninsula” walls

C. Related Sections:
   1. 131500-GENERAL PROVISIONS FOR SWIMMING POOL for general warranty and standards information.
   2. 131520- SWIMMING POOL CONSTRUCTION for coordination of deck equipment within the pool structure.
   3. 260000- ELECTRICAL for bonding requirements of deck equipment.

1.3 SUBMITTALS

A. Samples: Provide samples of all specified materials requested by the Architect.

B. Product Data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list for items proposed to be provided under this Section.
   2. Manufacturer's specifications, copies of guarantees and other data needed to prove compliance with the specified requirements.
   3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

C. Shop drawings in sufficient detail to show design criteria, fabrication, installation, anchorage, and the interference of the work of this Section with the work of adjacent trades.

D. Provide operation and maintenance manuals compiled in accordance with the provisions of Division 1 Specifications.

1.4 GUARANTEES

A. Attention is directed to provisions of the general documents regarding guarantees and warranties for work under this contract.

B. Manufacturers shall provide their standard guarantees for work under this section. However, such guarantees shall be in addition to and not in lieu of all other liabilities, which manufacturers and Contractor may have by law or by other provisions of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. General: Equipment is based on a specific manufacturer's model to establish standard of quality and shall not limit the use of other manufacturers' products.

B. Acceptable Manufacturers of Deck and Safety Equipment:
1. Paragon Aquatics, 341 Route 55, LaGrangeville, NY 12540-5105; ASD. Tel: (914) 452-5500, Fax: (914) 452-5426, Website: http://www.paragonaquatics.com
2. S.R. Smith Inc. , 105 Challenger Dr. Portland, Tennessee 37148, Tel: (615) 325-0770, Fax (615) 325-0775, Website: http://www.srsmith.com.
3. Spectrum Pool Products, 7100 Spectrum Lane, Missoula, MT 59808, Tel: (406) 543-5309, Fax (406) 728-7143, Website: http://www.spectrumproducts.com.
4. or approved equal.

2.2 STARTING PLATFORMS

A. Starting Platform: Dual-Leg Competitor: 24 by 32 inch top with rear mount. Platform color to be determined. Units numbered sequentially 1 through 6.

B. Anchor by KDI Paragon. 6-inch dual wedge heavy cast T304 Stainless Steel sockets with taper lock base and wedge. Designed for use with KDI Standard Dual leg (Competitor) Staring platform.

2.3 STANCHIONS

A. Sockets for Stanchion Posts for Backstroke and Recall Lines: Stanchion socket shall be cast bronze with vandal proof threaded plug, by KDI Paragon or Spectrum

B. Stanchions for Backstroke and Recall Lines: Provide stanchions of stainless steel tube, 1.90 by 0.109 wall thickness. Stanchions shall be equipped with top U-hook and sliding eyebolt collar.

Finish height shall be 4 feet above finish pool deck for recall stanchions, 7 feet for backstroke stanchions.. KDI Paragon or spectrum. Each stanchion to be provided with (2) anchorages.

2.4 LADDERS

A. Anchorage for Ladders: Anchorage shall be cast bronze No. 28102 with escutcheon plate No. 28302.

B. Ladders: Ladders shall be 24 inch wide Heavy Duty Cross Braced by KDI Paragon Inc. Width of frames from front to back shall be 24". Pipe wall thickness of 0.109 inches.
   1. 4-Step Ladders
   2. 3-Step Ladders

2.5 RAILS

A. Stair Assist Rails: Provide custom fabrication. KDI Paragon 1.90 inch by 0.109 inch wall thickness rails. Anchorage shall be cast bronze No. 28102 with escutcheon plate No.28302. At stairs per Drawings.

B. Barrier Rails at Deck: At location indicated to prevent access to peninsulas and guard the zero depth deck transition edge, provide custom railings as indicated. KDI Paragon 1.90 inch by 0.109 inch wall thickness rails. Anchorage shall be cast bronze No. 28102 with escutcheon plate No.28302.

PART 3 - EXECUTION

3.1 INSPECTION

A. The Swimming Pool Contractor shall examine all work prepared by others which is to receive the work of this Section and shall report any noted defects effecting this work of this Section to the Architect.

3.2 COORDINATION

A. Coordinate the Work of this Section with:
   1. Swimming Pool Work specified in Section 131520 and 131530.
   2. Concrete paving Work specified in Division 30.

3.3 INSTALLING EQUIPMENT

A. For equipment specified in this Section, install in strict accordance with the manufacturer's recommendations, anchoring firmly into position.

B. Verify that each item is properly installed and properly operating. Make required adjustments to achieve optimum operation.

C. The electrical subcontractor specified in Section 260000 shall bond all metal components according to the National Electric Code (NEC) and the Applicable Vermont Electrical Code.

END OF SECTION 131530

SECTION 15400– PLUMBING

(FILED SUB-BIDS REQUIRED)

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PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 FILING SUB-BIDS

A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a separate sealed envelope with the Awarding Authority at a time and place stipulated in the Bidding Requirements.

1. The following should appear on the upper left hand corner of the envelope:

NAME OF BIDDER: _____

PROJECT: Veterans Memorial Pool Patton Park
Bay Road
Hamilton, Massachusetts

SUB-BID FOR: Section 22 00 00 Plumbing

B. Every sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority, as required by Section 44F of Chapter 149 the General Laws as amended. Sub-Bid forms are included in this Project Manual or may be obtained at the office of the Architect.

C. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND, or CERTIFIED, TREASURER's, or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Town of Hamilton in the amount of five percent of the Bid. A sub-bid accompanied by any other form of bid depository than those specified will be rejected.

D. Work to be done under this Section is shown on the Drawings:
1. P100, P101, P200
2. The listing of Contract Drawings above shall not limit the Subcontractors responsibility to determine the full extent of his work as required by all Contract Drawings.

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

F. Examine all other Sections of the Specifications for requirements, which affect work under this Section whether or not such work is specifically mentioned in this Section.

G.

H. Sub-Sub-Bid Requirements:

I. NONE

J. Examine all other Sections of the Specifications for requirements, which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.3 SCOPE OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this section and, without limiting the generality thereof, including:
   1. Modifications to the interior sanitary drainage system, including soil, waste, and vent piping within the building to ten (10’-0”) outside the inside surface of the exterior foundation wall of the buildings.
   2. Modifications to the interior water systems, including cold and hot water piping. Cold water to commence ten feet (10’-0”) outside the inside surface of the exterior foundation wall of the buildings.
   3. Complete hot water generation systems including any re-circulating hot water systems.
   4. Drainage specialties such as drains, cleanouts, vacuum breakers, shock absorbers, wall hydrants, hose bibs, trap primers, etc.
   5. Backflow prevention on all equipment requiring same.
   6. Plumbing fixtures and all trim.
   7. Coordination with requirements as noted on the architectural drawings.

B. Items to be Furnished Only: Furnish access panels to the General Contractor for distribution by him to the various trade sections in whose work the panels occur.

C. Related work in Other Sections:
   1. Cutting and patching.
   2. Excavation, trenching and backfill.
   3. All electric power wiring, except as specified herein.
   4. Building heating, ventilating and air conditioning.
   5. Flashing of floor drains and vents through the roof.
   6. Toilet room accessories.
   7. Installation of access panels.
   8. Painting.
   9. Sprinkler system.

D. The Plumbing Contractor shall coordinate their scope of work with requirements as noted on architectural drawings.

1.4 CODES, ORDINANCES AND PERMITS

A. All work shall be installed in accordance with the laws, ordinances, rules and regulations of all local and state authorities having jurisdiction, and the rules and regulations of the State Plumbing

and Gas Codes. In case of conflict, the higher standard shall prevail. Extra payment will not be allowed for work or changes required by code enforcement authorities.

B. Apply and pay for inspection permits, certificates of inspection, and license fees in connection with this work, and deliver to the Owner at the completion of the work. All diagrams or drawings required by local or state authorities shall be supplied by This Contractor.

1.5 JURISDICTIONAL DISPUTES

A. Subcontract all portions of this work as necessary to avoid jurisdictional disputes and work stoppages that could arise during the installation of this work.

1.6 INTENT

A. It is the intention of these specifications and drawings to require the equipment to be furnished complete in every respect, and this Contractor shall furnish all equipment needed and usually supplied in connection with such systems. Equipment, materials and articles incorporated in the work shall be new, and of the best grade of their respective kinds for the type of work involved.

1.7 DRAWINGS

A. The drawings show the extent and general arrangement of piping, and locations of the equipment. Piping, fixtures, and equipment are shown diagrammatically. This Contractor shall be responsible for the locations in the most practical manner, free from interference with other piping or structural features. If any changes from the drawings are deemed advisable, details of such proposed changes shall be submitted for approval. No changes shall be made without such approval. Maintain maximum headroom or space conditions at all points. Where headroom or space conditions appear inadequate, Architect shall be notified before proceeding with the installation.

1.8 SHOP DRAWINGS AND SUBMITTALS

A. Within thirty days after award of the contract, provide six copies of schedule of materials proposed to be submitted for approval, prior to submission of any detailed drawings. The Architect will review this schedule and may supplement it with additional items or eliminate some items.

B. Supply manufacturers' drawings of all materials, equipment and apparatus remaining on the list, giving full information as to dimensions, construction, capacity and other pertinent facts, which shall be submitted to the Architect, and approval secured, before apparatus is ordered, built or installed. Samples shall be submitted, if required.

C. Approval by the Architect of shop drawings for any materials, apparatus, devices and layouts shall not relieve the responsibility of furnishing same of proper dimensions, size, quantity, quality and all performance characteristics to efficiently perform the requirements and intent of the

contract documents. Such approval shall not relieve This Contractor from responsibility of errors of any sort on the shop drawings. If the shop drawings deviate from the contract documents, advise the Architect of the deviations in writing accompanying the shop drawings, including the reasons for the deviations. Shop drawings without specific notations or without schedules as described herein, may be returned not approved. Each shop drawing for any item shall be clearly identified with codings used on the drawings complete with name and/or locations of equipment. Shop drawings covering more than one item shall be accompanied by a suitable location schedule.

D. Shop drawings are required for:
   1. Plumbing fixtures and equipment.
   2. Pipe and fittings.
   3. Valves.
   4. Pipe insulation.
   5. Drains and appurtenances.
   6. Pipe hangers, supports and special equipment.
   7. Water heaters and associated equipment.

1.9 SUBSTITUTIONS

A. Substitutions of equipment or materials other than those shown on the drawings or named in the specifications may be made only with the written approval of the Engineer, who reserves the right to require adequate proof of the quality of the substitute before permitting its use.

B. Where this Contractor proposes to use an item of equipment other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundations, piping, wiring, or of any other part of the mechanical, electrical or architectural layout, all such redesign, and all new drawings and detailing required therefore shall, with the approval of the Architect, be prepared by This Contractor at his expense.

C. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit and equipment from that specified or indicated on the drawings, with the approval of the Architect, This Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

1.10 COORDINATION DRAWINGS

A. Before materials are purchased or work is begun, prepare coordination drawings showing the size and location of equipment, piping, etc., in the manner described under SUPPLEMENTARY CONDITIONS.

B. Plumbing Contractor shall show on coordination drawings prepared by the General Contractor all of the plumbing work to be installed as part of this section of the specifications.

C. Coordination drawings are for the General Contractor's and the Architect's use during construction and shall not be construed as replacing any shop, "as-built" or record drawings required elsewhere in these contract documents.

1.11 RECORD DRAWINGS

A. The Architect will furnish the Contractor Autocad 2004 files of the plumbing drawings as issued for this contract. The Contractor shall change these drawings to indicate accurately and neatly the actual pipe routing and pipe sizes, as well as the actual locations of all equipment. At the end of the project the Contractor shall deliver to the Architect one set of reproducible "as built" drawings and a compact disc or DVD with electronic files of the drawings in Autocad 2004 format for the owner's permanent record.

B. The "as built" drawings shall show the actual location and valve tag number of all valves.

1.12 WORKMANSHIP

A. The entire work provided in this division shall be constructed and finished in a workmanlike and substantial manner. It is not intended that the drawings show every pipe, fitting and appliance, but This Contractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best practice and to the satisfaction of the Architect.

B. Keep other contractors fully informed as to the shape, size and position of all openings required for apparatus and give full information to the General Contractor and other subcontractors sufficiently in advance of the work so that all openings may be built in advance. Furnish and install all sleeves, supports, etc., specified herein, or required.

C. In case of failure to give proper and timely information, provide cutting and patching or have same done by the General Contractor, but in any case, without extra expense to the Owner.

D. Obtain detailed information from the manufacturers of apparatus as to the proper method of installing and connecting same. Obtain all information from the General Contractor and other subcontractors which may be necessary to facilitate the work and the completion of the whole project.

1.13 ACCESSIBILITY

A. All work shall be installed so that all parts required are readily accessible for inspection, operation, maintenance and repair. Minor deviations from the drawings may be made to accomplish this end, but changes of magnitude shall not be made without prior written approval from the Architect.

1.14 PROTECTION

A. Be responsible for work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment which are not immediately installed after delivery to the site. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

B. Protect work and material of other trades from damage that might be caused by work or workmen and make good any damage thus caused.

1.15 EXAMINATION OF SITE

A. Before submitting proposal, visit the site, examine its condition, and become acquainted with the obstacles and advantages for performing the work. Study the drawings and specifications explanatory of the work to be performed and compare them with the information gathered by the examination of the site.

B. No claim for extra compensation will be recognized if difficulties are encountered which an examination of the site conditions and contract documents prior to executing the contract would have revealed.

1.16 TEMPORARY OPENINGS

A. Ascertain from examination of the architectural drawings, whether any special temporary openings in the building will be required for the admission of apparatus furnished under this contract, and notify the Architect accordingly. In the event of failure to give sufficient notice to the Architect in time to arrange for these openings during construction, assume all costs of providing such openings thereafter.

1.17 OPENINGS IN EXTERIOR WALLS

A. Openings in exterior walls and roofs shall be kept properly plugged and caulked at all times, except when being worked on, to preclude the possibility of flooding due to storms or other causes. After completion of the work, openings for which This Contractor is responsible shall be permanently sealed and caulked in a manner approved by the Architect.

1.18 TESTS

A. Furnish all labor, material, instruments, supplies and services, and bear all costs for the accomplishment of the tests specified herein. Correct all defects appearing under test, and repeat the tests until no defects are disclosed. Leave the equipment clean and ready for use.

B. Perform all tests, other than specified herein, which may be required by legal authorities or by agencies to whose requirements this work is to conform.

1.19 GUARANTEE

A. Attention is directed to the provisions of the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS regarding guarantees and warranties for work under this contract.

B. Manufacturers shall provide their standard guarantees for work under this section. However, such guarantees shall be in addition to, and not in lieu of, all other liabilities which the manufacturer and contractor may have by law or by other provisions of the Contract Documents.

C. All materials, items of equipment and workmanship furnished under this section shall carry the standard warranty against all defects in material and workmanship. Any fault due to design which may develop shall be made good by and at the expense of This Contractor, including all other damage done to areas, materials and other systems resulting from this failure.

D. This Contractor shall guarantee that all elements of the systems are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.

E. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the guarantee period, the affected part or parts shall be replaced.

F. Any apparatus that requires excessive service during the guarantee period will be considered defective and shall be replaced.

G. Furnish, before the final payment is made, a written guarantee covering the above requirements.

1.20 DEMOLITION

A. The Plumbing Contractor shall be responsible for the disconnection of all potable water, plumbing systems, and plumbing related equipment as shown in the demolition plan.

B. The Plumbing Contractor shall disconnect any equipment, piping, hangers and fittings to provide for safe removal by General Contractor. The General Contractor shall be responsible for removal and proper disposal of all the removed Plumbing materials.

C. It is the intent of this section to require the removal of the existing Plumbing systems and equipment as noted on the drawings. The Plumbing Contractor shall visit the sight to review the existing conditions prior to submitting bid. No additional compensation will be provided for removal of systems not viewed prior to submitting bid.

1.21 SYSTEM TRAINING

A. The plumbing contractor shall provide 8 hours of instructional training to the Owner or Owner’s representative. The training shall be video recorded and a DVD shall be provided for the Owner’s records.

B. The training times and dates shall be coordinated with the owner.

C. Training shall include but not be limited to:
   1. Hot Water production system
   2. Cleanout locations
   3. Ball valve and isolation valve locations
   4. Technical manual review

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Sanitary waste, storm, and vent piping systems above grade, within the building foundation walls:
   1. Drainage piping 2" and larger shall be no-hub cast iron with rubber gaskets and mechanical couplings. Vent piping 2” and larger may be DWV type copper.
   2. Drainage piping 1-1/2" and smaller shall be no-hub cast iron piping with the exception of sink traps which shall be DWV type copper with wrought copper drainage fittings, 95/5 lead-free solder joints.
   3. Vents 1-1/2" smaller may be DWV type copper.

B. Storm, Sanitary waste and vent drainage piping below grade:
   1. Sanitary waste and vent: cast iron, bell and spigot, rubber gasket joints, service weight, coated on exterior.
   2. Storm drainage: cast iron, bell and spigot, rubber gasket joints, service weight, coated on exterior.

C. Water piping:
   1. Underground domestic water: Type K copper tubing conforming to ASTM B88 with cast brass fittings conforming to ANSI B16.22.
   2. Above ground: Copper tubing, Type L, conforming to ASTM B-88 with solder joint wrought copper fittings conforming to ANSI B16.18 or B16.22, lead-free solder joints.

2.2 VALVES

A. Each valve type shall be of same manufacturer and appropriate for service in which used; valves shall be Milwaukee, Watts, Apollo, or approved equal. Type proposed for each service shall be submitted for approval. In general, shut- off valves, except for exposed stops at fixtures, shall be ball valves.

B. Each system shall be provided with valves as required by Code and as specified. Valves shall be installed for isolation and to facilitate operation, replacement and repair. Provide access panels where valves are concealed behind non- removable ceilings or walls. Provide shut off valves for gas and water supply piping to individual fixtures and appliances.

C. Valves shall be:
   1. Ball valves - 2 inches and smaller, bronze, 400 lb., 1/4 turn solder ends for copper tubing.
   2. Ball valves - 3 inches and larger - 400 lb., 1/4 turn, bronze. IPS thread ends.
   3. Check valves - 2 inches and smaller - brass, 125 lb., spring check, IPS thread ends, Nibco or equal.
   4. Check valves - 2-1/2 inches and larger - bronze, 125 lb., spring check, flanged ends, Nibco or equal.
   5. Drain valves - cast bronze, 1/2" and 3/4", threaded outlet for garden type hose connection, Nibco #72.

2.3 BACKFLOW PREVENTERS

A. Backflow preventer: Backflow preventers shall be installed to prevent backflow of contaminated water in the potable water supply:
   1. On all hose end faucets such as hose bibs, wall hydrants, service sink faucets, etc. - Watts #8A, non-removable type.
   2. On any and all equipment: Watts #009, reduced pressure type, unless otherwise noted.

2.4 MISCELLANEOUS PIPING MATERIALS

A. Nipples: Nipples shall conform to WW-N-351 and shall be the same material as the piping in which installed.

B. Unions: Unions shall be brass or bronze, 125 lb., either threaded or with solder joint ends, conforming to WW-U-516 for use in copper tubing. For use in steel piping unions shall conform to WW-U-531.

C. Insulating bushings and Unions: hard rubber threaded bushing inserted between two dissimilar metals.

D. Flanges on copper tube or pipe: cast bronze, 150 lb., solder joint connection.

E. Flanges on steel piping: carbon steel, 150 lb., welding neck or slip-on ASTM A181, Grade 1, ANSI B16.5

F. Floor and ceiling escutcheon plates: Floor and ceiling escutcheon plates shall be split hinged, locked type. Plates shall be of pressed steel with a heavy coating of copper, nickel and chromium.

G. Copper: Copper for flashing shall be soft temper or light cold rolled, minimum weight 16 ounces per square foot.

H. Sheet lead: Sheet lead for flashing shall be at least four pounds per square foot.

I. End cleanout: Threaded brass tapered plug fitted with raised head for cast iron piping with plug fitted with raised head.

J. Wall cleanouts: Chrome plated steel access panels, complete with frame and anchor straps, concealed hinges, slotted actuated cylinder lock installed flush with wall to gain access to valves and cleanouts. Access panels shall have general characteristics of Zurn, Josam, Smith #4761 or #4766 or equal.

K. Floor cleanouts: Cast iron, raised head caulking plug, brass cleanout cover flush mounted with flanged ring having anchor lugs, nickel-bronze scoriated hinged cover plate with "CO" cast in the cover, vandal-proof screws, similar to Zurn, Josam, Smith #4021, or equal. Access covers in all finished areas shall be similar to Zurn, Smith #4160 or 4200 or equal, with identical inlay of adjacent materials and vandal-proof screws.

L. Shock or water hammer arrestors: Shock or water hammer arrestors shall conform to the requirements of PDI-WH-201, ASSE 1010, or ANSI A112.26.1, size as required. Units shall be the standard factory prefabricated products as manufactured by Jay R. Smith, Amtrol, or equal. Provide at the last fixture on all pipe runs exceeding twenty feet in length.

2.5 HANGERS, SUPPORTS AND INSERTS

A. Pipe - 2 inches and smaller - 1A band type complete with threaded rod hanger nut, lock nut and sized to encompass insulation and pipe supported, similar to Carpenter-Patterson Fig. 1A or 122 CT or equal.

B. Piping - 2-1/2 inches and larger - clevis hanger type complete with threaded rod, locking and adjusting nuts and sized to encompass insulation and pipe supported, similar to Carpenter-Patterson Fig. 100 or equal.

C. Where due to space requirements, pipe must run close to structure above, a roll hanger with two threaded rods and nuts shall be used similar to Carpenter-Patterson Fig. 142 or Fig. 109.

D. Supports for piping from below shall be Carpenter-Patterson Fig. 333 or equal.

E. Extension pipe or friction deck clamp shall be used on all piping except water piping passing through floors, similar to Carpenter-Patterson Fig. 126.

F. Pipe hangers and supports shall be installed for all piping systems as follows:

PIPE SIZE	MINIMUM ROD DIAMETER
to 1 inch	3/8 inch
to 2 inch	3/8 inch
to 3 inch	1/2 inch
to 6 inch & larger	5/8 inch

G. Hangers and supports shall be acoustically protected by means of resilient type clamps and isolation. They shall be furnished complete with all appurtenances and shall be Hold-Rite, Grinnell, Carpenter-Patterson, or equal. Hangers and supports shall be hot-dipped galvanized where exposed and dip painted, where concealed. Copper tubing shall be suspended from copper plated hangers.

2.6 SLEEVES

A. Sleeves for piping passing through foundation walls shall be steel pipe, standard weight, and two sizes larger than pipe.

B. Sleeves for piping passing through interior wall shall be twenty gauge galvanized sheet metal and shall be set flush with walls.

C. Sleeves for piping passing through concrete floors shall be black steel pipe and shall extend one inch above floor and be flush below. Within chases 26-gauge galvanized sheet metal may be used.

D. All plumbing piping passing through foundation walls shall be provided with expandable wall hole closure. Closure shall be Link-Seal as manufactured by Thunderline Corp.

E. All sleeve openings around piping other than those provided with Link-seals shall be sealed with fire-retardant silicone foam as manufactured by Chase Technology Corp.

2.7 DRIP PANS

A. Examine the drawings and in cooperation with the Electrical Contractor confirm the final location of all electrical equipment to be installed in the vicinity of piping. Plan and arrange all overhead piping no closer than two feet from a vertical line to electric motors and controllers, switchboards, or similar equipment. Piping is not permitted in electric equipment, transformer, switch gear and telephone gear rooms.

B. Where the installation of piping does not comply with the requirements of foregoing paragraph, where feasible the piping shall be relocated.

C. Where relocation of piping is not feasible, furnish gutters as follows:
   1. Provide and erect a gutter of 16 ounce cold rolled copper or 18 gauge galvanized steel, under every pipe which is within 2 feet from a vertical line to any motor, electrical controllers, switchboards, panel boards or the like.
   2. Each gutter shall be reinforced, rimmed, soldered and made watertight, properly suspended and pitched to a point outside of the electrical room.

2.8 ACCESS PANELS

A. Furnish access panels for access to plumbing equipment. The sizes of the access panels for hidden valves, cocks and cleanouts in walls and ceilings shall be 12 x 12 inches. The panels shall be factory fabricated completely flush with heavy metal door and frame. Frames shall be welded construction of not less than 14-gauge steel, with heavy piano type hinges set flush with frame, and shall be secured in the closed position. In no case shall opening of the door require removal of nuts, bolts, screws, wing-nuts wedges or any other screwed or loose device. Access panels shall have UL rating, conforming to requirements of area in which it is installed. Access panels shall be Milcor, WayLocktor, Jay R. Smith or equal. Access panels shall be turned over to the General Contractor for installation. Access panels shall not be required in removable tile ceilings. Access panels in fire rated ceilings and/or walls shall have U.L. fire ratings comparable to that location installed.

2.9 SPECIALTIES AND ACCESSORIES

A. Vacuum breakers shall have bronze body and internal trim with high temperature resisting rubber disc and external trim, similar to Chicago, Beacon, Watts #188, or equal. Furnish at hose bibs, wall hydrants and at locations shown on the drawings and governed by code.

2.10 INSULATION

A. All insulation work shall be manufactured by Johns-Manville, Gustin-Bacon, Owens-Corning Fiberglass Corp. or equal, and be executed by a qualified Insulation Sub-contractor who is thoroughly experienced in this type of work, who has adequate facilities and equipment for erecting same; who is acceptable to the Architect. Application and finish on all pipes, fitting and valves shall be as recommended by manufacturer and approved by the Architect. Details shall be submitted for approval. All jackets and adhesives shall be flame retardant. Insulation shall be provided on all piping, valves and fittings.

B. Hot water supply and re-circulating piping:
   1. Piping – 1 inch thick for 1-½ inch piping and larger, ½ inch thick for 1-1/4 inch piping and smaller. Insulation shall be fibrous glass, 3-1/2 pound per cubic foot density minimum sectional pipe insulation with factory applied white All Service Jacket (ASJ) with butt strips and Benjamin-Foster, or equal BF85-75, or longitudinal seams.
   2. Fittings and Valves - shall be insulated with insulation cement or molded fitting insulation to thickness of adjoining insulation finished with two coats of Benjamin-Foster, or equal "Foster Sealfas" 30-36 lagging cloth.

C. Cold water piping:
   1. Piping –½ inch thick for all piping. Insulation shall be fibrous glass, 3-1/2 pound per cubic foot density minimum sectional pipe insulation with factory applied white All Service Jacket (ASJ) with butt strips and Benjamin-Foster, or equal BF85-75, or longitudinal seams. No staples shall be utilized or accepted on the installation of the insulation on cold water piping.
   2. Fittings and Valves - shall be insulated with insulation cement or molded fitting insulation to thickness of adjoining insulation finished with two coats of Benjamin-Foster, or equal "Foster Sealfas" 30-36 lagging cloth.

D. Storm Drain Piping (cast iron): 1/2 inch thick, fibrous glass, 3-1/2 pound per cubic foot density, sectional pipe insulation with a white flame retardant vapor barrier jacket covering all pipe insulation butted. All longitudinal seams and butt seams shall be sealed with Benjamin-Foster, or equal, "Foster Sealfas" 30-36 adhesive and covered with vapor barrier jacket. Storm piping shall be insulated from the roof drain body to the vertical leader to the floors below.

E. All pipe insulation shall have a flame spread rating of 25.

2.11 PIPE LABELS

A. All hydronic piping shall be labeled with plastic adhesive labels at a minimum. Labels shall indicate the piping system (hot water, hot water recirc, cold water, etc.), and shall indicate the direction of flow. Piping shall be labeled every 20 feet minimum on straight runs and shall be labeled within five feet of changes of direction. Labels shall be applied to the insulation jacket.

2.12 PLUMBING FIXTURES

A. See drawings for plumbing fixture selections.

B. Mounting heights shall be as shown on architectural details.

C. Each individual fixture shall be provided with supply stops for each water service.

2.13 HOSE BIBBS

A. Interior hose bibs shall be Woodford Model 24, Josam, Zurn, or equal, chrome plated, vacuum breaker, hose connection, loose T key.

2.14 FLOOR CLEANOUTS

A. All floor cleanouts shall be Jay R. Smith model 4031 series or equal. Floor cleanouts in carpeted areas shall be of the carpet clamping type.

2.15 FLOOR DRAINS

A. Furnish and install all floor drains as indicated and required. Drains shall be Josam model 30000-S series or equal. All floor drain strainers shall be square shaped style with square grid pattern.

2.16 TRAP PRIMERS

A. Furnish and install trap primers for floor drains and sprinkler drain standpipes as indicated and required.

B. Trap primers shall be Precision Plumbing Products ULP-500LP, Jay R. Smith Prime-Eze, or equal in restrooms and Mifab M-500 or equal, pressure drop activated, brass with removable filter screen in all other locations.

C. Multiple trap distribution units shall be Mifab MI-DU or equal to serve two, three or four floor drains.

D. Provide access panels at all trap primer locations if necessary.

2.17 WALL HYDRANT

A. Wall hydrant shall be of the non-freeze type equal to Woodford Model 67, 3/4 inch inlet, vacuum breaker, bronze construction, of wall thickness as required. Confirm exterior finishes with architect.

2.18 WATER HEATER

A. Furnish and install water heaters as indicated in the water heater schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The plumbing drawings intend to show only the scope of the design, and the Plumbing Contractor shall be responsible for the correct installation of his work in a manner satisfactory to the best practices of his trade and to complete the scope of this work in all respects.

B. The contractor is responsible for field verifying all existing conditions for connections to existing systems, and shall modify the connection points as necessary based on existing conditions.

C. The location of piping as indicated on the drawings is diagrammatic only, and the exact location shall be determined in the field. The run and arrangement of all pipes shall be approximately as shown on the drawings, as directed during installation, as straight and direct as possible, forming right angles or parallel lines with building wall and other pipes, and neatly spaced. All risers shall be erected true and plumb, parallel with walls and other pipes, and neatly spaced. All horizontal runs of piping except where concealed in partitions, shall be kept as high as possible and close to walls. Wherever possible, adjacent pipe lines, both heating and plumbing, shall be grouped in the same vertical or horizontal planes. All piping shall be concealed and shall have a minimum number of fittings. Piping shall not interfere with the operation or accessibility of doors, windows, access panels, or equipment and shall not encroach on aisles or passageways. All piping shall be installed to preserve access to all valves, traps and equipment.

D. This Contractor shall be responsible for the correctness of field dimensions and shall check for himself all grades, lines, measurements, and other data in any way affecting his work. He shall refer to the project, phasing schedule together with architectural, structural, and drawings of other trades for a full comprehension of the extent of the work to be performed and to avoid interference, and shall not be entitled to any extra compensation for any additional work or expense arising from his failure to do so. In case interference develops, the Architect shall decide which work is to be relocated, regardless of which was first installed. Work installed by the Contractor which is improperly located and/or interferes with or modifies either the phasing schedule or the architectural or structural design, shall be changes as directed by the Architect, and all costs incidental to such changes shall be paid by the Plumbing Contractor.

E. The Plumbing Contractor shall also provide the necessary data and supervision for the provision of all openings in the structure, including bolt hole templates, weights of equipment and manufacturer's recommendations for proper emplacement design. This shall be furnished to the General Contractor and other related trades.

F. No plumbing fixtures, devices, equipment or piping shall be installed which will provide a cross or interconnection be- between a distributing supply for drinking or domestic hot water system and a polluted supply or drainage system. Backflow preventers and vacuum breakers shall be installed where noted on the drawings, and in conjunction with all hydrants, hose bibs, water lines to equipment, water closets, service sinks, and where required to prevent polluted back siphoning.

G. All exposed run outs to equipment, materials and fixtures having chrome plated trim and/or fittings shall be chrome plated brass with chrome plated brass fittings, unless otherwise noted.

3.2 SANITARY AND RAINWATER (STORM) SYSTEMS

A. Interior sanitary and rainwater piping shall pitch in accordance with code requirements, unless otherwise noted. Buried soil and waste piping shall be a minimum of 2 inches in diameter.

B. All changes in pipe size and direction on soil and waste piping shall be made with Y's and cleanouts, reducing fittings, recessed reducers. Wyes and 45 degree fittings or 45 degree combination fittings shall be used wherever conditions permit.

C. Sanitary long sweep bends and wyes shall be used for connections to branch lines for fixtures and tee wyes on vertical runs of pipe. Long turn fittings shall be used wherever conditions permit.

D. All fittings, regardless of type, shall be furnished complete with the necessary bolts, nuts and washers, as well as brass or chrome plated nipples of the proper length and wax ring gaskets for the water closet connection.

E. Cleanouts shall be installed where indicated on the drawings, or approximately every 50 ft. along horizontal runs, at all changes in direction, and at the base of all soil, waste and leader stacks. Test tees with brass clean out plugs shall be installed at the base of all vertical piping. No projection above the floor line will be permitted. Cleanouts occurring in or back of walls shall be extended out to finished wall and finished with flush metal access panel. Cleanouts located in floor shall be extended to grade and finished with an access panel. Cleanouts located above hung ceilings are to be made accessible through metal access panels. Running cleanouts may be used where it is impractical to use end cleanouts at base of risers.

F. Each fixture, drain and piece of equipment must be separately trapped unless otherwise noted, and all traps must be vented. All main stacks of back ventilation shall run parallel and as close as possible to the soil stack, and shall connect to the vent continuation of the soil stack at least 3 feet above the highest plumbing fixture on the stack. Horizontal vent lines shall pitch toward a waste line.

G. Vents shall extend a minimum of 18 inches and a maximum of 24 inches above roof.

H. Fittings for piping above ground shall be drainage patterns.

3.3 DOMESTIC COLD AND HOT WATER PIPING

A. All interior water piping shall be installed without traps or pockets and shall pitch to draw-offs so that the whole system or individual sections can be properly drained. Piping shall have valves and be graded to allow for complete drainage of the system. All draw-off valves shall have hose end which shall be capped. Piping shall be pitched up toward risers and fixtures for proper air relief. Piping subject to expansion shall be flexible and installed to safely absorb all deflection stressed.

3.4 PIPE JOINTS

A. Joints for hub and spigot cast iron soil pipe shall be made with rubber gaskets conforming to State Plumbing Code.

B. Soldered joints on water and waste piping shall be made up using lead-free tin antimony solder, conforming to Federal Spec. QQ-S-571C, and joint shall be filled the full length of the socket. The fitting shall be heated evenly to the proper temperature to run the solder. The ends of the tubing and the inside of the fitting shall be thoroughly cleaned to a bright shining finish before applying flux. Flux shall be non-corrosive type conforming to Fed. Spec. 0-F-506.

3.5 VALVES

A. All piping systems shall be provided with valves so located that they can be operated, replaced, repaired and offer complete control to each group of fixtures, appliance, equipment, and each gas, hot and cold water branch. Each fixture, appliance or piece of equipment shall have a separate shut-off valve, furnished and installed, of approved type, for service to be connected to. Locate valves on supply and return, at each piece of equipment or fixture, each side of regulating valves, each side of pumps, each side of meter, and on main branches. Drain valves on systems containing water shall be installed at the base of each riser (after the shut-off valve), on down- fed fixtures and at equipment, also at such other locations as required to allow for complete drainage of the system. Valves shall be located as shown on the drawings or as here-in-before specified.

3.6 VALVE TAGS

A. Valve tag scheme shall be approved by the Engineer prior to installation in the field and insertion on the record drawings.

B. Contractor shall provide a valve tag chart and clearly label the valve tags on the record drawings. The valve chart shall include but not be limited to: tag #, location, valve type, size and what the valve controls.

C. Valve tags shall be securely fastened to the valve handle by heavy aluminum or brass hooks or chain.

3.7 HANGERS AND SUPPORTS

A. Sanitary piping shall have a hanger at each hub or every 5 feet, whichever is less. Water and gas piping shall be supported at all changes in direction, on branch lines regardless of length, at base and at top of risers. Piping adjacent to floor, where ceiling hangers are impractical, shall be adequately supported by a suitable hanger, as approved by the Architect, with rod to plate at floor, said plate to be secured to floor.

3.8 ACCESS PANELS

A. Access panels shall be turned over to the General Contractor for installation into structure. This Contractor shall direct the General Contractor as to location of access panels.

3.9 SLEEVES

A. Provide sleeves for all piping penetrating new walls, ceilings and floors. Where pipes run through sleeves, the annular openings shall be sealed with fire resistant materials as called for under Part 2 - MATERIALS.

3.10 FIRESTOPPING

A. The Contractor shall provide UL listed through penetration fire stopping systems for all penetrations of fire rated floor/ceiling, roof/ceiling and wall assemblies. Coordinate the required UL system with the architectural plans and the material of the piping.

B. Submit each UL listed through penetration fire stopping system to the Architect for review.

3.11 TESTING

A. The Plumbing Contractor shall notify the Architect three working days prior to day tests are to be made. Test all piping and make it gas and water tight, in accordance with the authority having jurisdiction and ordinances, and in the presence and to the satisfaction of the applicable Inspector along with the Architect and his representative.

B. No piping shall be buried, concealed or insulated before tested and approved. Partial tests shall be made as required, by the progress of the work, and the Plumbing Contractor shall accommodate the testing operations to the progress of the project. Furnish all equipment, labor, services and apparatuses, and pay for all costs for pertinent tests. All approvals shall be rendered in writing and submitted to the Architect. Remedy all defective work and replace all defective materials, equipment or fixtures with new ones of the specified grade. No caulking, peening, or wicking of screwed joints or holes will be acceptable. This Contractor shall make and remove all temporary piping and line connections required for the tests and shall dispose of test water and all wastes after tests in a satisfactory and non-damaging manner.

C. Piping Systems
   1. Upon completion of the roughing in and before setting plumbing fixtures, the entire water piping system shall be tested at a hydrostatic pressure of not less than 150 percent of the maximum working pressure of the system, and shall hold tight at this pressure for 2 hours, without additional pumping. Where a portion of the work is to be concealed before completion, this portion shall be tested separately in the same manner s described for the entire system.
   2. Upon roughing in and before setting fixtures, all outlets in soil, waste, rainwater and vent systems shall be temporarily capped and made tight. The piping within the building shall then be filled with water up to the roof and must remain full, without showing any leakage of water. All parts of the system shall be subject to not less than 10 feet of hydrostatic head, above the point being tested. Test tees shall be provided as to facilitate testing.
   3. All buried piping in the sanitary and storm drainage systems under the building and outside the building walls shall be tested as specified in 2. above by proving the lines tight under a head of 10 ft. of water above the highest horizontal line to be tested.

3.12 CLEANING AND STERILIZATION OF SYSTEMS

A. The Plumbing Contractor shall be responsible for the cleaning and purging of all pertinent systems after installation and before system operation. Any damage to part of the building, its finish or furnishings, due to This Contractor's failure to properly clean the system, shall be repaired or replaced, at his expense.

B. All plumbing fixtures shall be thoroughly cleaned of all plaster, sticks, rust stains and other foreign matter or discoloration, leaving every part in an acceptable condition and ready for use. Surfaces shall be cleaned, polished and left bright. The surfaces of all pumps, meters, floor drains, cleanouts, sediment buckets and other equipment shall be cleaned and each items hall be left in a first class condition.

C. All finished metal work shall be cleaned, polished and left bright. All equipment, pipe, valves, drains and fittings shall be cleaned of grease, metal cutting and sludge, which may have accumulated during construction and/or testing.

D. The Plumbing Contractor shall refinish and restore to its original condition all plumbing equipment which has sustained damage to the manufacturer's prime and finish coats of paint and/or enamel.

E. The entire new potable water system shall be thoroughly sterilized by the Plumbing Contractor with a solution containing not less than 50 parts per million of available chlorine. The chlorinating materials shall be either liquid chlorine conforming to the requirements of the U.S. Army Spec. No. 4-1 or sodium hypochlorite solution conforming to the requirements of Fed. Spec. O-B-441, Grade D. The sterilizing solution shall be allowed to remain in the system for a period of 8 hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 parts per million. Sterilization shall be to the satisfaction of the Board of Health. Submit certification, in writing, that this work has been accomplished in conformance with the above.

END OF SECTION

SECTION 15600

HVAC (FILED SUB-BID REQUIRED)

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PART 1 - GENERAL

1.1 FILING OF SUB-BIDS

A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a separate sealed envelope with the Awarding Authority at a time and place stipulated in the Bidding Requirements.
   1. The following should appear on the upper left hand corner of the envelope:

      NAME OF BIDDER: _____

      PROJECT: Veterans Memorial Pool Patton Park
      Bay Road
      Hamilton, Massachusetts

      SUB-BID FOR: Section xx xx xx – NAME OF SECTION

B. Every sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority, as required by Section 44F of Chapter 149 the General Laws as amended. Sub-Bid forms are included in this Project Manual or may be obtained at the office of the Architect.

C. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND, or CERTIFIED, TREASURER's, or CASHIER'S CHECK issued by a responsible bank or trust company payable to the *Town of Hamilton* in the amount of five percent of the Bid. A sub-bid accompanied by any other form of bid depository than those specified will be rejected.

D. Work to be done under this Section is shown on the Drawings:
   1. H100
   2. The listing of Contract Drawings above shall not limit the Subcontractors responsibility

E. Sub Sub-Bid Requirements:
   1. TESTING ADJUSTING AND BALANCING
   2. SHEETMETAL
   3. AUTOMATIC TEMPERATURE CONTROLS

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

G. Examine all other Sections of the Specifications for requirements, which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.2 WORK INCLUDED

A. The work included in the Heating, Ventilating and Air Conditioning specifications consists of furnishing all materials, labor, equipment and appurtenances to perform, and leave in satisfactory operating condition the new systems.

B. It is the intention of these specifications to call for finished work, fully tested and ready for continuous operation. Any apparatus, equipment, material or work not mentioned in the

specifications or incidental accessories to make the work completely balanced, perfect in all respects and ready for operation, even if not specifically mentioned, shall be furnished, tested, adjusted or balanced at no additional expense to the Owner. Should there appear to be discrepancies or questions of intent, the Contractor shall refer the matter to the Architect for decision before start of any related work.

C. The drawings, where applicable, show equipment and device locations, required flows at those devices and locations of new thermostats and controls (if applicable). In addition, the drawings identify routing for new ducting and new piping as well as their respective sizes. The HVAC Contractor shall field verify that the routing is free of obstacles and other trades work.

D. The Contractor shall confer and cooperate with all other building trades so that all work will be installed in the proper relationship to all other work.

E. The Contractor shall provide and maintain all staging, scaffolding, ladders and hoisting equipment required for the execution of the work by his personnel. Remove same from premises when no longer required.

F. The work under this section shall include furnishing all motor starters and components for installation by the electrical contractor.

G. The work under this section shall include all labor, materials, accessories, services, and equipment necessary to furnish and install:
   1. All fans.
   2. All ductwork.
   3. All duct fittings.
   4. All ductwork accessories.
   5. All air inlet and outlet equipment.
   6. Testing, Adjusting and Balancing

1.3 DEFINITIONS

A. Where used in this specification, the following definitions shall apply:
   1. Test means to determine quantitative performance of HVAC equipment.
   2. Adjust means to produce the specified fluid flows at the terminal equipment.
   3. Balance means to establish the specified fluid flows within the distribution systems.
   4. Procedure is the standardized approach and execution of sequence of work operations to yield reproducible results.
   5. Report forms shall be test data sheets arranged for collection of test data in logical order for submission and review. These data shall form the permanent record which shall be used as the basis for any future testing, adjusting, and balancing required.
   6. The testing, adjusting, and balancing Contractor shall hereinafter be referred to as "The Contractor", who may be the HVAC Contractor or a subcontractor to the HVAC contractor.

1.4 GENERAL REQUIREMENTS FOR SHEETMETAL DUCTWORK

A. Where specifications refer to SMACNA standards, the latest SMACNA standards shall be considered as the minimum acceptable. If local codes require other standards, then the local codes shall govern.

B. All ductwork indicated on the drawings is to be considered as shown in schematic. Changes in duct size or duct elevation to clear obstructions or to accommodate field conditions caused by the work of other trades, not shown on the drawings, shall be made by contractor, where

necessary to conform to the actual space conditions and shall be provided at no additional cost to the owner. No duct changes shall be fabricated until after written approval of the modified or original shop drawings by the Engineer.

C. It shall be this Contractor's responsibility to field verify all dimensions and to coordinate his work with the work of other trades. Locations and placement of ducts shall be coordinated with the work of the other trades before any ductwork is fabricated or installed.

D. Each duct system shall be constructed for the specific duct pressures and/or pressure classifications shown on or required by the contract drawings. Where no specific duct pressure or class designation is shown, the SMACNA 2" W.G. pressure class is the basis for compliance with these standards.

1.5 RELATED WORK IN OTHER SECTIONS

A. The following is a list of related work to be performed or furnished by other trades under other sections of the specifications:
   1. Power wiring to hvac equipment.

1.6 CODES AND STANDARDS

A. All work and materials provided under this specification shall conform to the requirements of the all municipal, state building codes, all referenced standards and guidelines, including but not limited to the National Fire Prevention Association, Underwriters Laboratories, American Society of Mechanical Engineers, American Society of Heating Refrigeration and Air Conditioning Engineers and any other regulatory body having jurisdiction over this work. Where standards or codes are mentioned the latest edition or revision shall be followed. Where provisions of the contract documents conflict with applicable standards, codes, laws, rules or regulations, the latter shall govern. Where provisions of the contract documents are in excess of the applicable standards, codes, laws, rules or regulations, the former shall govern, unless specifically noted otherwise by the contract documents.

B. Equipment shall bear Underwriters' Laboratory labels where applicable.

C. The following publications form a part of this Specification to the extent indicated by the reference thereto. In text, the publications are referred to by the initials of the organization:
   1. American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE). ASHRAE Handbook, Systems Volume.
   2. Associated Air Balance Council (AABC) National Standards for Field Measurement and Instrumentation. Total System Balance, Volume 4, 1982 edition.
   3. National Environmental Balancing of Environmental Systems (NEBB). Procedural Standards for Measuring Sound and Vibration. Sound and Vibration in Environmental Systems.

1.7 COORDINATION WITH OTHER BUILDING TRADES

A. Structural members and building openings for HVAC equipment, ducts, fans, etc., for use by the HVAC Contractor shown on the architectural or structural plans are the coordination responsibility of the HVAC Contractor.

B. All motors for HVAC equipment shall be furnished and set under this section. All motor starters shall be provided by the HVAC contractor for installation by the Electrical Contractor. All

controls shall be provided and installed. All control wiring shall be provided and installed by this Contractor in accordance with the applicable provisions of the electrical specifications.

C. It shall be this Contractor's responsibility to field verify all dimensions and to coordinate his work with the work of other trades. Locations and placement of ducts, fittings, accessories and equipment shall be coordinated with the work of the other trades before ductwork is fabricated or installed.

1.8 SHOP DRAWINGS AND SUBMITTALS

A. The Contractor shall submit the number of copies required in other sections of the specification of all necessary shop drawings for approval to the Architect.

B. Shop drawings for equipment shall include printed catalog specifications and printed capacity data to enable confirmation of capacities and specifications as well as certified dimensional prints, which may have selection data shown thereon.

C. Shop drawings, catalog specification data and capacity ratings of the following equipment, where applicable and such other equipment that is being furnished shall be submitted to the Architect for approval prior to purchase or installation of any work or equipment:
1. Registers, Grilles and Diffusers
2. Fans

D. The Architect's review of shop drawings is for general conformance with the design concept and contract documents. Markings and/or comments shall not be construed as relieving the Contractor from compliance with the plans and specifications or as departures therefrom. The Contractor shall remain responsible for details and accuracy of the drawings.

E. The Contractor is responsible for the dimensions and arrangement of the equipment as it is applied to this project.

F. The following submittals must be presented before final acceptance of the work:
1. Contractor's guarantee and warranty.
2. Manufacturer's literature and supplied information.
3. Maintenance and Operating Instructions Manuals.
4. Record drawings.
5. Logs of all system testing, adjusting, balancing and verification of system performance.
6. After completion, submit complete test reports for approval. Where test results differ from specified design conditions, the Contractor shall report to the Architect the reasons for the difference.

G. Accompany submittals with transmittal letter, in duplicate, containing:
1. Date.
2. Project title and contract number.
3. Contractor's name and address.
4. The number of each shop drawing and product data submitted.
5. System logs with proper identification.
6. Other pertinent data.

H. Submittals shall be clearly identified and include:
1. Date and revision dates.
2. Project title and contract number.
3. The names and addresses of the Contractor, supplier, and manufacturer.
4. Identification of product.
5. Applicable standards, such as ASTM number or ANSI number.

6. Contractor's signature certifying to his review of submittal.

1.9 APPROVAL OF SUBMITTALS

A. The Architect will return signed and approved or disapproved submittals to the Contractor in the timeframe in accordance with the specifications. Any submittals which have been disapproved, shall be resubmitted by the Contractor within one week for final approval.

1.10 RESPONSIBILITY FOR ACCURACY OF SUBMITTALS

A. The Contractor is solely responsible for the accuracy and completeness of all submittals, regardless of corrections made in, or approval given to, such submittals. When the Architect makes comments and returns the submittals, it is incumbent upon the Contractor to thoroughly review the comments and notations made by the Architect. When, in the Contractor's opinion, the notes made by the Architect are in error or in conflict with other elements of the system, it is incumbent upon the Contractor to promptly notify the Architect of his findings or opinion along with substantiating data, in writing to preclude misunderstanding or expensive alterations caused by a review error or oversight. The submittals are intended to provide detailed documentation of the system design and its components. The responsibility for their correctness rests completely, totally and solely with the Contractor.

1.11 SUBSTITUTION OF MATERIALS OR EQUIPMENT

A. Named manufacturers for any equipment specified herein or identified on the drawings are identified for the purpose of identifying quality standards, performance information or type. Any substitution as “or equal” shall be considered. The Architect shall determine whether or not the offered equipment is equal to the specified. Where dimensional constraints exist the contractor shall be responsible for any extra costs associated with extra work required to make the “or equal” equipment fit.

B. After approval of the submittals, substitution of materials or equipment of makes other than those specifically named in the submittals will be approved by the Architect only if the material or equipment proposed for substitution is equal to and/or superior to material or equipment named in construction, efficiency, utility and accuracy; and further that the material or equipment named in the submittals cannot be delivered to the job in proper sequence due to conditions beyond the control of the Contractor.

C. To receive consideration, requests for substitution shall be accompanied by documentary proof of equality or difference of both proposed equipment to be substituted and equipment named in the approved submittals. Substitution by the Contractor of other materials or processes than those named in the approved submittals shall be done only upon written authorization from the Architect.

1.12 FEES AND PERMITS

A. The Contractor shall apply for, obtain and pay for all required permits, inspections, certificates, and incidental charges required for proper performance of the work, and shall furnish the Architect with copies of applications and all correspondence.

1.13 OPERATING INSTRUCTIONS

A. The Contractor shall provide three (3) copies of a OPERATIONS AND MAINTENANCE MANUAL, bound, indexed and titled in an 8½" x 11" Post binder with hard covers (not a three ring looseleaf type binder). The manuals shall each contain:
   1. Clear and concise instructions for operation, maintenance, adjustment and lubrication for all mechanical equipment.
   2. A parts list of all parts of the equipment, with catalog numbers and other data necessary for ordering of replacement parts.
   3. Copies of all approved equipment shop drawings.
   4. Index shall include type of equipment, manufacturer, local representative with address and telephone number.

1.14 RECORD DRAWINGS

A. The Architect will furnish the Contractor electronic files of the mechanical drawings as issued for this contract in AutoCAD 2013 format. The Contractor shall change these drawings to indicate accurately and neatly the actual locations of all ducts, equipment and grilles. At the end of the project the Contractor shall deliver to the Architect one set of reproducible As-built drawings and a DVD or Compact Disk with As-Built drawing files in AutoCAD 2013 format for the owner's permanent record.

1.15 TESTING AND CHECKOUT

A. After completion of any work installed by the Contractor, field tests shall be performed and checkout of the system accomplished. The tests shall include functional and operational tests where applicable on all equipment under all conditions that exist at the time. All defects of new equipment disclosed by tests shall be rectified without additional cost to the Owner. The Contractor shall be required to make minor adjustments to equipment and accessory material to provide a thoroughly functional installation. All new equipment shall be installed, tested and checked before the Contractor tests, adjusts or balances the system as a whole.

B. The Contractor shall adjust the speed controllers for each exhaust fans and provide a report of the final airflows.

1.16 PROTECTION

A. The Contractor shall be responsible for his work and equipment until finally inspected and accepted by the Owner. The Contractor shall be responsible for proper storage of his materials and equipment. Equipment and materials storage shall in no way interfere with building operations or personnel. Any work adversely affected by the work performed by the Contractor shall be repaired or replaced by the Contractor at the option of the Owner, and at no additional cost to the Owner.

1.17 DUCT CLEANLINESS

A. Any equipment connected to ductwork shall not be operated until construction progress has reached a point where minimal dust is being created as determined by the Architect.

B. If any equipment is to be used prior to the point of minimal dust creation, all return or exhaust intakes shall be covered with filter material and all filters in the equipment shall be changed on a daily basis.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials, except as otherwise specified, shall be new, of current production, first quality and the best of each class specified.

B. Required materials not covered by detailed specifications shall be of a suitable class, grade, quality and type and shall be subject to the approval of the Architect. Where two or more units of the same class of equipment are required, these units shall be the products of a single manufacturer.

C. All equipment shall be installed and constructed to operate safely, as designed, without leakage, undue wear, noise, vibration or corrosion.

2.2 ELECTRIC MOTORS AND RELAYS

A. Design, type and ratings of electric motors shall comply with the National Electrical Code, NEMA and Underwriter's Laboratory.

B. Unless otherwise noted or required for special applications, motors shall be open drip- proof with sealed ball bearings.

C. All electric motors shall be of the voltage, type and frame as specified in the electrical portion of the specifications.

2.3 RECTANGULAR DUCTS

A. All ductwork shall be fabricated of G-60 coated galvanized steel of lockforming grade and conforming to ASTM standards A-525 and A-527, unless otherwise noted, and shall be constructed in accordance with the latest SMACNA standards.

2.4 ROUND DUCTS

A. All ductwork shall be fabricated of G-60 coated galvanized steel of lockforming grade and conforming to ASTM standards A-525 and A-527, unless otherwise noted, and shall be constructed in accordance with the latest SMACNA standards.

2.5 FLEXIBLE CONNECTORS

A. All connections between ceiling exhaust fans and ductwork shall be made with a piece of flexible duct not exceeding six inches in length.

B. All connections between inline fans ductwork shall be made with a flexible connection consisting of a heavy fiberglass fabric, double coated with neoprene and shall be fireproof conforming to NFPA 90A, waterproof and airtight.

2.6 INLINE EXHAUST FANS

A. Exhaust fans shall be inline type.

B. Fans shall have the capacities indicated on the schedule.

C. Housing shall be insulated.

D. Motor shall be totally enclosed, 4-pole condenser type engineered to run continuously.

E. Fans shall be Energy Star rated.

F. Provide a solid state speed controller.

2.7 INLINE CABINET FANS

A. Fans shall have the airflow and static pressure capacities and the electrical characteristics shown on the schedule.

B. The fans shall be of the centrifugal direct drive type.

C. The fan housing shall be constructed of heavy gauge galvanized steel. The housing shall be lined with ½" acoustical insulation.

D. The outlet duct collar shall include an aluminum backdraft damper and shall be adaptable for horizontal or vertical discharge.

E. The access for wiring shall be external.

F. The motor disconnect shall be internal and of the plug in type.

G. The motor shall be mounted on vibration isolators.

H. The fan wheels shall be of the forward curved centrifugal type and be dynamically balanced.

I. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance and shall be UL Listed and CSA approved.

J. Provide a solid state speed controller.

2.8 REGISTERS, GRILLES AND DIFFUSERS

A. The types, sizes and airflow patterns of the registers, grilles and diffusers as specified and as shown on the plans have been selected to accomplish the intent and purpose of the system. Any substitutions proposed for items scheduled, shown or specified must provide the same air flow patterns, at the same air volumes and must have the same acoustical characteristics as the specified elements.

B. All registers, grilles and diffusers shall have a baked enamel, off-white, semi-gloss finish.

C. Frame types of diffusers shall be as appropriate for the type of ceiling in which they are to be installed.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. All work shall be coordinated with the work to be installed by other sections of these specifications.

B. All work shall be executed in a workmanlike manner by workmen skilled in this type of work and shall present a neat appearance when completed.

C. All duct supports, structural members, hangers and other apparatus necessary to support firmly and substantially the various components of the systems shall be provided under this section.

D. Nameplates, catalog numbers, and rating identifications shall be securely attached to equipment.

E. The work shall be performed in a timely manner so as to cause no delay in the overall job progress. The Contractor shall cooperate with the other trades so that the work is installed in the most beneficial sequence for expeditious project completion.

3.2 CLEANING OF SYSTEMS AND PREMISES

A. Before the systems are tested and balanced, all ducts serving the area under construction shall be cleaned so that no dirt, dust or other foreign matter will be carried through or deposited in the systems or the space served by the duct systems.

B. At all times keep the premises clear of rubbish.

C. Upon completion of the work in an area, remove all debris and rubbish resulting from the execution of this contract, and dispose of same. At anytime should the General Contractor be dissatisfied with the performance of the HVAC Contractor's clean up responsibilities, he may elect after notifying the HVAC Contractor to undertake this operation and to backcharge the HVAC Contractor accordingly.

3.3 HVAC CONTRACTOR'S WARRANTY

A. The HVAC Contractor shall provide a one year warranty against failure of the installed materials for any reason. The warranty shall cover the full costs of parts and labor required to remedy the defect, including, if necessary, replacement at the site, and shall run from the date of the Architect's acceptance of the system. The warranty shall also include provision for field inspection at no charge to the Owner, to verify failure, establish probable cause, and determine corrective action required. The HVAC Contractor shall furnish all service during the first year of operation. Any material that in the opinion of the architect, requires excessive service during the first year of operation shall be considered defective and will be replaced by the HVAC Contractor at no charge to the Owner.

B. The HVAC Contractor shall provide a listing of all manufacturers’ commercial warranties provided by those manufacturers on their materials. The list of these warranties must include the time period of each warranty. One copy each of those warranties shall be submitted with the listing.

C. The HVAC Contractor shall be responsible for warranting the testing, adjusting and balancing work for a period of one year after final date of completion. The HVAC Contractor shall also be responsible for all damage to existing systems as a result of the work performed. All damaged systems shall be repaired or replaced at the option of the Owner at no additional cost to the Owner. All such repair or replacement work shall be done immediately upon finding.

D. Warranty response to any malfunction shall be on a next day, normal working hour basis.

E. Work under warranty shall be performed by fully qualified workmen and/or technicians.

F. All guarantees and warranties required to be provided for the work in this Section shall begin their term on the date of final written acceptance of the entire system by the Owner.

3.4 SUBMITTALS

A. The capacity of each HVAC unit shall be substantiated by computer generated selection data or other detailed selection data provided by the manufacturer, for the specific conditions defined on the drawings.
   1. The selection data shall clearly show the entering and leaving fluid conditions, the fluid flow volume and the fluid pressure drop through the unit, the ambient conditions, the heat rejection media entering and leaving conditions, the available external static pressure, the unit total static pressure, the airside pressure drops, the refrigerant and the saturated suction temperature, the required RPM of the unit, the motor horsepower, the motor voltage, the motor efficiency, the motor RPM, the motor type, the fuel efficiency, the fuel consumption rate, the maximum capacity, the part load performance data of the anticipated operation of the system, and the radiated sound ratings at design conditions as may be appropriate for any specific piece of equipment.

B. Contractor shall submit shop drawings indicating the method of supporting all units.

3.5 PERFORMANCE

A. The drawings are diagrammatic and the final arrangement of the work shall suit the existing and field conditions, the characteristics of the materials used and the instructions of the Engineer and/or the Architect.

B. The Contractor shall be responsible for repair of damaged or disturbed existing work or the work of other trades caused by his work, testing of his work or repair to his work.

C. All devices shall be installed in accordance with the manufacturer's recommendations, the Engineer's instructions and so as to provide all required access for cleaning, operation, repair and maintenance.

3.6 START UP

A. All equipment, systems, controls and units shall be started as part of a heating, ventilating and air conditioning system, in accordance with all manufacturers recommendations.

3.7 ROUND DUCTS

A. General
   1. All ductwork shall be installed in accordance with the best trade practices and SMACNA standards shall be the minimum requirements.
   2. The Contractor shall follow the application recommendations of the manufacturer of all hardware and accessory items and make selections of such consistent with the duct classification and services.

B. Duct Gauge
   1. Round ducts shall be constructed of the galvanized steel with duct walls in accordance with “SMACNA” standards.

3.8 FLEXIBLE DUCTS

A. Length
   1. Flexible duct shall only be used where approved by the Architect or as noted for vibration isolation at the EF-2 inlet and outlet.
   2. The minimum length of flexible duct shall be used.
   3. The maximum length of flexible duct in any single duct run shall be six inches.

B. Bends
   1. Bends shall be made with not less than one and one half duct diameter centerline radius.
   2. Maximum bend shall be 90°.

C. Fastening
   1. Secure flexible duct to collar or sleeve by peeling back jacket and insulation at end of flexible duct. Fit duct over collar or sleeve and clamp with ½" wide galvanized steel or stainless steel bands or clamps and matching seals. Pull jacket and insulation back in place and secure with two wraps of pressure sensitive sealing tape. Clamping device shall be two inches back from end of flexible duct. Seal with two wraps of duct tape.

D. Installation
   1. Flexible duct is to be installed as straight as possible and as tight as possible.
   2. Submittals shall include product data sheets as well as the manufacturer's recommended installation practices.

3.9 SUSPENSION OF DUCTWORK

A. Rigid round and rectangular ducts shall be installed with support systems as required to maintain alignment. Horizontal ducts shall have a support within two feet of each elbow and within four feet of each branch intersection.

B. Strap hangers on rectangular ducts may be used on ducts less than 60" wide if they are secured to the bottom of the duct with an approved fastener and with a minimum 1" tab below the duct, or with no fasteners if the strap is a single continuous loop.

C. Multiple trapeze hangers may be suspended from rod hangers to support ducts directly above and below each other if the rods are sized to support the combined load.

D. Round ducts less than 10" in diameter may be suspended by wire.

E. All hangers and trapezes shall be sized, spaced and selected in accordance with Section IV of SMACNA "HVAC DUCT CONSTRUCTION STANDARDS".

3.10 ROUND DUCT FITTINGS

A. Elbows larger than 8" shall be five piece welded construction.

B. Branch and take-off fittings shall be conical tee or conical reducing tee fittings.

C. Final connections to the individual terminal supply units shall be by means of flexible duct.

3.11 FINAL ACCEPTANCE

A. The Contractor shall leave all system components in proper working order, such as belt guards in place, access doors closed, doors to electrical switch boxes closed, thermostats restored to specified setting. All recorded data shall represent a true, actually measured, or observed condition. Any abnormal conditions in the mechanical systems or conditions which prevent total system balance, shall be reported to the Architect immediately upon finding. The Contractor shall permanently mark all dampers and other adjustment devices in a manner that will allow the settings to be restored.

B. The Contractor shall verify control system operation as specified, and shall report all system problems and malfunctions. The verification and checkout of the control system shall be accomplished during the heating and cooling cycles of operation for an appropriate period of time to assure control response and overall stability.

C. The Contractor shall verify that all air systems are in compliance with all standards, such as ASHRAE minimum outside air, and all other applicable codes and requirements.

D. The Contractor shall make any necessary changes in fan speed, and shall realign all belts when necessary.

3.12 AIR BALANCING

A. Adjust the speed controllers for each and provide a balancing report showing the final airflows for each.

B. Upon completion of balancing and adjusting of the systems hereinafter specified, submit six (6) copies of the data for review and approval by the Architect/Engineer.

C. All balancing and adjusting of air systems shall be done in accordance without the latest edition of the NEBB procedural Standards for Testing, Adjusting and Balancing of Environmental systems or the latest edition of SMACNA's HVAC Systems Testing, Adjusting and Balancing.

D. The Balancing Subcontractor shall balance and adjust air systems to meet design requirements. ± 5%. Balancing shall be accomplished by adjusting dampers, etc. to obtain design requirements.

3.13 SEQUENCES OF OPERATION

A. See drawing H100 for the exhaust fan sequences of operation.

END OF SECTION

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SECTION 260000

ELECTRICAL (FILED SUB-BID REQUIRED)

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PART 1 - GENERAL

1.1 FILING OF SUB-BIDS

A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a separate sealed envelope with the Awarding Authority at a time and place stipulated in the Bidding Requirements.

B. The following should appear on the upper left hand corner of the envelope:

NAME OF BIDDER: _____

PROJECT: Veterans Memorial Pool Patton Park
Bay Road
Hamilton, Massachusetts

SUB-BID FOR: Section xx xx xx – NAME OF SECTION

C. Every sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority, as required by Section 44F of Chapter 149 the General Laws as amended. Sub-Bid forms are included in this Project Manual or may be obtained at the office of the Architect.

D. Sub-bids filed with the Awarding Authority shall be accompanied by BID BOND, or CERTIFIED, TREASURER's, or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Town of Hamilton in the amount of five percent of the Bid. A sub-bid accompanied by any other form of bid depository than those specified will be rejected.

E. Work to be done under this Section is shown on the Drawings:

1. E000, E001, E100, E101, E200
2. The listing of Contract Drawings above shall not limit the Subcontractors responsibility

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

G. Examine all other Sections of the Specifications for requirements, which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including, but not limited to, the following:

1. Complete main power distribution system including main distribution switchboard with main service disconnect switch, power distribution section, over current protective devices, all provisions for metering including utility metering, surge protection, and secondary feeders from utility transformer to main service disconnect.
2. Complete building secondary power distribution system with lighting and power distribution panelboards, and all feeders.

3. All branch power circuits to all building operational equipment including but not limited to, lighting fixtures, power outlets, mechanical heating and cooling equipment and as required for all special systems components.
4. Complete grounding system as required by Article 250 of the National Electrical Code.
5. Complete raceway system with conduits, conduit fittings, outlet boxes, wire ways, hangers, supports, and all incidental items as required for a complete installation. Raceway systems installed exposed in all finished areas shall be specifically designed for the application.
6. All wiring devices including light switches, duplex receptacles and special power outlets. Provide cover plates for all wiring devices.
7. All lighting fixtures including emergency and exit lights complete with lamps, ballasts, and starters as shown on the Drawings.
8. Telecommunications as shown on design drawings.
9. Complete wiring of all items of equipment furnished by the Owner and/or under other Sections of these Specifications.
10. Vendor services, testing and training.
11. All devices and products under this section are to meet the voltage requirements available on site. It the Electrical Contractor's responsibility to ensure this.

B. Items to be installed only: Install items as furnished by the following designated sections:

1. PLUMBING
2. AIR CONDITIONING

C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. SECTION GENERAL CONDITIONS OF THE CONTRACT.
   a. Cutting, patching and drilling, except installation of pipe supports and fastenings.
2. EARTHWORK.
   a. All excavation and backfill.
3. CAST-IN-PLACE CONCRETE.
   a. All concrete work.

D. Extent: The work required under this Section, without limiting the generality thereof, includes the furnishing of all labor and materials required to supply and distribute proper power, including all conduit and controls, to all electrical fixtures, accessories, devices, motors, motor controllers, etc., and the special systems called for under all Sections of the Specifications, and all other materials, equipment, and labor necessary, whether or not such items are specifically indicated on the Drawings or in the Specifications to complete the electrical work, in all respects ready for continuous and trouble free operation.

E. Intent: It is the intent of the Contract Documents to include all work and materials necessary for erecting complete, ready for continuous use, all electrical and special systems shown on the accompanying Drawings, or as hereinafter described. These Drawings shall be taken in a sense as diagrammatic; branch circuit runs, electrical equipment, etc. and methods of running them are shown, but it is not intended to show

every fitting, wire, or device, nor every structural difficulty that will be encountered during the installation of the work.

1.3 QUALITY ASSURANCE

A. Execution:

1. The Electrical Subcontractor shall refer to all the Drawings for a full comprehension of the work to be done and for conditions affecting the location and placement of his equipment and materials. These Drawings are intended to be supplementary to the Specifications and any work indicated, mentioned, or implied in either is to be considered as specified by both. Should the character of the work herein contemplated or any matter pertaining thereto be not sufficiently explained in the Specifications or Drawings, the Electrical Subcontractor may apply to the Architect-Engineer for further information and shall conform to such when given, as it may be consistent with the original intent. The Architect-Engineer reserves the right to make any reasonable changes in location prior to installation at no expense to the Owner. All lines are diagrammatic and exact locations are subject to the approval of the Architect-Engineer.

2. Before submitting his bid, the Electrical Subcontractor shall visit the site with the Drawings and Specifications and shall become thoroughly familiar with all conditions affecting his work since the Electrical Subcontractor will be held responsible for any assumption he may make in regard thereto.

3. The Electrical Subcontractor shall, at all times, have a foreman or superintendent on the project authorized to make decisions and receive instructions as if the Electrical Subcontractor himself were present. The Electrical Subcontractor shall employ only competent and experienced workmen at a regular schedule in harmony with the other tradesmen on the job. The Electrical Subcontractor shall also exercise care and supervision of his employees in regard to proper and expeditious layout of his work.

4. When items in the contract drawings and specifications are in conflict, then the more stringent of the two shall take precedence.

B. Products:

1. All materials used in this Section shall be new, full weight, and first class in every respect, without defects, and designed to function properly in that portion of the work for which they are intended and with the same brand of manufacturers for each class of material or equipment.

2. Equality of material or equipment other than those named or described in this Section will be determined in accordance with the provisions of the Contract and as specified further herein.

C. All work installed under these Drawings and Specifications must be installed in strict accordance with the requirements of all local and other departments having jurisdiction, the utility companies, and with the requirements of the Underwriters' Laboratories, Inc., National Bureau of Fire Underwriters, International Building Code, National Electrical Code 2014 (USA), EIA/TIA Building Telecommunication Wiring Standard, and/or similar codes applied hereto.

1.4 CODES AND STANDARDS

A. Workmanship, material and equipment shall be in accordance with Specifications and Drawings and in some instances the requirements exceed those required by codes and standards. Where not exceeded, the codes and standards shall be considered as

absolute minimum requirements. Where conflicts occur between codes the most stringent shall apply.

B. All materials, appliances, equipment and devices provided under this contract must meet the requirements of Underwriters Laboratories (UL) Standards.

C. Refer to NEC, for definitions of terms used in the Drawings, Specifications, etc. These definitions, in conjunction with local authorities interpretation, convention and common usage, will apply.

D. International Building Code.

E. International Fire Code

F. Massachusetts Building Code

1.5 REFERENCE ABBREVIATIONS

A. References are made in the various Electrical Sections to technical societies, codes, specifications, trade organizations, and regulatory authorities in accordance with the following abbreviations:

1. ADA - Americans with Disabilities Act (1992).
2. FM - Factory Mutual
3. IEEE - Institute of Electrical and Electronics Engineers.
4. IPCEA - Insulated Power Cable Engineers Association.
5. NEC - National Electrical Code (NFPA Pamphlet No. 70).
6. NEMA - National Electrical Manufacturer's Association.
7. NETA - International Electrical Testing Association, Inc.
8. NFPA - National Fire Protection Association.
9. UL - Underwriters Laboratories, Inc.

1.6 SHOP DRAWINGS AND DATA TO BE SUBMITTED

A. Within 30 days of award of the Contract, the Electrical Subcontractor shall submit, for approval, six (6) copies of a complete list of manufacturer's shop drawings, detail prints and data.

B. Reference catalog cuts and brochures of products to proper paragraph in Specifications. Furnish numerical index by Specifications paragraph number listing product name, catalog number and reference to page number of submittal brochure.

C. Cross reference individual catalog numbers of substitute products to numbers of specified materials.

D. Bind submittal in booklet form.

E. Requests for permission to use substitute or alternate products shall be accompanied with evidence to prove that the product:

1. Conforms to the standard of performance and quality specified.

2. Will physically fit in the space allocated, with sufficient access and maintenance space.
3. Will not entail changes in details and construction of related work whether mechanical, electrical, or general in nature.
4. Involves no additional costs to the Owner or extended construction time.

F. Requests for permission to use substitute or alternate products shall be immediately brought to the Architect's attention. In the event that the use of these products may be determined to result in a material or labor savings to the Contractor, then the amount of these savings as a credit to the Owner will be required to assist in determination of acceptability of the product. Provide drawings, specifications, samples, performance data and other information as may be required to assist in determination of acceptability of the product.

G. Equipment Items

1. Submit manufacturer's certified data relative to equipment required for the installation of the electrical systems.
2. Submit adequate engineering data on each piece of equipment to allow a careful check of compliance with the technical requirements of the Contract Documents. Clearly indicate on submitted data the manufacturer's name, piece number, equipment capacity, and other applicable technical data.
3. Data and drawings for Electrical Systems:
   a. Disconnect Safety Switches
   b. Wiring Devices
   c. Panel boards
   d. Raceways and Fittings
   e. Switchboards
   f. Underground Conduit
   g. Telephone/Data Systems
   h. Wires and Cables
   i. Transient Voltage Surge Suppressor
   j. Electric metering components
   k. Lighting Fixtures and Controls
4. Shop Drawings: Submit 1/4-inch minimum scale coordinated Shop Drawings relating to the equipment, and foundations, and dimensioned locations of each, including accessories, and showing clearances for operating and servicing. Provide a detailed layout of electrical rooms.
   a. Major conductor routing
   b. Major electrical equipment.
5. Do not release for shipment, deliver, or install any equipment or material without the prior approval of the Architect-Engineer.

1.7 OPERATING AND MAINTENANCE MANUALS

A. Bind in loose-leaf binders with the words, "Operating and Maintenance Manual" and the Project identification imprinted on the cover. Prepare three complete sets of records for the Owner, with table of contents, index, and tabbed section dividers.

B. During the construction period, accumulate the following for inclusion in the Operating and Maintenance Manuals:

1. Copies of warranties and guarantees on each piece of equipment installed.
2. Fixture brochures.
3. Wiring and control diagrams.
4. Approved Shop Drawings.
5. Operating instructions for:
   a. Electrical Systems
   b. Fire Alarm System
   c. Lighting Control System
   d. Emergency Standby Generator
   e. Security Equipment
6. Recommended maintenance procedures.
7. Lists of major items of equipment with name, address, and telephone number of each local representative.

C. Submit the manuals for approval at approximately 75 percent job completion.

D. Each manual shall consist of:

1. Complete description of each item of equipment and apparatus furnished and installed including ratings, capacities, and characteristics.
2. Fully detailed parts list, including all numbered parts of each item of equipment and apparatus furnished and installed.
3. Manufacturer's printed instructions describing operation, servicing, maintenance and repair of each item of equipment and apparatus.
4. Typewritten record of all tests made of materials, equipment, and systems. All such records shall state the date tests were conducted, the names of all persons making and witnessing the tests, and citing any unusual conditions relevant to the tests.

1.8 DELIVERY, STORAGE, AND HANDLING

A. The Electrical Subcontractor shall provide for the delivery of all his materials and fixtures to the building site when required so as to carry on his work efficiently and to avoid delaying his work and that of other trades.

B. The Electrical Subcontractor shall, at all times, fully protect his work and materials from injury or loss by others. Any injury or loss, which may occur, shall be made good without expense to the Owner. The Electrical Subcontractor shall be responsible for the proper protection of all his materials until the Owner accepts the building.

1.9 GUARANTEE/WARRANTY

A. The Electrical Subcontractor shall and hereby does warrant that all work executed and all equipment furnished under this Section shall be free from defects of workmanship and materials for a period of one year from date of final acceptance of this work. The Electrical Subcontractor further agrees that he will, at his own expense, repair and replace all such defective work and all other work damaged thereby which becomes defective during the term of the Guarantee/Warranty.

1.10 RECORD DRAWINGS

A. Accumulate Record Drawings during the construction of the project. Keep one (1) set of Contract Drawings at the job site at all times, and mark changes, rerouting or modifications which occur, clearly on the Drawings with dimensions.

B. At completion of the job, obtain electronic drawings from the Architect and transfer the notations indicating changes to them. Reproducible drawings shall be submitted for review prior to final payment. Submit a complete set of reproducible drawings together with AutoCAD 2006 electronic drawings prior to final payment.

1.11 OWNER-FURNISHED, CONTRACTOR-INSTALLED EQUIPMENT

A. Install and make all necessary electrical connections to scheduled/designated Owner-furnished equipment. Scope and content will be defined by the Architect/Owner.

1.12 TEMPORARY LIGHT AND POWER

A. This Contractor shall furnish, install, maintain and remove at completion of work necessary temporary electrical distribution wiring.

B. Temporary light shall be based on 100W lamp for rooms up to 500 sq. ft. and two (2) 200W lamps for every 1000 sq. ft. or fraction thereof. All lamps shall be furnished and replaced by this Contractor. In tenant open area spaces, temporary lighting shall be provided with bird cage type temporary fixtures on a 25 ft grid.

C. Panel boards, switches, receptacles, poles, transformer, metering and accessories required for temporary light and power installation shall be provided.

D. Outlets shall be located at convenient points so that extension cords of not over fifty (50) feet will reach work requiring temporary light and power.

E. The General Contractor and Subcontractors, individually, shall furnish cords, sockets, motors and accessories for their work.

F. Temporary wiring, service equipment and accessories thereto installed, shall be removed at the expense of this Contractor after they have served their purpose.

G. The General Contractor is required to pay the cost of electricity consumed by himself and by his Subcontractors. This Contractor shall pay for replacement of lamps broken and/or removed from the premises during the construction period and until date of substantial completion as determined by Architect.

H. Temporary work shall be furnished and installed in conformance with OSHA, local codes and ordinances.

I. The Electrical Contractor shall install and maintain in each section of the building sufficient power for the requirements of the entire wing.

J. The Electrical Contractor shall supply power for the General Contractor's and Clerk of the Work's trailers.

K. Permanent power to lamps shall not be energized during construction (with the exception of testing) until accepted by the Architect and the Owner as being substantial completion of work.

L. As part of this Bid, this Contractor shall furnish to the Owner, at the end of the project, two (2) cases of each style of lamp being used on the project.

1.13 ELECTRIC SERVICES

A. The electrical contractor shall furnish and install the following:

1. Obtain new electric service from the electric company. Coordinate installation and pay all fees including costs for poles, etc.
2. Provide pre-cast concrete pad, raceways conduits, and grounding as required by the electric utility company. Provide the work in accordance with utility standards and specifications.
3. Provide meter sockets, conduits, cables, and terminations of the service entrance cables to the main switchboard.
4. Provide grounding system and terminations to main switchboard and ground bars inside buildings.
5. Test phase rotation and phasing.
6. New power to the building shall be provided as per the drawings. The Electrical Contractor shall actively pursue the utility company to confirm electrical services can be provided.

1.14 TELECOMMUNICATIONS SERVICE

A. The electrical contractor shall furnish and install the following:

1. Furnish all labor and incidentals required, including conduit, boxes, fittings, and pull boxes as shown on the Drawings and as specified.
2. Make all necessary arrangements with the Telephone Company for any participation that may be necessary and furnish all labor that may be required. Pay all charges the Telephone Company may have for their service.
3. Provide ¾" fire rated plywood backboard, finished black, size as shown on drawings (refer to Architectural drawings – backboard by General Contractor).
4. Provide underground empty conduit, pull string as required by the Telephone Company.
5. Provide a 6AWG installed grounding conductor as required by the Telephone Company.

1.15 MANUFACTURER'S SERVICES

A. The training program shall represent a comprehensive program covering all aspects of the operation and maintenance of each system.

B. All training schedules shall be coordinated with and at the convenience of the Owner. Shift training may be required to correspond to the Owner's working schedule.

1.16 TELECOMMUNICATIONS

A. RELATED DOCUMENTS

1. The General and/or Special Conditions Sections are a part of this specification and the Contractor shall consult them in detail for instructions pertaining to this work.

B. SCOPE

1. Furnishing of all labor, material, equipment, supplies, and services necessary to construct and install the complete communications systems as shown on the drawings and specified herein. Work shall include but is not necessarily limited to the following items:

a. Data

b. Telephone

C. JOB CONDITIONS

1. Site Inspections: Before submitting proposals, each bidder should visit the site and fully familiarize himself with all job conditions and shall be fully informed as to the extent of his work. No consideration will be given after bid opening date for alleged misunderstanding as to the requirements of work involved in connecting to the utilities, as to requirements of materials to be furnished, or as to the extent of demolition required.

2. Existing Conditions: All existing systems, and conditions shown on the plans as existing are approximate, and the Contractor shall verify all details of the project before any work is started.

3. Scheduled Interruptions: Planned interruptions of telephone/data/cable TV service, to any facility affected by this contract, shall be carefully coordinated and approved by the Architect at least ten (10) days in advance of the requested interruption. The Contractor shall not interrupt services until specific approval has been granted by the Architect. The request shall indicate services to be affected, date and time of interruption and duration of outage. Request for interruption of service will not be approved until all equipment and material required for the completion of that particular phase of work are on the job site. The work may have to be scheduled after normal working hours.

4. Maintaining Service: Any existing service (or operating system) which must be interrupted for any length of time shall be supplied with a temporary service as necessary for continuation of the normal operation of this facility.

D. CODES, PERMITS AND INSPECTIONS

1. Minimally, the following standards must be met when applicable to the work performed:

a. International Standards Organization/International Electrotechnical Commission (ISO/IEC) DIS 11801

b. Underwriters Laboratories (UL) Cable Certification and Follow up Program.

c. ANSI/TIA/EIA-568-B.1 -- Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements

d. ANSI/TIA/EIA-568-B.2-1 -- Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components

e. ANSI/TIA/EIA-568-B.3 -- Optical Fiber Cabling Components Standard

f. ANSI/TIA/EIA-569-A -- Commercial Building Standard for Telecommunications Pathways and Spaces

g. ANSI/TIA/EIA-606(A) -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

h. ANSI/TIA/EIA-607(A) -- Commercial Building Grounding and Bonding Requirements for Telecommunications

i. ANSI/TIA/EIA-526-7 -- Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant

j. ANSI/TIA/EIA-526-14A -- Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant

k. ANSI/TIA/EIA-758(A) -- Customer-Owned Outside Plant Telecommunications Cabling Standard

2. The installation shall comply with all local, state, and federal laws and ordinances applicable to communication equipment installation and with the regulations of the latest published edition of the National Electrical Code (N.E.C.) and the Federal Communications Commission (FCC) where such regulations do not conflict with those laws and ordinances. The Contractor shall obtain and pay for all permits and inspection fees, and after completion of the work, shall furnish the Architect a certificate of final inspection and compliance with the standards listed above as applicable. Any charges by a utility (Data, Telephone, Cable TV, etc.) for providing service as shown shall be included in the bid and paid by the Contractor.

E. DRAWINGS AND SPECIFICATIONS:

1. The drawings and these specifications are complimentary each to the other. What is called for by one shall be as binding as if called for by both. Where the drawings and/or specifications differ as to quantity or quality, the greater quantity or higher quality shall be provided. Omissions from the drawings and specifications of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such work. In any case of discrepancy in the figures or catalog numbers, the matter shall be submitted to the Architect, who shall promptly make a determination in writing. Any adjustment by the Contractor shall be at the Contractor's own risk and expense. Electrical drawings are diagrammatic only. Do not scale these drawings. All equipment shall be installed in accordance with manufacturer's recommendations and any conflicting data shall be verified before bidding.

F. STANDARDS OF MATERIALS AND WORKMANSHIP:

1. Materials: All materials shall be new and shall be listed and approved by the Underwriters' Laboratories, Inc., in every case where a standard has been established for a particular type of material in question. All work shall be executed in a workmanlike manner and shall present a neat appearance.

2. Prior Approvals: Equipment and materials of the same type or classification and used for the same purpose, shall be products of the same manufacturer. It is the intention of these specifications to indicate a standard of performance and quality for all materials incorporated in this work. Manufacturer's names and catalog numbers are used to designate the item of equipment or material as a means of establishing grade and quality. Where several manufacturers are named, only those named manufacturers' products will be considered and the Contractor's bid shall be on their products. The first named of several manufacturers is the manufacturer whose product was used in engineering the project. Other named manufacturers, although acceptable as manufacturers, shall guarantee that their product will perform as specified and will meet space requirements. Where performance characteristics of such equipment differs from the equipment scheduled on the drawings, the engineer shall reserve the right to reject it.

3. For approval of products other than those specified, bidders shall submit to the Architect, a request in writing, at least ten (10) days prior to bid date. Requests received after this time will not be reviewed or considered regardless of cause. Requests shall clearly define and describe the product for which approval is requested. Requests shall be accompanied by manufacturer's literature, specifications, drawings, cuts, performance data, model numbers, list of references or other information necessary to completely describe the item. Approval will be in the form of an Addendum to the specifications issued to all prospective Prime Contract Bidders on record. The Addendum will indicate the additional products which are approved for this project.
4. Substitutions: Reference to a particular product by manufacturer, trade name, or catalog number establishes the quality standards of material and equipment required for this installation and is not intended to exclude products equal in quality and similar design. The Architect reserves the sole right to decide the equality of materials proposed for use in lieu of these specified. It shall be the Contractor's responsibility to furnish the information and data sufficient to establish the quality and utility of the items in question, including furnishing samples if required.
5. Shop Drawings: The Contractor shall submit a list of items proposed for use. He shall also submit catalog data and shop drawings on proposed systems and their components, panelboards, safety switches, starters and contactors, transformers, lighting fixtures, and wiring devices. Where substitutions alter the design or space requirements, the Contractor shall defray all items of cost for the revised design and construction including costs to all allied trades involved. Data shall be submitted within ten (10) calendar days after the contract is awarded. Provide six (6) copies of shop drawings unless a greater number of copies is required by the General Conditions. Each submittal data section shall be covered with an index sheet listing Contractor, Sub-Contractor, Project Name, and an index to the enclosed submittals.
6. Each major section of submittals such as power, equipment, lighting equipment, fire alarm, etc., shall be secured in a booklet or stapled with a covering index which lists the following information:
   a. General contractor with phone number and project manager.
   b. Subcontractor with phone number and project manager.
   c. Supplier of equipment with phone number and person responsible for this project.
   d. Index of each item covered in submittal and model number as proposed in the attached.
   e. Any deviation from contract documents shall be specifically noted on submittal cover index and boldly on specific submittal sheet.
7. Operating and Maintenance Manuals: At completion of the work, furnish three (3) copies of written operation instructions which shall include manufacturer's descriptive bulletins, operating and maintenance manuals and parts lists of all equipment installed. Also include in such instructions, the specified size and capacity ratings of all equipment installed. Each set of instructions shall be assembled into a suitable loose-leaf type binder and presented to the Architect for delivery to the Owner.
8. Record Drawings: Maintain one extra set of black-line, white print drawings for use as Record drawings. Records shall be kept daily, using colored pencil. As the work is completed, relevant information shall be transferred to a reproducible set, and copies made to be given to the Architect.

G. INTERFACE WITH OTHER CONTRACTS

1. It shall be the responsibility of the Contractor to cooperate with all other crafts working on this project. All cutting, trenching, backfill, and structural removals to permit entry of the communications system components shall be done by this Contractor. All patching and finishing shall be done by the General Contractor.

H. GROUNDING

1. Provide grounding and bonding systems in strict accordance with the latest published edition of N.E.C., except where more stringent requirements are specified herein. Inter-connection of neutral and ground is not permitted at any point in the communications system. Install grounding conductors to permit shortest and most direct path to ground. Inaccessible joints are not to be made in grounding conductors. Where grounding conductors are in raceway, bond conductor and raceway at both ends. Grounding and bonding fittings used shall be UL listed and be compatible with metals used in system. Sheet metal type straps are not acceptable.
2. The Contractor shall test and provide written certification of final ground system; including test method, equipment model and serial numbers, and final measurements at each point. The ground electrode system must be less than 25 ohms.

I. GUARANTEE AND SERVICE

1. Upon completion of all tests and acceptance, the Contractor shall furnish the Owner of a written guarantee covering the electrical work done for a period of one (1) year from date of acceptance. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Upon notice from the Architect or the Owner, the Contractor shall, during the guarantee period, rectify and replace any defective material or workmanship and repair any damage caused thereby without additional cost.

PART 2 - PRODUCTS

2.1 GENERAL PROVISIONS FOR ELECTRICAL WORK

A. SUMMARY

1. The Specifications for accompanying drawings are intended to secure the provision of all material and labor necessary for complete electrical installation tested and ready for service, and as called for herein and as indicated on the drawings. Each system shall be complete and shall include all the necessary appurtenances and minor auxiliaries required to make it functional and complete in every respect.
2. All materials shall be new and shall conform to the standard of the Underwriters Laboratories, Inc. Materials shall be fabricated in accordance with the specifications and approved rules and regulations of NEMA and shall be UL listed and labeled. Materials and apparatus for like services shall be by the same manufacturer.
3. Provide a complete electrical system as described herein and / or as shown on the drawings.

B. CODES AND PERMITS

1. The requirements of the National Electrical Code, the rules and regulations of state and municipal authorities having jurisdiction, the construction requirements of NEMA, NFPA, ANSI, OSHA and BOCA shall be observed and shall govern all materials furnished and installation methods applied.
2. The Contractor of electrical work shall at his expense, obtain all necessary permits and certificates, pay all fees and charges connected with his work in compliance with the codes, applicable laws and municipal regulations, and shall deliver these to the Owner/Engineer before final acceptance of his work.

C. SITE VISIT

1. Bidders, before submitting proposals, shall visit and carefully examine the site affected by this work to familiarize themselves with existing conditions and with the difficulties that may attend the execution of this work. Bidders shall also consider the eventuality of having to perform certain tasks on premium time, outside of normal working hours. Submission of a proposal with appropriate references to potential scheduling concerns will be construed as evidence that such an examination has been made and proper consideration given. Later claims for more labor, equipment or materials, required because of difficulties encountered, will not be recognized.

2. The Contractor for the electrical work shall also examine the general construction and mechanical/plumbing plans and specifications, insofar as labor and materials and type of construction, etc., may affect the electrical examination has been made. No later claims for extra work resulting from failure to do so will be recognized.

D. CUTTING AND PATCHING

1. The Contractor shall seal all conduit/cable penetrations through fire rated walls with approved, UL listed fire sealant to match the required fire ratings.

2. Where required by drawings, the Electrical Contractor shall repair or replace paved areas disturbed by the installation of underground conduits and / or cables. Patched or re-paved areas shall be completed using appropriate and suitable materials and methods to effect a permanent repair.

E. CLEANING AND ADJUSTMENTS

1. Upon completion of work, contractor shall clean and lubricate fans, motors, and other running equipment and apparatus, which he has installed and make certain such apparatus and equipment are in proper working order and ready for tests.

2. Scratched or damaged painting shall be touched up with appropriate materials and methods as necessary to return the painting to a new condition and appearance.

F. ACCEPTANCE

1. Seven (7) days prior to date of requested Final Inspection, Contractor shall:

   a. After the completion of the work, the electrical contractor shall test and demonstrate to the satisfaction and approval of the Owner, Engineer or their representatives all systems in perfect working order, using instruments or by actual operation of the system.

   b. Furnish engineer required maintenance manual, parts list, operating instructions, wiring diagrams, and electric control diagram.

G. RACEWAYS AND CONDUCTORS

1. Electrical metallic tubing shall be thin wall steel pipe, minimum size 1/2”, and may be used in hung ceilings, dry hollow partitions, hollow block walls, and exposed in dry locations. Fitting shall consist of compression or set screw type of connectors.

2. Underground rigid nonmetallic conduit shall be NEMA TC2, Schedule 40 PVC with NEMA TC3 fittings.

3. Flexible steel conduit shall be galvanized, minimum ¾”, and may be used for final connections to motors and recessed fixtures in dry locations.

4. Liquid tight, flexible conduit shall be zinc coated with PVC jacket. It shall be used for final connections to motors.

5. Conductors shall be 600 V Type THW, THWN, or THHN, color coded, minimum size #12 AWG.
6. All raceways shall be concealed in walls, floors or ceiling. All indoor conduit shall be EMT unless otherwise approved. MC Cable is not acceptable unless prior approved for use in certain areas by the architect.
7. All conductors shall be copper.
8. Branch circuits more than 100 feet long shall be #10 AWG for the entire length, up to the first outlet or junction box.
9. Exposed conduit shall be painted prior to installation to match the background color.

H. OUTLET BOXES

1. Pressed steel, galvanized, code gauge, and shall be used for wiring devices in concealed work.

I. WIRING DEVICES

1. Receptacles shall have configuration in accordance with NEMA standards, for voltage and current rating as required by capacity of equipment served and corresponding branch circuit protection. As a minimum, receptacles shall be of the grounded type, 20A, 125V AC, Pass & Seymour or approved equal.
2. Ground Fault receptacles, if required, shall be minimum of 20A, 125V in conformance with NEMA WD-1.10 standard.
3. Exposed pull boxes shall be of proper size and type to satisfy the specific application.
4. Safety switches, heavy duty type with or without fuses, size and NEMA enclosure type as shown on drawings.

J. GROUNDING

1. Equipment ground shall consist of grounding all metallic non-current carrying components of electrical system (conduit system, cabinets, frames of motors, panelboards, etc.). Metallic raceways shall effectively and permanently maintain continuity of ground between equipment. Grounding source for equipment ground shall be the same as for the service ground. Mechanical equipment, machinery, etc., shall also be effectively grounded. Equipment grounding conductors shall be run in all raceways.

K. EXECUTION OF WORK

1. Install all materials and equipment in a neat and workmanlike manner and provide for the following:
   a. All work shall be installed so as to be readily accessible for operation, maintenance and repair. Minor deviations from the plans may be made to accomplish this, subject to the approval of the Engineer.
   b. The area of work shall be kept free of litter and debris. Contractor shall clean up the work area at the end of each working day. All scrap material and other waste shall be removed from the site by the contractor.
   c. Electrical contractor shall coordinate the electrical work with other trades, including but not limited to all construction documents, shop drawings, etc. for all structural and mechanical work. Electrical contractor shall secure shop drawing from other contractors and verify exact electrical

characteristics of equipment to be wired. This is done before electrical contractor rough-in for subject equipment. If discrepancies are noted between the electrical contract drawings and the other contractor shop drawings, electrical contractor is to notify Engineer at once. Failure by the electrical contractor to perform this duty will not relieve him of the responsibility to correct wiring deficiencies at his expense.

d. Drawings are diagrammatic, small scale and indicate the general arrangement of systems and work included. Electrical Contractor shall apply for detailed information regarding the location of all equipment before rough-in as the final location may differ from that shown on drawings. Outlets, etc., improperly placed because of failure to obtain this information shall be relocated and installed without additional expense. Certain raceways, bends, fittings, boxes, system components, appurtenances and related specialties are not shown, but shall be provided. Do not scale drawings.

e. All electrical work required for identical items shown on the drawings shall be provided although each specific identical item may not be shown.

f. All circuits shall be clearly identified at panelboards with printed circuit schedules. All other electrical equipment shall be labeled with white engraved with black lettering laminated nameplates.

2.2 ELECTRICAL GENERAL REQUIREMENTS

A. SCOPE OF WORK

1. Coordinate all work in this Section with related trades.
2. Furnish all materials, equipment, supplies, transportation and labor, and perform all operations necessary in the installation of all electrical work, complete and in operating condition.
3. Examine the drawings and specifications and determine work to be performed by the electrical and other trades. Provide the type and quantity of electrical materials and equipment necessary to complete this work and place all systems in proper operation, tested and ready for use.
4. Work Included: In general, the electrical work shall consist of, but not be limited to, the following:
   a. Incidental items not indicated on the drawings nor mentioned in the specifications that belong to the work described or are required to provide a complete system as though called out here in every detail.
   b. Acquire all permits and pay all fees as may be necessary to perform the specified work.
5. Work Related to the Mechanical Trade, shall be included under the Electrical Section of the Work. Coordinate work with the Mechanical Contractor.
6. The requirements of authorities shall be the minimum acceptable requirements for the work and nothing described in these specifications or indicated on the drawings shall be construed to permit work not conforming to the most stringent of the applicable codes and regulations.
7. When drawings or specifications call for materials or construction of better quality or larger size than required by codes, laws, rules and regulations, the drawings and specifications shall take precedence.
8. Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify

the Architect immediately and cease work on all parts of the Contract which are affected until approval for any required modifications to the construction has been obtained from the Architect.

B. WORK RESPONSIBILITIES

1. Examine the site and all electrical, architectural and other drawings and accept such conditions and make allowance for them in preparing the bid. No extra charges will be considered for costs resulting from failure to comply with the above.

2. The drawings indicate diagrammatically the desired locations or arrangements of conduit runs, outlets, equipment, etc. and are to be followed as closely as possible. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions. The contractor is responsible for the correct placing of his work and the proper location and connection of his work in relation to the work of other trades.

3. Locations shown on architectural and ceiling plans and/or wall elevations shall take precedence over electrical plan locations, but where a major conflict is evident, notify the Architect for instructions prior to commencing work on the same.

4. In the event changes in the indicated locations or arrangements are necessary due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without extra costs, providing the change is ordered before the conduit runs, etc. and the work directly connected to same is installed and no extra materials are required.

5. All scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any work, carefully check and verify all dimensions, sizes, etc. with the drawings to see that the equipment will fit into the spaces provided without violation of applicable codes.

6. Where equipment is furnished by others, verify voltage characteristics and dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

7. Should any changes to the work indicated on the drawings or described in the specifications be necessary in order to comply with the above requirements, notify the Architect immediately and cease work on all parts of the Contract which are affected until approval for any required modifications to the construction has been obtained from the Architect.

8. Perform all work competent and skilled personnel.

9. All work shall be of the highest quality consistent with the best practices of the trade.

10. Replace of repair, without additional compensation, any work which, in the opinion of the Architect, does not comply with these requirements.

11. The Electrical Contractor shall be responsible for the safety and good condition of all materials and equipment until final acceptance by the Owner; for providing adequate and proper storage facilities during the progress of the work; for replacing all damaged and defective work before applying for final acceptance; for erecting and maintaining suitable barriers, protective devices, light and warning signs for the protection of the public and employees; and for all loss, damage or injury to persons or property resulting from any neglect of these responsibilities.

12. The Contractor shall be responsible for all faults and deficiencies in his work during the guarantee period and shall repair, at no cost to the Owner, all such deficiencies

that occur immediately upon notification by the Owner. All damage to other work there from, which may occur during the construction and guarantee period, shall be repaired at once, at no cost to the Owner.

C. INTERPRETATION

1. All requests for interpretation of plans and specifications must be made by the Contractor through the Architect. Any such requests made by equipment manufacturer or suppliers will be referred to the Contractor.

D. SELECTION OF MATERIALS AND EQUIPMENT

1. Specified materials and equipment shall be selected within the operating ranges indicated for efficiency, capacities, noise levels, and projected life. In the absence of specific criteria, conservative commercial practice, in the opinion of the Architect, will apply.
2. Items of a similar application shall be of the same manufacturer.
3. The label of listing by Underwriters Laboratories, Inc. shall appear on all materials and equipment for which standards have been established by that agency.
4. Where local or other authorities have jurisdiction, have established label or approval requirements, furnish all materials and equipment with either the required labels affixed, or the necessary written approval.
5. The equipment plans are designed around standard products of one or more of the manufacturer's listed as being acceptable for the product involved. Where one or more manufacturer is listed as being acceptable for a product, each manufacturer listed for that product shall be considered as "equal" and acceptable.
6. All materials to be free of asbestos and urea formaldehyde.

2.3 BASIC ELECTRICAL MATERIALS AND METHODS

A. SUMMARY

1. This Section includes the following:
   a. Raceways
   b. Building wire and connectors
   c. Supporting devices for electrical components
   d. Electrical identification
   e. Electricity-metering components
   f. Concrete equipment bases
   g. Cutting and patching for electrical construction
   h. Touchup painting

B. DEFINITIONS

1. EMT: Electrical metallic tubing
2. FMC: Flexible metal conduit
3. IMC: Intermediate metal conduit
4. LFMC: Liquid tight flexible metal conduit
5. RNC: Rigid non-metallic conduit

C. COORDINATION

1. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
    a. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
2. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the work. Coordinate installing large equipment requiring positioning before closing in the building.
3. Coordinate electrical service connections to components furnished by utility companies.
    a. Coordinate installation and connection of exterior underground and overhead utilities and services, including provisions for electricity metering components.
    b. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
4. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Section "Access Doors."
5. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
6. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.
7. Where exposed, conduits shall be run parallel and perpendicular to beams and joists in the most inconspicuous manner possible.

D. RACEWAYS

1. EMT: ANSI C80.3, zinc-coated steel, with set-screw or compression fittings.
2. FMC: Zinc-coated steel
3. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings
4. LFMC: Zinc-coated steel with sunlight resistant and mineral-oil-resistant plastic jacket
5. RNC: NEMA TC2, Schedule 40 PVC, with NEMA TC3 fittings
6. Raceway Fittings: Specifically designed for the raceway type with which used.

E. CONDUCTORS

1. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.
2. Conductors, Larger Than No. AWG: Stranded copper.
3. Insulation: Thermoplastic, rated at 75 deg C minimum.
4. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

F. SUPPORTING DEVICES

1. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
3. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.
4. Slotted-Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.
   a. Channel Thickness: Selected to suit structural loading.
   b. Fittings and Accessories: Products of the same manufacturer as channel supports.
5. Non-metallic Channel and Angle Systems: Structural grade, factory formed, glass fiber resin channels and angles with 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least one surface.
   a. Fittings and Accessories: Products of the same manufacturer as channels and angles.
   b. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel. I
6. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or click type hangers.
7. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
8. Cable Supports for Vertical Conduit: Factory fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot-dip galvanized finish.
9. Expansion Anchors: Carbon steel wedge or sleeve type.
10. Toggle Bolts: All steel springhead type.
11. Power Driven Threaded Studs: Heat treated steel.

G. ELECTRICAL IDENTIFICATION

1. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A 13.1, NFPA 70, and these Specifications.
2. Raceway and Cable Labels: Comply with ANSI Al 3.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
   a. Type: Preprinted, flexible, self adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
   b. Color: Black letters on orange background.
   c. Legend: Indicates voltage.
3. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
4. Underground Warning Tape: Permanent, bright colored, continuous printed, vinyl tape with the following features;
   a. NOT less man 6 inches wide by 4 mils thick.
   b. Compounded for permanent direct burial service.

c. Embedded continuous metallic strip or core.

d. Printed legend that indicates type of underground line.

5. Tape Markers for Wire: Vinyl or vinyl cloth, self-adhesive, wraparound type with preprinted numbers and letters.

6. Color Coding Cable Ties: Type 6/6 nylon, self locking type. Colors to suit coding scheme.

7. Engraved Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.

8. Fasteners for Nameplates and Signs: Self tapping, stainless steel screws or No. 10/32 stainless steel machine screws with nuts and flat and lock washers.

H. EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

1. Current-Transformer Cabinets: Comply with requirements of electrical power utility company. These shall be included in the bid price.

2. Meter Sockets: Comply with requirements of electrical power utility company.

I. TOUCHUP PAINT

1. For Equipment: Equipment manufacturer’s paint selected to match installed equipment finish.

2. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

2.4 ACCEPTABLE MANUFACTURERS

A. Manufacturer's names and catalog numbers are scheduled or specified for the purpose of establishing standard of design, quality, appearance, performance and serviceability, and not to limit competition. Scheduled products (as may be modified by detailed specifications) are those selected as the basis for system design with respect to physical size and space arrangements, required capacity and performance characteristics, and the product quality intended.

B. The Drawings indicate scheduled products physically arranged in the spaces, based on catalog data of specific manufacturers.

C. Listed "Acceptable Manufacturers" are those considered capable of manufacturing products conforming to detailed specifications, and as such, are invited to compete on an equal basis provided the offering is comparable in every respect to scheduled or specified products and actually conforms to the detailed specifications and schedule requirements. Listing herein as "acceptable manufacturers" does not imply "accepted", "approved", "prior approval", or any other such connotation. All product offerings must be submitted for approval after Contract award.

D. Vendors are invited to submit material or equipment bids to bidding contractors on any comparable equivalent product, whether or not the manufacturer of such product is listed herein as an "acceptable manufacturer". Such product bids should clearly indicate offerings that are not listed as "acceptable manufacturers". In the event a bidding contractor, after satisfying himself that such unlisted product is in fact "equal" to the specified product with respect to design, quality, performance and arrangement (space requirements), and the Contractor desires to furnish that product on the Project, he may request the name of the manufacturer be added to the list of acceptable manufacturers as an 'Alternate'.

E. At a bidder's request, an unnamed manufacturer's equipment will be considered to determine additional "acceptable manufacturers" if a request is made in writing no later than six (6) days prior to the bid opening. If such requests are found acceptable, an addendum will be written listing additional acceptable manufacturers. Consideration will be given only to requests of bonafide bidders (contractors), not to those received from vendors.

F. Manufacturers of materials and equipment shall be as specified, scheduled, or as listed in each respective product Specification Article.

2.5 SIGNAGE AND IDENTIFICATION EQUIPMENT

A. Identify electrical equipment with nameplate bearing equipment name and number, using bevel edges, 1/16-inch thick, 1-1/2-inch black laminated bakelite with engraved white letters, 1/2-inch (double line) or 7/8-inch (single line) high, permanently mounted on the equipment in a conspicuous place with screws. Cardholders with card identification will not be accepted.

B. Underground Warning Tapes For Buried Lines-

1. Provide 3-inch wide metallic core brightly colored polyethylene detection tape, shallow buried in the trench above non-metallic conduits, serving the dual purpose of line location and identification. The tape shall be easily detected by any commonly used metal detector and shall bear a printed message (continuous along entire length) describing the contents of the line beneath.

2. Provide 6-inch wide brightly colored polyethylene tape, shallow buried in the trench above metallic conduits, to identify the contents of the line beneath. The tape shall bear a printed message (continuous along entire length) describing the type of the buried line and its contents.

C. Panel boards/Switchboards - Provide nameplates to identify each section as specified for electrical equipment. Type identification cards/panel directory for insertion in cardholder pockets in each lighting and appliance panel board.

D. Miscellaneous:

1. Provide nameplates to identify motor starters, automatic transfer switches, breakers, disconnect switches, time clocks, transformers, and miscellaneous electrical equipment as to systems or mechanical equipment served, source or specific function as appropriate.

E. Nameplates and tags shall correspond to the Record Drawings.

F. Submit complete details of identification legends, color fields, and sizes, coordinated between trades.

G. Provide special signage on breakers and main service equipment as required by the authority having jurisdiction and as shown on the Drawings.

2.6 SLEEVES, INSERTS, ANCHORS AND SUPPORTS

A. Provide in concrete, carpentry or masonry construction, hangers, sleeves, expansion bolts, inserts, supporting steel, or other fixtures necessary for the support of equipment and devices furnished under each Section of the Specifications.

B. Except as otherwise indicated or specified, each conduit, passing through walls, floors, ceilings or partitions shall be provided with sleeves having internal diameters approximately 1-inch larger than the outside diameter of conduit.

C. Sleeves through interior partitions and floors shall be no less than 22 gage-galvanized steel, set flush with the finished surfaces.

D. Sleeves through pre-cast or post-tensioned structures shall be no less than Schedule 40 galvanized steel pipe and shall be subject to the acceptance of the designer of the structure. Submit size, location, and sleeve material for Structural Engineer review and acceptance.

E. Sleeves through grade slabs, basement or exterior wall shall be steel or cast iron conduit with water stop flange, set flush with finished surfaces, and with the space between the pipe and the sleeves packed with oakum or jute twine and caulked watertight.

F. Sleeves in wet or potentially wet floors or spaces such as equipment rooms or sprinkled areas shall be Schedule 40 galvanized steel pipe with water stop flange and with the top of the sleeve projecting 2-inches above the finished floor, with annular space packed with oakum or jute twine and caulked watertight.

G. Option - Provide link-seal neoprene closure fittings in lieu of packing.

H. Attachments to structure shall be by means of beam clamps wherever practicable. Unavoidable attachments to concrete structure shall be by means of pre-set concrete inserts whenever the need for such attachment can be reasonably foreseen and the locations and sizes of inserts is known prior to pouring of concrete. In instances where it is necessary to make attachments to concrete and proper inserts have not been pre-set, the attachment shall be made by means of drilled holes and expansion anchors of either the bolt stud or flush variety. Design working stress of attachments shall be limited to 25 percent of the average maximum (ultimate) stress values published by the manufacturer.

I. Inserts shall be cast iron or galvanized steel individual type, with accommodations for removable nuts and threaded rods up to 3/4-inch diameter, and permitting lateral adjustment.

J. Fasteners in concrete beams shal l be sufficiently above the bottom of the beam to clear reinforcing.

K. Expansion anchors shall be zinc and chromate plated for corrosion protection and conform to the dimensional requirements of Federal Specification FF-S-325. Expansion anchors shall be selected and installed in accordance with the recommendations of Expansion Anchor Manufacturer's Institute (EAMI) and the manufacturer's instructions.

2.7 WATERPROOFING

A. Seal penetrations of wet or potentially wet structures, floors, exterior walls, etc., other than those requiring fire stopping, with sealant to prevent moisture leakage. Apply sealing material (caulking) in accordance with manufacturer's published instructions.

B. Product Research and Chemical Co. "Poly-Sulphide Sealant" PRC-5000.

2.8 AUXILIARY STRUCTURAL SUPPORTS

A. Provide auxiliary structural supports as necessary to support electrical systems from the building structure indicated on the structural drawings. Supporting members shall be metal strut framing or standard structural shapes, designed to support imposed loads with a working stress no greater than 25 percent of ultimate stress values of the members, and articulation with the building structure without exceeding structural limitations at the point of attachment to the building structure. Prepare calculations and Shop Drawings of each such support and submit for approval.

2.9 WIRE AND CABLE

A. General:

1. Wire and cable for feeder and branch circuits shall conform to the requirements of the current edition of the National Electrical Code, and shall meet applicable ASTM specifications. Conductors shall be soft drawn, annealed, 98 percent conductivity copper. Wire and cable shall be new, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on the outer covering at regular intervals. Conductors No. 8 AWG and smaller shall be color-coded #6 and larger to be marked with phasing tape. Colors for each phase and neutral shall be consistent throughout the system.

B. 600 volt insulation:

1. Provide conductors with insulation rated for 600 volts unless specified or indicated otherwise. System design is based on the following U.S. products:
2. NEC Type THW, XHHW, THWN or THHN solid or stranded for Number 12 AWG or smaller.
3. NEC Type THW, XHHW, THWN or THHN stranded for Number 10 and larger.
4. Plenum Cable: Provide UL listed cables, complying with the requirements of the National Electrical Code, insulated with a UL classified fluoro-polymer material for all cable applications within plenums unless enclosed in conduit. Any cables not enclosed in conduits in such plenums shall have insulation classified as low smoke producing and very low flame spread, such as Teflon FEP or Halon ECTFE, and is UL listed for the specific application.
5. Type MTW for battery and DC power circuits.

C. Acceptable Manufacturers: for Wire and Cable: Essex, Okonite, and Southwire.

D. Acceptable Manufacturers for Connectors: Appleton, Blackburn, Bridgeport, Buchanan, Burndy, Ideal, Killark, 3M, O.Z., Penn Union, Thomas & Betts.

2.10 RACEWAYS

A. Metallic conduit and ANSI C80.4 fittings shall be incorporated into the Electrical Work in accordance with the applicable articles of the National Electrical Code.

B. GRC - Galvanized rigid conduit, threaded and coupled steel, ANSI C80.1, UL-6, protected by an overall zinc coating to the inside and outside surfaces of the metal. Coating may be applied by the hot-dip metalizing or sherardizing process.

C. IMC - Intermediate metal conduit, threaded and coupled steel, manufactured in accordance with UL 1242, hot-dip galvanized, installed in accordance with UL general information card DYBY and NEC Article 345, with threaded joints.

D. EMT - Electrical metallic tubing, 'thin wall" zinc coated steel, enameled interior, ANSI C80.3, UL-797, assembled using concrete tight and rain tight cast gland-ring compression threaded insulated throat type fittings for sizes 1-1/4' and smaller. Sizes 1-1/2" and larger can be setscrew type with insulated throat.

E. ENT – Electrical non-metallic tubing.

F. Flex - Flexible steel, UL-1, conduit shall be constructed from interlocking single strip flexible steel tubing, galvanized or sherardized. Connectors shall be galvanized, malleable iron squeeze type, or Tomic twist-in type.

G. Liquid-tight flexible metallic raceway shall be similar to standard flexible steel conduit except encased in liquid tight neoprene outer jacket.

H. PVC - Polyvinyl chloride Schedule 40, NEMA TC2, UL 651, with solvent welded joints.

I. SMR - Surface Metal Raceway - An assembly consisting of base and cover sections, fittings and boxes, constructed of corrosion resistant coated steel with an interior finish to avoid abrasion of electrical conductors, conforming to UL No. 5-1977 and F.S. W-C-582.

J. Acceptable Manufacturers - Walker & Wire mold.

K. Application:

1. Provide electrical metallic tubing (EMT) within structure, except as specified otherwise.
2. EMT connectors - Provide gland ring compression threaded fittings for 1/2" thru 1-1/4". Sizes 1-1/2" and larger shall be setscrew type.
3. Rigid steel conduit (GRC) shall be used in the following locations (except where indicated otherwise):
   a. High voltage raceway.
   b. At or below grade.
   c. In locations where electrical metallic tubing is not permitted and other raceway is not required.
   d. In or beneath slabs on grade.
   e. Hazardous areas as defined by NEC.
   f. Where exposed to physical damage, excessive moisture, rain, etc.
4. Intermediate metal conduit (IMC) may be substituted for GRC for sizes 4-inches and smaller if approved by code authority.
5. PVC may be used:
   a. In or beneath slabs on grade.
   b. In concrete duct banks provide there is 2” spacing with 3" overall coverage.
6. Provide flexible conduit for transformer connections, and at equipment requiring adjustments or removal for service, not subject to moisture.

7. Provide liquid-tight flexible conduit for each motor and rotating device for power and control, computer room and for other equipment requiring adjustments or removal for service in mechanical rooms or where subject to moisture or weather.
8. Non-metallic conduit (and grounding conductor) with rigid steel riser stub-ups may be used for slabs on grade.
9. Conduit and fittings shall be UL listed for the application and location of their intended uses.

L. Acceptable Manufacturers for GRC, IMC, and EMT: Allied, and Triangle & Wheatland.

M. Acceptable Manufacturers for GRC, IMC, and EMT Fittings: AFC, Appleton, Bridgeport, Midwest, Neer, O.Z. Gedney, Raco, and Steel City.

N. Acceptable Manufacturers for flex and liquid-tight flex: American Flex, Alflex, Anaconda, Coleman, Electric-Flex, and International.

O. Acceptable Manufacturers for flex and liquid-tight flex fittings: Appleton, Bridgeport, Berger, Efcor, Electro line, Midwest, Neer, O.Z. Gedney, Raco, and Steel City.

P. Acceptable Manufacturers for PVC and PVC fittings: Cantex, Carlon Certain teed, National, Sedco, and Midwest.

2.11 HANGERS AND SUPPORTS

A. All free standing equipment shall be braced and anchored to the floor. Secure equipment using stainless steel anchor bolts in accordance with the manufacturer’s instructions..

B. Conduits: Support securely from the structure with rigid steel supports. Provide necessary channels, hanger rods, bolts, nuts, locknuts, accessories and devices to provide a complete structural system. The system shall allow free expansion and contraction.

C. Panel boards, disconnects, starters, cabinets, pull and junction boxes, etc. Provide channel supports and miscellaneous steel angles to rigidly support equipment from the structure where required by special conditions and where vertical and/or horizontal support is required other than that provided in the structure.

D. Structural support systems shall be specifically designated as suitable for electrical installations. Bases, dimensions and sizes are to be as required for application, job conditions, loads imposed and manufacturer's recommendations.

E. Channels: Provide continuous slotted channel, #12 gage steel (minimum). Fasten conduits to channels with pipe channel straps.

F. Hanger Rods: Provide steel rods with continuous, free running threads.

G. Straps, Pipe and Conduit Hangers, Inserts, Clamps, Accessories and Devices Provide malleable iron or formed steel, as applicable.

H. Flexible cable, strap or wire hangers and fasteners will not be accepted.

I. Steel and malleable iron shall be zinc chromate electro galvanized.

J. Attachments to Structure - Fastenings to wood shall be by wood screws or screw type nails. Fastenings to hollow masonry units shall be by toggle bolts. Fastenings to concrete or brick shall be by preset inserts or expansion bolts. Fastenings to steel shall be by machine screws, bolts (with flat washers and lock washers), and welded threaded studs or beam clamps designed for the application. Wood plugs and gun fired power driven fasteners will not be accepted.

K. Fasten single runs of conduit directly to the structure or hang on rod hangers with one or two hole pipe straps, "U" bolts, lay-in pipe hangers, conduit and pipe hangers, beam clamps and angle clamps as appropriate.

L. Fasten multiple runs of conduit directly to the structure using continuous channel inserts or continuous surface channels. Trapeze hangers utilizing channels and rod hangers may also be used.

M. Conduit shall be securely fastened within three feet of each outlet or junction box, fitting, cabinet or panel board. Conduit shall be fastened at intervals not to exceed ten (10) feet.

N. Provide riser clamps at floor lines for vertical runs of conduit.

O. Conduits and Raceways with Expansion Joints: Install supports to allow equally distributed expansion and contraction. Use guides, saddles, "U" bolts and/or anchors designated for this application.

P. Cables and Wires in Manholes, Cable Chambers, Cable Chases and Other Locations: Provide hangers, racks, cable cleats and supports designated for the application to insure a neat and secure installation.

Q. Structural support systems, channels, hanger rods, bolts, nuts and accessory items shall be as manufactured by Uni strut or approved equal.

R. All supports shall be directly connected to basic structural elements of the building or site work. Electrical support systems shall be independent of other systems (HVAC, plumbing, suspended ceilings, raised floors, etc.). Support systems may be shared with similar wire way and conduit systems (fire alarm, security, MATV, etc.).

S. Provide seismic supports and bracing for emergency power system and life safety equipment and raceways requiring seismic supports.

2.12 FUSES

A. SUMMARY

1. This Section includes the following:

a. Fuses

B. QUALITY ASSURANCE

1. Source Limitations: Obtain fuses from one source and by a single manufacturer.
2. Comply with NFPA 70 for components and installation.
3. Listing and Labeling: Provide fuses specified in this Section that are listed and labeled.

a. The Terms “Listed” and “Labeled”: As defined in the National Electrical Code, Article 100.

C. EXTRA MATERIALS

1. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

   a. Spare Fuses: Furnish quantity equal to 20 percent of each fuse type and size installed, but not less than 1 set of 3 of each type and size.

D. MANUFACTURERS

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fuses that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:

   a. Cooper Industries Inc.; Bussmann Div.

   b. Eagle Electric Mfg. Co., Inc.

   c. General Electric Co.; Wiring Devices Div.

   d. Gould Shawmut.

2.13 GROUNDING AND BONDING

A. Rods: Ten (10) feet long, 3/4-inch diameter copper weld rods or as indicated on the drawings.

B. Conductor: Sized no smaller than the following:

1. The size noted on the drawings or otherwise scheduled.

2. The size of the phase conductors in the feeder or branch circuit.

3. The sizes required by Article 250 of the National Electrical Code.

C. Compression Grounding Connectors: Provide Hyground compression system as manufactured by Burndy. Each connector shall have the die index number embossed on application.

D. Grounding connectors shall meet the test requirements of IEEE Standard 837-2002 and shall be exothermic type.

E. All ground conductors shall be copper, and unless specifically noted otherwise, shall be provided with Type THW or THWN, 600-volt insulation.

F. All ground electrode conductors shall be bare copper, sized in accordance with Article 250 of the National Electric Code.

G. Ground busses required for the interconnection of grounding conductors shall be solid copper bars, rigidly supported by metal framework and insulated from the building structure.

H. Conductors shall be supported independently and rigidly attached to the building structure. Attach conductors to the buss with compression type lugs.

2.14 WIREWAYS, PULL AND JUNCTION BOXES

A. Provide wire way, junction and pull boxes indicated and at locations required by the National Electrical Code, and at those locations required to facilitate the pulling of wire, fabricated in accordance with NEMA and National Electrical Code requirements with respect to material, gages, dimensions and methods of fastening. Wire way, junction and pull boxes shall bear the UL label and shall be listed for the application and location of their intended use. Units shall be finished in standard gray enamel, sides and backs spot welded in position, and removable screw cover.

B. Construct wire way and accessories in accordance with UL 870, with hinged, removable, sealable covers, arranged for lay-in conductor installation. Connectors shall be slip-in arrangement with captive mounting screws. Arrange hangers in a "J" configuration to allow conductor lay-in from one side.

C. Interior boxes shall be stamped or fabricated galvanized steel.

D. Exterior boxes not totally protected from exposure to driving rain or from excessive moisture shall be PVC or hot-dip galvanized cast iron, complete with threaded hubs, bolted weatherproof covers, and rubber or neoprene gaskets.

E. Grade level exterior boxes shall be PVC or cast iron with solid covers secured with rubber gaskets and bronze cap screws. Conduit connections shall be drilled and tapped for threaded

F. Construct exterior concrete boxes as detailed with solid cast iron covers secured with rubber gaskets and bronze cap screws.

G. Conduits entering boxes shall be through tight-fitting bored or punched holes, or threaded hubs, and shall be secured firmly.

H. Covers in finished areas shall have prime coat.

I. The volume of the boxes shall be in accordance with the NEC requirements, but shall be no smaller than four (4) inches square in any case.

J. Boxes shall be accessible at job completion. Boxes with covers in finished areas shall be in those physical locations approved by the Architect.

K. Acceptable Manufacturers: Carlon, Circle AW, Hoffman, and Neenah.

2.15 OUTLET BOXES AND ACCESSORIES

A. Interior boxes: Standard, single or multiple gang stamped galvanized steel boxes, of the proper size to accommodate the device and function for which intended, complete with extension or plaster rings where required. Boxes for mounting of surface lighting fixtures shall be 4-inch octagon boxes, with 3/8-inch no-bolt fixture studs used to securely support fixture. Provide proper covers or device plates.

B. Exterior boxes: Hot-dip galvanized cast iron, complete with threaded hubs, bolted weatherproof covers, and rubber or neoprene gaskets.

C. Concrete boxes: Outlet boxes in concrete slabs shall be two-piece concrete boxes not less than 4-inch nominal size with a minimum depth of 2-1/2-inches. If used for lighting fixtures, outlet boxes shall be equipped with fixture stud.

D. Waterproof boxes: Conduit boxes of cast or metal threaded hub type with suitable gasket covers shall be used where waterproof boxes are required.

E. Flush type floor boxes: Fully adjustable (before and after concrete pour), cast iron for slabs on grade, stamped steel for slabs above grade, with surface flush ring finish to match wiring devices and coverlets specified, with waterproof threaded outlets, sized and arranged to receive devices scheduled.

F. Acceptable Manufacturers: Appleton, Adult, Bell, Bowers, Crouse Hinds, Killark, O.A Gedney, Raco, Red Dot, and Steel City.

2.16 WIRING DEVICES

A. Install on each and every outlet box, a wiring device and cover plate, as indicated by symbol on the Drawings. Manufacturer's model numbers are not intended to indicate color of devices. Color of devices is designated under "Device Plates". Toggle switches shall be quiet, ac type, and specification grade, listed by Underwriters Laboratories, Inc., and meeting the requirements of NEMA Standard WD-1-1971. Back or side screw terminal shall accommodate up to 10 AWG solid or stranded conductors. Contacts shall be rated at 20 amperes, 120/277 volts ac only, single pole, 3-way, 4-way, or key-operated as indicated.

B. Each pilot light shall be installed as a separate device, using a multi-gang box and switch plate when combined with another device. Lamp holders shall be of the strap type, with flush neon pilot light having red jewel.

C. General purpose single and duplex receptacles: shall be specification grade rated 125 volts, two-pole, three-wire, grounding type with polarized parallel slots, Style S Series, in accordance with Federal Specification W-C-596, and listed by Underwriters Laboratories, Inc., in accordance with NEMA Standard Publication WD-1, paragraph 3.02. Bodies shall be of phenolic compound supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side or-back wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke.

D. Device Plates:

1. Provide one-piece coverlets with rounded edges for outlets and fittings to suit the devices installed. Screws shall have countersunk heads, provided in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices; plaster fillings will not be permitted. Plates shall be installed with an alignment (plumb) tolerance of 1/1 6-inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed.

2. Provide smooth zinc finish cast metal or sheet steel plates with ivory color devices in:

a. Unfinished walls.

b. Equipment rooms.

3. Exterior coverlets - Provide Type 302 stainless steel weatherproof plates with spring-hinged cover and PVC plate and cover gaskets with ivory color devices.

4. Provide high-impact STAINLESS STEEL plates with matching color devices in all areas unless noted otherwise.

E. Finish color shall be selected by the Architect.

F. Acceptable Manufacturers: Hubbell, Bryant, Pass & Seymor, Leviton, and Cooper Wiring Devices.

2.17 SURGE PROTECTION DEVICES (TVSS)

A. Description: This section describes the materials and installation requirements for integrated surge protection devices (SPD) in switchboards, panelboards, and motor control centers.

B. Approved Vendors: Square D, Siemens or Eaton.

C. Integral Surge Suppressor

1. SPD shall be Listed and Component Recognized in accordance with UL 1449 Second Edition to include Section 37.3 highest fault current category. SPD shall be UL 1283 listed.

2. SPD shall be installed by and shipped from the electrical distribution equipment manufacturer's factory.

3. SPD shall provide surge current diversion paths for all modes of protection; L-N, L-G, N-G in WYE systems, and L-L, L-G in DELTA systems.

4. SPD shall be modular in design. SPD for service entrance application shall provide two modules per phase for redundant protection. Each mode including N-G shall be fused with a 200kAIC UL recognized surge rated fuse and incorporate a thermal cutout device.

5. Audible diagnostic monitoring shall be by way of audible alarm. This alarm shall activate upon a fault condition. An alarm on/off switch shall be provided to silence the alarm. An alarm push to test switch shall be provided.

6. If a dedicated breaker for the SPD is not provided, the SPD shall include a UL recognized disconnect switch. A dedicated breaker shall serve as a means of disconnect for distribution SPDs.

7. SPD shall meet or exceed the following criteria:

a. Minimum surge current capability (single pulse rated) per phase shall be:

1. Service entrance switchboard: 240kA per phase
2. Panelboard/MCC locations: 160kA per phase

8. SPD shall have a minimum EMI/RFI filtering of –50dB at 100 kHz with an insertion ratio of 50:1 using MIL-STD-220A methodology.

9. SPD shall be provided with one set of NO/NC dry contacts.

10. SPD shall have a warranty for a period of five years, incorporating unlimited replacement of suppressor parts. Warranty shall be the responsibility of the electrical distribution equipment manufacturer and shall be supported by their respective field service division.

2.18 DISCONNECT SWITCHES

A. This section specifies the furnishing, installation and connection of low voltage disconnect switches.

B. APPLICABLE PUBLICATIONS

1. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. The publications below shall be the latest approved version.
2. National Fire Protection Association (NFPA):

70	National Electrical Code (NEC)

3. Underwriters Laboratories, Inc. (UL):

98	Enclosed and Dead-Front Switches
248	Low Voltage Fuses
977	Fused Power-Circuit Devices

C. LOW VOLTAGE FUSIBLE SWITCHES RATED 600 AMPERES AND LESS

1. Shall be quick-make, quick-break type in accordance with UL 98, NEMA KS 1 and NEC.
2. Shall have a minimum duty rating, NEMA classification Heavy Duty (HD) for system voltage.
3. Shall be horsepower rated.
   a. Shall have the following features:
   b. Switch mechanism shall be the quick-make, quick-break type.
   c. Copper blades, visible in the OFF position.
   d. An arc chute for each pole.
   e. External operating handle shall indicate ON and OFF position and shall have lock-open padlocking provisions.
   f. Mechanical interlock shall permit opening of the door only when the switch is in the OFF position, defeatable by a special tool to permit inspection.
   g. Fuse holders for the sizes and types of fuses specified.
   h. Electrically operated.
   i. Solid neutral for each switch being installed in a circuit which includes a neutral conductor.
   j. Ground Lugs: One for each ground conductor.
   k. Enclosures:
      1. Shall be the NEMA types shown on the drawings for the switches.
      2. Where the types of switch enclosures are not shown, they shall be the NEMA types which are most suitable for the environmental conditions where the switches are being installed.
      3. Shall be finished with manufacturer's standard gray baked enamel paint over pretreated steel (for the type of enclosure required).

D. LOW VOLTAGE UNFUSED SWITCHES RATED 600 AMPERES AND LESS

1. Shall be the same as Low Voltage Fusible Switches Rated 600 Amperes and Less, except it shall not accept fuses.

E. MOTOR RATED TOGGLE SWITCHES

1. Refer to appropriate section for motor rated toggle switches.

F. IDENTIFICATION SIGNS

1. Install nameplate identification signs on each disconnect switch to identify the equipment controlled.
2. Nameplates shall be laminated black phenolic resin with a white core, with engraved lettering, a minimum of 6 mm (1/4-inch) high. Secure nameplates with screws.

2.19 LIGHTING AND APPLIANCE PANELBOARDS

A. References:

1. The panelboards and protection devices in this specification are designed and manufactured according to latest revision of the following standards (unless otherwise noted).
2. ANSI 61
3. ANSI/NEMA KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts)
4. ANSI/NEMA PB 1, Panelboards
5. ANSI/NFPA 70, National Electrical Code
6. ASTM - American Society of Testing Materials
7. CSA C22.2 No. 29, Panelboards and Enclosed Panelboards
8. CSA C22.2 No. 5.1, Molded Case Circuit Breakers
9. Federal Specification W-C-375, Rev. B, Amend. 1, Circuit Breakers, Molded Case; Branch Circuit and Service
10. Federal Specification W-P 115, Rev. C, Panel, Power Distribution
11. NEMA AB 1, Molded Case Circuit Breakers and Molded Case Switches
12. NEMA PB 1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
13. UL 489, Molded-Case Circuit Breakers and Circuit-Breaker Enclosures
14. UL 50, Enclosures for Electrical Equipment
15. UL 67, Panelboards
16. UL 943, Ground-Fault Circuit-Interrupters.

B. Definitions:

1. Overcurrent Protective Device: a circuit breaker pole or single fuse. Example: a 2-pole device is considered 2 protective devices.

C. System Description:

1. Short circuit rating of panelboards shall be the interrupting rating of lowest rated device in the panel or applicable UL series rating for proper main and branch device combinations.
2. Panelboards shall have a maximum of 42 protective devices per panel, including sub-feeders and excluding main overcurrent protective devices. For more than 42 devices, 2 or more panelboards are required.
3. With 2 or more panelboards, sub-feed lug or thru-feed lugs shall be used in all but 1 section of each panelboard. Lugs shall have same capacity as incoming mains. Cable inter-connections shall be field installed.

4. Protective devices shall be molded case circuit breakers.

D. Submittals:

1. Manufacturer shall provide copies of following documents to owner for review and evaluation in accordance with general requirements of Division 1 and Division 16:
2. Product Data on specified product;
3. Shop Drawings on specified product;
4. Certified trip curves for each specified product;

E. Project Record Documents:

1. Maintain an up-to-date set of Contract documents. Note any and all revisions and deviations that are made during the course of the project.

F. Operation and Maintenance Data:

1. Manufacturer shall provide copies of installation, operation and maintenance procedures to owner in accordance with general requirements of Division 1 and Division 16.
2. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

G. Quality Assurance (Qualifications):

1. Manufacturer shall have specialized in the manufacture and assembly of lighting and appliance panelboards for 50 years.
2. Lighting and appliance panelboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in Article 1.03 of this specification.
3. Installer has specialized in installing lighting and appliance panelboards with minimum 5 years documented experience.

H. Delivery, Storage, and Handling:

1. Deliver, store, protect, and handle products in accordance with recommended practices in manufacturer's Installation and Maintenance Manuals.
2. Deliver each lighting panelboard in individual shipping cases for ease of handling. Each panelboard shall be wrapped for protection.
3. Inspect and report concealed damage to carrier within specified time.
4. Store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. (Heat enclosures to prevent condensation.)
5. Handle in accordance with NEMA and manufacturer's written instructions to avoid damaging equipment, installed devices, and finish.

I. Project Conditions (Site Environmental Conditions):

1. Follow (standards) service conditions before, during and after panelboard installation.
2. Lighting and appliance panelboards shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Ambient temperature of area will be between minus 30 and plus 40 degrees C. Indoor locations shall be protected to prevent moisture from entering enclosure.

J. Warranty:

1. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

K. Maintenance Service:

1. Furnish complete service and maintenance of lighting and appliance panelboards for 1 year from date of substantial completion.

L. Extra Materials:

1. Provide parts/spares as indicated in drawings.

M. Field Measurements:

1. Make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

N. Manufacturer:

1. Siemens products have been used as the basis for design. Other manufacturers' products of equivalent quality, dimensions and operating features may be acceptable, at the Engineer's discretion, if they comply with all requirements specified or indicated in these Contract documents.

O. Components:

1. Refer to Drawings for: actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; and other required details.

P. Ratings:

1. Lighting and appliance panelboards shall be rated as indicated in drawings.
2. Maximum current ratings for mains, sub-feeds and branches, respectively, shall be specified in drawings.

Q. Enclosure:

1. Boxes shall be a nominal 20 inches wide and 6 inches deep with wire bending space per National Electric Code.
2. Fronts shall be reinforced steel with concealed hinges and concealed trim adjusting screws. Trim clamps are unacceptable.
3. All door locks shall be corrosion proof Valox (or equal) with retractable latches. All door locks shall be keyed for a single key.
4. Clear Lexan (or equal) directory card holders shall be permanently mounted on front door.
5. All panelboard series ratings shall be prominently displayed on dead front shield.
6. Interiors shall permit top or bottom incoming cables.
7. Panels shall be “door within a door” type construction.

R. Bus bars:

1. Bus bars shall be phase sequenced, fully insulated and supported by high impact Noryl (or equal) interior base assemblies.
2. Bus bars shall be mechanically supported by zinc finished galvanneal steel frames to prevent vibration and damage from short circuits.
3. Terminations shall be UL tested and listed and suitable for UL copper wire.
4. Provide 1 copper bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors for bolt-on branch circuit breakers. Bus bars shall be rated as indicated in drawings.
5. Split solid neutral bus shall be plated and located in main compartment for all incoming neutral cables to be same length.
6. Lugs shall be rated for 75 degree C terminations.
7. Main lugs for copper conductors shall be compression lugs. Lug bodies shall bolt in place.

S. Circuit Breakers:

1. Molded case circuit breakers shall be bolt-on devices.
2. All circuit breakers shall have thermal and magnetic trip elements in each pole.
3. 2 and 3 pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole.
4. Circuit breakers shall not be restricted to any mounting location due to physical size.
5. All branch breakers 15 to 100 amperes shall be able to be mounted in any panel position
6. Main and sub-feed circuit breakers may be vertically or horizontally mounted.
7. Branch breaker panelboard connections shall be copper to copper.
8. All panelboard terminations shall be rated as indicated in drawings.
9. All breakers shall have an over center mechanism and be quick make and quick break.
10. All breakers shall have handle trip indication and a trip indicator in window of circuit breaker housing.
11. Breaker handle and faceplate shall indicate rated ampacity.
12. Circuit breaker escutcheon shall have standard ON/OFF markings.
13. Main breakers shall be UL listed for use with: Shunt, Under Voltage, and Ground Fault Shunt Trips; Auxiliary and Alarm Switches; and Mechanical Lug Kits.
14. Branch breakers shall be UL listed for use with: Shunt Trips, Auxiliary and Alarm Switches.

T. Accessories:

1. Contactor control relays
2. Tork (or equal) time clocks
3. Locking devices for breakers and operating handles.
4. Furnish nameplates for each device as indicated in drawings. Color schemes shall be as indicated on drawings.

U. Finish:

1. Boxes shall be corrosion resistant, zinc finish galvanneal.
2. Fronts shall be powder finish painted ANSI 61 gray.

V. Examination:

1. Verify that panelboards are ready to install.
2. Verify field measurements are as instructed by manufacturer.
3. Verify that required utilities are available, in proper location and ready for use.
4. Beginning of installation means installer accepts conditions.

W. Installation:

1. Additional provisions and editing may be required for this part.
2. Install per manufacturer's instructions.
3. Install required safety labels.

X. Field Quality Control:

1. Inspect installed panelboards for anchoring, alignment, grounding and physical damage.
2. Check tightness of all accessible mechanical and electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer's instructions.
3. Test each key interlock system for proper functioning.

Y. Adjusting:

1. Adjust all circuit breakers, access doors, operating handles for free mechanical and/or electrical operation as described in manufacturer's instructions.

Z. Cleaning:

1. Clean interiors of panels to remove construction debris, dirt, shipping materials. Repaint scratched or marred exterior surfaces to match original finish.

2.20 POWER PANELBOARDS

A. References:

1. The low voltage power panelboards and protection devices in this specification are designed and manufactured according to latest revision of the following standards (unless otherwise noted).
2. ANSI/NEMA PB 1, Panelboards
3. ANSI/NFPA 70, National Electrical Code
4. Federal Specification W-C-375, Rev. B, Amend. 1, Circuit Breakers, Molded Case; Branch Circuit and Service
5. Federal Specification W-P 115, Rev. C, Panel, Power Distribution
6. Federal Specification W-S-865 - Heavy Duty Switches
7. UL 489, Molded-Case Circuit Breakers and Circuit-Breaker Enclosures

8. UL 50, Enclosures for Electrical Equipment
9. UL 67, Panelboards
10. UL 98, Enclosed and Dead Front Switches

B. Definitions:

1. Overcurrent Protective Device - Single pole circuit breaker. Example: A 2-pole device is considered 2 protective devices.

C. System Description:

1. Equipment shall be indoor deadfront power panelboards for molded-case circuit breakers.
2. Panelboards shall meet service entrance requirements when specified.
3. Panelboards shall have integrated short circuit rating. Fully rated panel rating is that of lowest rated device in panelboard. Series rating are for the UL tested main-branch combination.
4. Switchgear over 1000 amps rated at 480 volts shall have ground fault protection.

D. Submittals:

1. Manufacturer shall provide copies of following documents to owner for review and evaluation in accordance with general requirements of Division 1 and Division 16:
2. Product Data on specified product;
3. Shop Drawings on specified product;
4. Trip curves for each specified product;

E. Installation, Operation, and Maintenance Data:

1. Manufacturer shall provide copies of installation, operation and maintenance procedures to owner in accordance with general requirements of Division 1 and Division 16.

F. Quality Assurance (Qualifications):

1. Manufacturer shall have specialized in the manufacture and assembly of low voltage power panelboards for 25 years.
2. Low voltage power panelboards shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in Section 2.30, A of this specification.

G. Delivery, Storage, And Handling:

1. Contractor shall deliver, store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals.
2. Ship each low voltage power panelboard section in individual shipping splits for ease of handling. Each panelboard section shall be mounted on shipping skids and wrapped for protection.
3. Contractor shall inspect and report concealed damage to carrier within specified time.

4. Contractor shall store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic.
5. Contractor shall handle in accordance with manufacturer's written instructions to avoid damaging equipment, installed devices, and finish.

H. Project Conditions (Site Environmental Conditions):

1. Low voltage power panelboards shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Ambient temperature of area will be between minus 30 and plus 25 degrees C. Indoor locations shall be protected to prevent moisture from entering enclosure.

I. Warranty:

1. Manufacturer warrants equipment to be free from defects in materials and workmanship for 1 year from date of installation or 18 months from date of purchase, whichever occurs first.

J. Field Measurements:

1. Contractor shall make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

K. Manufacturer:

1. Siemens Company products have been used as the basis for design. Other manufacturers' products of equivalent quality, dimensions and operating features may be acceptable, at the Engineer's discretion, if they comply with all requirements specified or indicated in these Contract documents.

L. Components:

1. Refer to Drawings for: actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; and other required details.

M. Enclosures:

1. Panel box shall be galvanized code gauge sheet steel with removable end walls.
2. Enclosures shall be surface mounted.
3. Enclosures shall be NEMA type per intended location.

N. Fronts:

1. Provide a four-piece front to cover wiring gutter and wiring access areas. Provide a lockable hinged door with semi-concealed hinges to cover access to circuit breakers.
2. Hinged door fronts, when specified, shall be provided with door-in-door. An inner door shall cover the circuit protective devices and shall be able to be locked.
3. Door locks shall be GE Valox style.

O. Interiors:

1. Panelboard interior shall be designed and assembled such that circuit protective devices shall be solidly connected to the distribution panel vertical bus. The bus bars shall be attached to the feeder device by bolts and to the vertical bus by bolts and anti-turn methods.

2. Circuit breaker connectors shall be designed so that circuit breakers may be removed without disturbing adjacent devices.
3. Panelboards shall be rated as indicated in drawings. Main devices shall have maximum rating of 1200 amperes.
4. Panelboards shall have three vertically aligned bus bars.
5. Bus bars shall be copper. The bus bars shall have sufficient cross sectional area to meet UL 67 temperature rise requirements through actual tests. The bus bars shall be standard density rated for 1000 amperes per square inch copper. Bus bars shall be phase-sequenced and rigidly supported by high impact resistant, insulated bus supporting assemblies to prevent vibration or short circuit mechanical damage.
6. Neutral bus shall be fully rated.
7. All solderless terminations shall be suitable for copper UL listed wire or cable and shall be tested and listed in conjunction with appropriate UL standards. Terminations shall be rated for use with conductor ampacity as assigned in the NEC 75 degree C table.
8. Ground wire terminations shall be provided as an optional kit for installation by panelboard installer without voiding UL label.

P. Main and Branch Devices:

1. Circuit breakers:
2. Main and branch circuit breakers shall be quick-make, quick break, and trip indicating, low voltage molded-case (or equal).
3. Circuit breaker case shall have ON/OFF and International I/O position indicators.
4. Breaker faceplate shall list current rating, UL and IEC certification standards, and AIC ratings.
5. Circuit breakers shall be factory sealed and shall be date coded on breaker case.
6. Breakers shall be UL listed for reverse connection without restrictive line or load markings. Circuit breakers shall be able to mount in any operating position.
7. 3-pole breakers with ampere ratings greater than 150 ampere shall have interchangeable rating plugs.
8. Interrupting rating of breakers shall not be less than maximum short circuit current available at incoming line terminals.
9. Breakers shall have UL listing.
10. Main breakers and lugs shall be convertible by installer for top or bottom incoming feed.
11. Where indicated on the drawings,} the main breaker shall be provided with integral ground fault pick-up and delay settings and adjustable long time settings.

Q. Accessories:

1. Provide through-feed lugs for panels rated 200 Amperes and above.
2. Padlocks
3. Grounding bars. (Neutral bus shall have grounding lug for Service Entrance applications.)
4. Exterior mounted equipment label

5. Furnish nameplates for each device as indicated in drawings. Color schemes shall be as indicated on drawings.

R. Finish:

1. Standard panelboard boxes shall be galvanealed (zinc finished) or galvanized.
2. Fronts shall be coated with phosphatized rust inhibitor and finish coated with ANSI 61 light gray baked on powder coat.
3. Screw fasteners shall be zinc coated to retard corrosion.

S. Examination:

1. The following procedure shall be performed by the contractor:
2. Verify that low voltage panelboards are ready to install.
3. Verify field measurements are as shown on Drawings.
4. Verify that required utilities are available, in proper location and ready for use.
5. Beginning of installation means installer accepts conditions.

T. Installation:

1. Contractor shall install per manufacturer's instructions.
2. Contractor shall install required safety labels.

U. Adjusting:

1. Adjust all circuit breakers, switches, access doors, operating handles for free mechanical and electrical operation as described in manufacturer's instructions.
2. Adjust circuit breaker trip and time delay settings for proper operation of all electrical systems and devices.

V. Cleaning:

1. Clean interiors of switchboards, panels, separate enclosures to remove construction debris, dirt, shipping materials.
2. Repaint scratched or marred exterior surfaces to match original finish.

2.21 SHORT CIRCUIT RATINGS

A. It shall be the responsibility of the electrical contractor and equipment manufacturer to supply devices rated for the available fault current.

B. Electrical equipment, circuit protective devices, bussing, and switches shall be rated to interrupt or withstand short circuit faults greater than the available fault current.

2.22 INTERIOR LIGHTING

A. Furnish, install and wire lighting fixtures scheduled or indicated by type designation on the Drawings. If type designation is omitted, fixtures shall be of the same type as shown for rooms of similar usage. Verify before purchase and installation.

B. Locations of fixtures on Electrical Drawings are diagrammatic. Verify location and spacing with architectural reflected ceiling plans and other reference data before installation. Coordinate space conditions, including head room clearances, and

interference's with ceiling components, such as ducts, openings, beams and piping, prior to installation.

C. Check the architectural finishes, and regardless of the catalog prefixes and suffixes shown, furnish fixtures with the proper trim, frames, supports, hangers and other miscellaneous appurtenances to properly coordinate with said finishes. Where required, furnish reinforcing for ceiling construction to support weight of fixtures.

D. Fixtures shall be free of light leaks and designed to provide sufficient ventilation of lamps and ballasts, including vent holes where required. Outdoor fixtures with vent holes shall have wire mesh screens in the vent holes.

E. Wiring channels and socket mountings shall be rigid and accurately made. Sockets shall hold lamps securely against normal vibration and maintenance handling. Provide silver plated contacts in sockets for mogul base incandescent, metallic vapor and mercury vapor lamps, in all outdoor fixtures, and tungsten halogen lamps.

F. Housing shall be National Electrical Code gage, bonderized steel or equal rust protection, rigid constructions, baked-on enamel finish, color as selected by Architect. Fluorescent housings shall be suitable for continuous row mounting where indicated. Incandescent housings shall have matte black finish on concealed surfaces, and all fixtures shall be prewired.

G. Fluorescent troffers shall conform to NEMA Standards Publication, latest edition, including references to fixture dimensions and temperature ratings.

H. Reflectors shall have no less than 85 percent reflectance.

I. Light shields and lens shall be as specified under individual fixture types but lens thickness shall be no less than 0.125-inches, shall weigh not less than eight ounces per square foot, manufactured from 100% virgin acrylic.

J. Fixtures a scheduled by manufacture’s names and catalog numbers are fixtures which will be acceptable. Fixtures of other manufacture, if similar and equal (with respect to quality of materials, components, construction, light distribution characteristics and physical size, shape and appearance) to those scheduled, will be considered as substitutions for the scheduled fixtures, subject to approval of submittal data (and sample, if required).

K. Submit shop Drawings or catalog cuts for each type of fixture specified or noted. Drawings shall indicate fixture type, complete details of fixtures, including manufactures catalog numbers for sockets, ballasts, light shields, metal gages, type of wiring, color and texture of finish. Submit samples of finish and ETL curves (photometric data) when required. Submit fixture sample as specified.

L. All fixtures installed in rated ceilings or ceilings with insulation are to have protective boxes maintaining the rating of the ceiling or being IC rated.

M. Acceptable manufacturers: Any listed manufacturer conforming to Specifications.

2.23 LAMPS

A. Provide lamps for all fixtures. Lamps on the project shall be new, delivered to the job site in original packing cases and sleeves, and shall be of the same manufacture. Incandescent lamps not scheduled otherwise shall be inside frosted, high duty service,

130 volt. Fluorescent lamps not scheduled otherwise shall be rapid start, standard type and cool white color. High intensity discharge (H.I.D.) lamps shall be of the type and color scheduled.

B. Acceptable manufacturers: General Electric, North American Phillips, Osram/Sylvania

C. Install lamps in fixtures prior to energizing and replace burned out lamps up to the day building is accepted for occupancy.

2.24 BALLASTS

A. Electronic ballasts for fluorescent lamps shall be premium energy savings "high efficiency", high power factor Class 'P' one, two, three or four lamps as scheduled, sound level Class A, UL listed. Constant light output shall be maintained over operating ranges of 110V to 125V for 120V ballasts and 254V to 289V for 277V ballasts. Total harmonic distortion shall not exceed 10%. The ballast shall withstand line transients as defined in IEEE Publication 587, Category: Non-consumer. With regard to radiated and generated noise, the ballast shall meet FCC Rules and Regulations, Part 18. Operating frequency shall exceed 25 KHZ with no noticeable flicker. Maximum lamp current crest factor shall be 1.7 per ANSI Standards. The ballast shall contain no PCB'S. Input wattage (ANSI) shall not exceed 75 for two (2) F40/40W lamps.

B. Compact fluorescent ballast (for PL or TTL lamps) shall be high power factor, potted and rated to operate at the available service voltage. The ballast capacitor shall contain no PCB'S.

C. Where scheduled, high intensity discharge ballasts shall be encased and potted, constant wattage auto transformer (CWA), have built-in thermal cutout with automatic reset, high power factor and shall be separately fused with built-in or inline replaceable fuse rated to the manufacturer's recommendations. The ballast capacitor shall contain no PCB'S. Sound rating shall be Class B.

D. High intensity discharge ballasts shall be core and coil, high power factor, constant wattage auto transformer, and shall be separately fused with built-in or inline replaceable fuse(s) rated to the manufacturer's recommendations. Ballasts shall be UL listed. Ballast noise shall not be objectionable for the environment specified. Individual ballasts that, by comparison with those in other fixtures in the installation, are excessively noisy shall be replaced. For lower wattage lamps where constant wattage autotransformer ballasts are not available, high reactance auto transformer (HX-HPF) or reactor (R-HPF), high power factor ballasts may be used.

2.25 TELEPHONE AND DATA SYSTEM

A. The Low Voltage Contractor shall provide a Cable TV Backbone as per local utility specifications. The EC shall provide a pathway for this infrastructure to each floor electrical room.

B. The low voltage contractor shall wire to the electrical room punch down blocks. The outlets shall be wired per the TIA 570-A standard.

C. Telecommunications service to the building (from Comcast and Verizon) and associated utility backcharges shall be included in the bid price.

2.26 TELECOMMUNICATIONS

A. GENERAL

A. All equipment and materials shall have ratings established by the recognized independent agency or laboratory. The Contractor shall apply the items used on the project within the ratings and subject to any stipulations or exceptions established by the independent agency or laboratory. Use of equipment or materials in applications beyond that certified by the agency or beyond that recommended by the manufacturer shall be cause for removal and replacement of such misapplied items.

B. CABLES

A. Data/Communication Cable: Cable shall be Category 6+ unshielded twisted pair. The vendor shall determine if plenum or riser rated cable is required for the specific installation.
B. Cable Pathway: Extension of all data cables shall be within raceway, conduit, cable tray or other designed cable delivery system provided and installed by the contractor. No cable should be exposed or uncovered, except in designated equipment rooms or wiring closets. All raceway, conduit, or Wire Mold type of wire management device must be secured and be permanently fastened to appropriate supporting structure.
1. Cabling will have a 15 year *manufacturers* warranty on all parts and labor.

D. All copper cable terminations shall comply with, and be tested to TIA/EIA 568B and TSB-67 standards for Category 6+ installations.

1. All test results shall be compiled and given to the Owner in electronic format.

E. Cables to be provided by the Contractor:

J. Cat-6+ cabling and labeled terminations from the Data Equipment Rack to all data connection points.

K. Cat-6+ cabling and labeled terminations from the Telephone Equipment Rack to all Telephone connection points.

C. CABLE ROUTING

1. Cabling:
All communications cabling used shall comply with the requirements as outlined in the National Electric Code (NEC) article 760 and the appropriate local codes. All cabling shall bear CMP (Plenum Rated), CM/CMR (Riser Rated) markings. All cabling shall be solid copper, 24 AWG, 100 W balanced twisted-pair (UTP) Category 5e cables with four individually twisted pairs, which meet or exceed the mechanical and transmission performance specifications in ANSI/TIA/EIA-568-B.2-1 up to 1 GHz.
2. Plenum Cabling Bundling:
In suspended ceiling and raised floor areas where duct, cable trays or conduit are not available, the contractor shall bundle, in bundles of 50 or less, station wiring with plastic cable ties snug, but not deforming the cable geometry. The cable bundling shall be supported via “J” hooks attached to the existing building structure and framework at a maximum of five-foot intervals. Plenum rated cable will be used in all air handling areas. The contractor will adhere to manufacturers' requirements for bending radius and maximum pulling tension of all data cables, fiber optic cables, and patch cables.
3. Fire Stopping:
1. Sealing of openings between floors, through rated fire and smoke walls, existing or created by the contractor for cable pass through shall be the responsibility of the contractor. Sealing material and application of this material shall be accomplished in

such a manner, which is acceptable to the local fire and building authorities having jurisdiction over this work.

D. Warning Labels:

1. All fiber optic cable running through crawl spaces, in attics, or above drop ceilings shall be clearly and noticeably marked as fiber optic cable, unless completely covered and protected in conduit. Warning markings must be placed at a minimum of every five (5) feet.

D. STRUCTURED CABLING SYSTEM

A. All drops installed and maintained by vendor must support (but not be limited to) the following application standards: 100Base-T (IEEE 802.3), 1000Base-T (Fast Ethernet), 100VG - AnyLAN (IEEE 802.12), 4/16 Mbps Token Ring (IEEE 802.5), and 52/155Mbps ATM (ATM Forum).

E. SYSTEM DESCRIPTION

B. Outlets: Outlets for data communication shall consist of one gang utility outlet boxes. Wall plates will be equipped with 8-pin modular (RJ-45) jacks, utilizing T568B wiring. Single-gang mounting plates may have one, two, three, or four openings. The following are the specifications for each type of opening:

C. Voice Outlet – Panduit 8-pin modular, category 3, unkeyed, black, pinned to T568B Standard.

D. Data Outlet - Panduit 8-pin modular, category 6+, unkeyed, orange, pinned to T568B Standard.

F. All wall boxes, faceplates, track, and all other associated pieces shall be the color of white. Each port shall be clearly marked what type of port it is and the number in which that port associates to in the termination point. All outlet cabling shall terminate on termination patch panels in their associated TC or WC.

G. Station Cable: Category 6+ UTP, 4 Pair, data cables shall be extended between the station location and its associated TC or WC. These cables shall consist of 4 pair, 24 gauge, UTP, and shall be terminated on the 8-pin modular jacks provided at each outlet. Cable jacket shall comply with Article 800 NEC for use as a plenum cable. The 4 pair UTP cable shall be UL certified.

F. PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protections: Take necessary precautions to protect all material, equipment, apparatus, and work from damage. Failure to do so to the satisfaction of the Architect will be sufficient cause for the rejection of the material, equipment, or work in question. Contractor is responsible for the safety and good condition of the materials installed until final acceptance by the Owner

B. Cleaning: Conduit openings shall be capped or plugged during installation. Fixtures and equipment shall be tightly covered and protected against dirt, moisture, chemical, and mechanical injury. At the completion of the work, the fixtures, material and equipment shall be thoroughly cleaned and delivered in condition satisfactory to the Architect.

A. Wall Plates, Jacks, and Plugs:

1. Telephone jacks shall be RJ-11. Utilize Leviton Part No. 41108-RW3. Confirm color with Architect. Terminations shall comply with, and be tested to TIA/EIA 568B.
2. Data jacks shall be Cat5e RJ-45. Utilize Leviton Part No. 61HOM-RW6. Confirm color with Architect. All Cat5e cable installed in the MAC Panel shall be terminated

with RJ-45 plugs. Utilize Ideal Part No. 85366. Terminations shall comply with, and be tested to TIA/EIA 568B.

B. Cabling Practices:

1. All low voltage wiring and faceplates shall be installed at least one (1) stud bay apart from line voltage wiring. Unless there is supplemental shielding, the distance between low voltage and high voltage cables should exceed 4” except where they cross. Low voltage wiring will cross high voltage wiring at right angles with a 2”minimum separation.
2. Protecting cabling from damage is the responsibility of the Contractor. The Contractor shall install nail plates where cabling passes through wall studs. Where steel framing is used, plastic bushings will be installed wherever cables pass through metal structural members. The cables will not touch any edges of metal framing.
3. The Contractor shall secure and support all cabling at maximum 48” intervals using industry standard fastening methods that will not compress or deform the cables.
4. Splicing or repair of cabling is not permitted. Any defective wiring, damaged cabling, or any cable or cable installation that does not meet these specifications, will be replaced. Contractor shall replace the damaged cable at their expense, unless it is the result of gross negligence by another trade or unavoidable because of subsequent changes.
5. The Electrical Contractor is responsible for all fire-stopping, smoke seals, and/or assemblies. No flammable materials will be used to line a chase or hole. All fire-stopping materials will meet applicable guidelines, standards, codes, rules, and regulations.

PART 3 - EXECUTION

3.1 GENERAL PROVISIONS FOR ELECTRICAL WORK

A. EXECUTION OF WORK

1. Install all materials and equipment in a neat and workmanlike manner and provide for the following:
   a. All work shall be installed so as to be readily accessible for operation, maintenance and repair. Minor deviations from the plans may be made to accomplish this, subject to the approval of the Engineer.
   b. The area of work shall be kept free of litter and debris. Contractor shall clean up the work area at the end of each working day. All scrap material and other waste shall be removed from the site by the contractor.
   c. Electrical contractor shall coordinate the electrical work with other trades, including but not limited to all construction documents, shop drawings, etc. for all structural and mechanical work. Electrical contractor shall secure shop drawings from other contractors and verify exact electrical characteristics of equipment to be wired. This is done before electrical contractor rough-in for subject equipment. If discrepancies are noted between the electrical contract drawings and the other contractor shop drawings, electrical contractor is to notify Engineer at once. Failure by the electrical contractor to perform this duty will not relieve him of the responsibility to correct wiring deficiencies at his expense.
   d. Drawings are diagrammatic, small scale and indicate the general arrangement of systems and work included. Electrical contractor shall apply for detailed information regarding the location of all equipment before rough-in as the final location may differ from that shown on drawings. Outlets, etc., improperly placed because of failure to obtain

this information shall be relocated and reinstalled without additional expense. Certain raceways, bends, fittings, boxes, system components, appurtenances and related specialties are not shown, but shall be provided. Do not scale drawings.

e. All electrical work required for identical items shown on the drawings shall be provided although each specific identical item may not be shown.

f. Electrical contractor shall submit shop drawings and/or catalog cuts for all equipment, materials and devices for review by the Engineer. Work shall not start until all reviews have been completed and the items to be provided are acceptable. All materials and equipment shall be commonly used acceptable grades in the construction industry and shall bear the UL Label when applicable.

g. All circuits shall be clearly identified at panelboards with typed circuit schedules. All other electrical equipment shall be labeled with white engraved with black lettering laminated nameplates.

h. All wiring devices, panelboards, junction boxes, conduits, equipment, etc., shall be properly grounded.

i. Upon completion of construction, the electrical contractor shall supply the Engineer with one (1) complete set of equipment manuals and as-built documents accurately showing the locations, sizes and nature of concealed items such as conduit, devices, equipment, etc., and homerun circuit designations as installed. These records (with dimensions where necessary) form a permanent record for future reference.

j. All electrical work performed shall be as shown on the drawings and shall be accomplished to the satisfaction of the Engineer. Wire all fixtures, devices, etc., to respective panel and controls as shown on plans in symbol form. Branch circuit wiring is not completely shown on drawings. Contractor is responsible to wire all devices as circuited symbolically.

k. All branch circuits to contain a separate green insulated grounding conductor.

l. All conduit and/or cable shall be installed above suspended ceilings, and/or installed concealed in walls/floors in all finished areas.

m. Install panelboard accessory items according to NEMA PB 1.1.

n. Circuit Directory: Type directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing.

o. Any spared circuits to be disconnected, and wiring to be removed. Circuit breakers to remain and will be re-labeled accordingly.

p. Provide ground continuity to main electrical ground bus.

2. Field Quality Control: Perform acceptance tests as follows:

a. Make continuity tests of each circuit.

b. Procedures: perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

c. On completion of work, the wiring system shall be entirely free from grounds, short circuits, opens, overloads and improper voltages, and thorough tests shall be made. Furnish all labor, material and instruments.

B. GUARANTEE

1. Contractor for electrical work shall furnish a guarantee covering all labor, materials and equipment for a period of (1) one year from date of final acceptance of his work. He shall agree to repair and make good, at his own expense, any and all defects which may appear during this time of said guarantee.

3.2 ELECTRICAL GENERAL REQUIREMENTS

A. SLEEVES AND ELECTRICAL PENETRATIONS

1. Location of Openings: Locate all chases, shafts and openings required for the installation of the electrical work during framing of the structure. Do any additional cutting and patching required due to improperly located or omitted openings without cost to the Owner, and with the approval of the Architect. Cutting or drilling in any structural member is prohibited without written approval of the Architect.
2. Location of Sleeves: Wherever conduits pass through concrete walls or suspended slabs, furnish and install sleeves of ample size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with the wall or extend two (2") inches above floor surfaces. Verify location with the Architects.
3. Where sleeves pierce slabs or walls separating machine room areas from or other quiet areas, the sleeves shall be packed with fiberglass insulation to prevent noise transfer.
4. Where raceways for electrical power, telephone or signal cables penetrate FIRE RATED walls, floors, partitions or slabs, fill and seal all such penetrations with a one-part intumescent caulk/putty sealant creating a fire stop equal to or exceeding fire rating of partition being penetrated. Fire sealant shall have ability to prevent spread of flame, smoke and water throughout the penetration and shall pass three (3) hour test, UL Test ASTM E814 and UL 1479. Fire sealant shall be 3M CP25 caulk and putty 303, installed in accordance with manufacturer's written instructions. Avoid all voids when arranging cables in penetration by using non-flammable fiber damming material wedged between cables.
5. Type of sleeves: Steel pipe or galvanized sheet metal is acceptable.
6. Finish Around Sleeves: Rough edges shall be finished smooth. Space between conduit and sleeves, where conduit passes through exterior walls and walls of existing structure, shall be sealed to permit movement of conduit, but prevent entrance of water.
7. Space between conduit and sleeves, where conduit passes through interior walls and slabs, shall be sealed with an approved sealing compound that is fireproof and will remain pliable.
8. Where faulty installation of sleeves, etc. occurs, the Electrical Contractor shall make all necessary changes and repairs, at no cost to the Owner, to the satisfaction of the Architect.
9. Where openings requested by the Electrical Contractor are left in floors or walls under other contracts, and are not used, such openings shall be filled in to match the adjoining work the Electrical Contractor.
10. All additional openings required and not requested while the work proceeds shall be cut as a part of the work of the appropriate trade and be paid for by the Electrical Contractor.

B. CUTTING AND PATCHING

1. The Electrical Contractor shall, at a time in advance of the work, verify all openings indicated on the drawings. Should the work of this Division require

it, he shall furnish new instructions as to his requirements for these openings, subject to the Architect's approval. All additional cutting, patching and reinforcement of the construction of the building (subject to the Architect's approval) shall be performed under the section of the specifications covering the particular materials, but the cost shall be an obligation of this section of the work.

2. The Contractor shall provide and pay for the addition of all structural steel required for the support or bracing of all work furnished and installed.

C. CLEANING AND PAINTING

1. Conduit and Equipment to be Installed: Clean thoroughly to remove plaster, splattered paint, cement and dirt, on both exterior and interior.
2. Conduit and Equipment to be Painted: Clean all conduit exposed to view in completed structure by removing plaster and dirt. Remove grease, oil and similar material from conduit and equipment by wiping with clean rags and suitable solvents in preparation for paint.
3. All items with Factory Finish: Remove cement, plaster, grease and oil, and leave all surfaces, including cracks and corners, clean and polished. Touch up any scratched or bare spots to match finish. Factory finish may be approved as prime coat by the Architect. See Painting Section.
4. All electrical apparatus and equipment in equipment rooms shall be provided with a factory finish cost. All panels in public spaces, corridors, etc. shall be provided with a factory prime coat.
5. Site Cleaning: Remove from site all packing cartons, scrap materials, and other rubbish relating to electrical installation.

D. TESTS

1. Conduct resistance to ground tests by qualified personnel to measure resistance to ground at all grounding electrodes. Make tests before slabs of affected areas are poured, in order that corrective measures, if required, may be taken. Submit to the Architect a report showing the results of these measurements. If the resistances exceed values specified elsewhere, perform all corrective measures as directed by the Architect.
2. Upon completion of the work and adjustment of all equipment, conduct an operating test for approval at such time as the Architect directs. Conduct the test in the presence of an authorized representative of the Architect. Demonstrate all systems and equipment to operate, in accordance with all requirements of the contract documents, and to be free from all electrical and mechanical defects.
3. All systems shall be free from short circuits and grounds, and shall show an insulation between phase conductors and ground not less than the requirements of the National Electrical Code. Test all circuits for proper neutral connections.
4. Complete all tests prior to final inspection of the project.
5. Preliminary Operations: Should the Owner require that any portion of the systems or equipment be operated prior to the final schedule dates for completion and acceptance of the work, the contractor shall consent. Such operation shall be under the direct supervision of, and at the expense of the Contractor, and shall not be construed as an acceptance of any of the work by the Owner.

E. OPERATING, INSTRUCTIONS AND SUPERINTENDENT

1. The services of an experienced superintendent shall be provided, who shall constantly be in charge of the erection of the systems in this Division, and who shall have complete knowledge of the design, operation and maintenance of all machinery, apparatus and other work installed under his supervision.
2. Upon the completion of the work, and prior to the final completion date, the Contractor shall submit to the Architect a letter signed by the Owner's representative stating that the Owner has been instructed in the proper operation of all installed equipment.

3.3 BASIC ELECTRICAL MATERIAL & METHODS

A. APPLICATION

1. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
2. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
3. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
4. Right of Way: Give to raceways and piping systems installed at a required slope.

B. RACEWAY APPLICATION

1. Use the following raceways for outdoor installations:
   a. Exposed: IMC
   b. Concealed: IMC
   c. Underground, Single Run: RNC
   d. Underground, Grouped: RNC
   e. Connection to Vibrating Equipment: LFMC
   f. Boxes and Enclosures: NEMA 250, Type 3R.
   g. Use the following raceways for indoor installations:
      1. Exposed: EMT
      2. Concealed: EMT
      3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC
      4. Damp or Wet Locations: IMC
      5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

C. RACEWAY AND CABLE INSTALLATION

1. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
2. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot water pipes. Locate horizontal raceway runs above water and steam piping.
3. Use temporary raceway caps to prevent foreign matter from entering.
4. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

5. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
6. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.
   a. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
   b. Space raceways laterally to prevent voids in concrete.
   c. Install conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
   d. Transition from non-metallic tubing to Schedule 80 non-metallic conduit, rigid steel conduit, or IMC before rising above floor.
   e. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.
7. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12-inches of slack at each end of the pull wire.
8. Install telephone and signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.
9. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.
10. Set floor boxes level and trim after installation to fit flush to finished floor surface.

D. WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS
1. Feeders: Type THHN/THWN insulated conductors in raceway as allowed by code.
2. Underground Feeders and Branch Circuits: Type THWN insulated conductors in raceway.
3. Branch Circuits: Type THW or THHN/THWN insulated conductors in raceway where exposed. Metal-clad cable where concealed in ceilings and gypsum board partitions.
4. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2 and 3, unless otherwise indicated.

E. WIRING INSTALLATION
1. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
2. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.
3. Connect outlet and component connections to wiring systems and to ground. 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.

F. ELECTRICAL SUPPORTING DEVICE APPLICATION

1. Damp Locations and Outdoors: Hot-dip galvanized materials or non-metallic, U-channel system components.
2. Dry Locations: Steel materials.
3. Support Clamps for PVC Raceways: Click-type clamp system.
4. Selection of Supports: Comply with manufacturer's written instructions.
5. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

G. SUPPORT INSTALLATION

1. Install support devices to securely and permanently fasten and support electrical components.
2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
4. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
5. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
6. Install ¼-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.
7. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2 inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
8. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
9. Simultaneously install vertical conductor supports with conductors.
10. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
11. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
12. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
13. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
    a. Wood: Fasten with wood screws or screw-type nails.
    b. Masonry: Toggle bolts on hollow masonry units and expansion bolts on

solid masonry units.

c. New Concrete: Concrete inserts with machine screws and bolts.

d. Existing Concrete: Expansion bolts.

e. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.

f. Steel: Welded threaded studs or spring-tension clamps on steel.

g. Field Welding: Comply with AWS D1.1.

h. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.

i. Light Steel: Sheet-metal screws.

j. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

H. IDENTIFICATION MATERIALS DEVICES

1. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

2. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

3. Self-Adhesive Identification Products: Clean surfaces before applying.

4. Identify raceways and cables with color banding as follows:

a. Bands: Pre-tentioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.

b. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

c. Colors: As follows:

1. Fire Alarm System: Red.
2. Security System: Blue and Yellow.
3. Telecommunication System: Green and Yellow.

5. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

6. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.

7. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

a. Phase A: Black.

b. Phase B: Red.

c. Phase C: Blue.

d. Neutral: White.

e. Ground: Green.

480 volt conductors shall have their own color coding system.

8. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
9. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

I. UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

1. Install equipment according to the Utility Company's written requirements.

J. FIRESTOPPING

1. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

K. CUTTING AND PATCHING

1. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
2. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

L. FIELD QUALITY CONTROL

1. Inspect installed components for damage and faulty work, including the following:
   a. Raceways.
   b. Building wire and connectors.
   c. Supporting devices for electrical components.
   d. Electrical identification.
   e. Electricity-metering components.
   f. Concrete bases.
   g. Electrical demolition.
   h. Cutting and patching for electrical construction.
   i. Touchup painting.
2. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.
   a. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
   b. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
   c. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
   d. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection.

Record test results.

e. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

M. REFINISHING AND TOUCHUP PAINTING

1. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section “Painting.”
   a. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
   b. Follow paint manufacturer’s written instructions for surface preparation and for timing and application of successive coats.
   c. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   d. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

N. CLEANING AND PROTECTION

1. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
2. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.4 GROUNDING & BONDING

A. APPLICATION

1. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
2. In raceways, use insulated equipment grounding conductors.
3. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
4. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
5. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
6. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   a. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
   b. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.
7. Underground Grounding Conductors: Use tinned-copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

B. EQUIPMENT GROUNDING CONDUCTORS

1. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
2. Install equipment grounding conductors in all feeders and circuits.

3. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
4. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.
5. Non-metallic Raceways: Install an equipment grounding conductor in non-metallic raceways unless they are designated for telephone or data cables.
6. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
7. Water Heater Cables: Install a separate equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components.
8. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
   a. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a ¼-by-2-by-12-inch grounding bus.
   b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
9. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.
10. Common Ground Bonding 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. COUNTERPOISE
1. Ground the steel framework or metal parts of the building with a # 3/0 AWG conductor.

D. INSTALLATION
1. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
   a. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
   b. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
2. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact or damage.
3. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond

straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

4. Metal Water Service Pipe: Provide insulation copper grounding conductors, in conduit, from buildings' main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
5. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
6. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
7. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

E. CONNECTIONS

1. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
   a. Use electroplated or hot tin coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
   b. Make connections with clean, bare metal at points of contact.
   c. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
   d. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
   e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
2. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
3. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
4. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding and bushings and bare grounding conductors, unless otherwise indicated.
5. Connections at Test Wells: Use compression-Type connectors on conductors and make bolted-and clamped-type connections between conductors and ground rods.
6. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
7. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and

dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

8. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

F. FIELD QUALITY CONTROL

1. Testing: Perform the following field quality-control testing:

a. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

b. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the 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. Perform tests, by the fall-of-potential method according to IEEE 81.

c. Provide drawings locating each ground rod and ground rod assembly and other grounding observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

d. Equipment Rated 500 kVA and Less: 10 ohms.

e. Equipment Rated 500 to 1000 kVA: 5 ohms.

f. Equipment Rated More than 1000 kVA: 3 ohms.

g. Substations and Pad-Mounted Switching Equipment: 5 ohms.

h. Manhole Grounds: 10 ohms.

i. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

G. GRADING AND PLANTING

1. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Re-establish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Maintain restored surfaces. Restore disturbed paving as indicated.

3.5 CONDUCTORS & CABLES

A. EXAMINATION

1. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation unsatisfactory conditions have been corrected.

B. WIRE AND INSULATION APPLICATIONS

1. Service Entrance: Type RHW or THWN, in raceway.

2. Feeders: Type THHN/THWN, in raceway.

3. Branch Circuits: Type THHN/THWN, in raceway.
4. Fire Alarm Circuits: Power-limited, fire-protective, signaling circuit cable.
5. Fire Alarm Circuits: Type THHN/THWN, in raceway.
6. Class 1 Control Circuits: Type THHN/THWN, in raceway.
7. Class 2 Control Circuits: Power-limited tray cable, in cable tray.
8. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.
9. Class 2 Control Circuits: Type THHN/THWN, in raceway.

C. INSTALLATION

1. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."
2. Remove existing wires from raceway before pulling in new wires and cables.
3. Pull Conductors: 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. Provide pull boxes and splice boxes as required.
4. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
5. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
6. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
7. Seal around cables penetrating fire-rated elements according to Division 7 Section 07840.
8. Identify wires and cables according to Division 16 Section "Basic Electrical Materials and Methods."
9. Identify wires and cables according to Division 16 Section "Electrical Identification."

D. CONNECTIONS

1. Conductor Splices: Keep to minimum.
2. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
3. Use splice and tap connectors compatible with conductor material.
4. Use oxide inhibitor in each splice and tap connector for aluminum conductors.
5. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.
6. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
7. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. FIELD QUALITY CONTROL

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

2. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.6 BRANCH CIRCUITRY

A. For all lighting and appliance branch circuitry, raceway sizes shall conform to industry standard maximum permissible occupancy requirements except where these are exceeded by other requirements specified elsewhere.

B. Circuits shall be balanced on phases at their supply as evenly as possible.

C. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.

D. Reduced size conductors indicated for any feeders shall be taken as their grounding conductors.

E. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one cable for each leg and one neutral cable, if any.

F. For circuitry indicated as being protected at 20 Amps or less, abide by the following:
   1. All 20 amp, 120/208 volt, 3 phase, 4 wire combined branch circuit homeruns shall be provided with a #8 AWG neutral conductor.
   2. Minimum conductor size shall be No. 12 A.W.G. copper.
   3. Conductors operating at 115 volts extending in excess of 100 Ft. or the last outlet or fixture tap shall be No. 10 A.W.G. copper throughout.
   4. Lighting fixtures and receptacles shall not be connected to the same circuit.
   5. Circuits shall be balanced on phases at their supply point as evenly as possible.

3.7 IDENTIFICATION AND TAGGING

A. Identify individually:
   1. Each transformer.
   2. Each panel-board.
   3. Each switch and circuit breaker.
   4. Each feeder, wire or cable of all systems.
   5. Each switchboard.
   6. Each end of nylon pull-wire in empty conduit.

B. Each wire or cable in a feeder shall be identified at its terminal points of connection and in each pull-box, junction box and panel gutter through which it passes.

C. The nomenclature used to identify panel-boards or load center shall designate the numbers assigned to them.

D. The nomenclature used to identify switches or circuit breakers shall:
   1. Where they disconnect mains or services designate this fact.
   2. Where they control feeders, designate the feeder number and the name of the load supplied.

3. Where they control lighting and appliance branch circuitry, designate the name of the space and the load supplied.

E. The nomenclature used to identify feeder wires and cables shall designate the feeder number.

F. Identification for panel-boards or load centers shall be by means of engraved lama-coid nameplates showing 1/4" high white lettering on a black background fastened to the outside face of the front.

G. Identification for switches or circuit breakers shall be by means of the following:

1. Where individually enclosed -- engraved lama-coid nameplates showing 1/8" high white lettering on a black background fastened on the outside front face of the enclosure.
2. Where in panel-boards or load centers without doors -- same as for individually enclosed.
3. Where in panel-boards or load centers with doors -- typewritten directories mounted behind transparent plastic covers, in metal frames fastened on the inside face of the doors.

H. Identification for wires and cables shall be by means of wrap around "brady" type labels.

I. Device plates for local toggle switches, toggle switch type motor starters, pilot lights and the like, whose function is not readily apparent shall be engraved with 1/8" high letters suitably describing the equipment controlled or indicated.

J. These identification letters shall be stamped into the metal of the bus bars of each phase of the main busses of each switchboard and each panel-board. The letters shall be visible from at least one "normal posture" location without having to demount any current carrying or supporting elements.

K. Equip the front face of all switchboard pull boxes junction boxes and the like containing cables, busing or devices operating in excess of 600 volts with enameled sheet metal "red on white" signs reading "DANGER--HIGH VOLTAGE."

L. Provide a sign at the service entrance equipment room indicating the type and location of all on site emergency or standby power sources.

M. Identify each outlet box, junction box, and cabinet used in conjunction with empty raceway for wires of a future system by means of indelible markings on the inside denoting the system.

N. Prior to installing identifying tags and nameplates, submit their nomenclature for approval. Conform to all revisions issued by the Architect.

3.8 RACEWAYS AND BOXES

A. EXAMINATION

1. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. WIRING METHODS

1. Outdoors: Use the following wiring methods:

a. Exposed: Rigid steel.
b. Concealed: Rigid steel or IMC.
c. Underground, Single Run: RNC.
d. Underground, Grouped: RNC.
e. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
f. Boxes and Enclosures: NEMA 250, Type 3R.
g. Others as approved elsewhere in this specification.

2. Indoors: Use the following wiring methods:
   a. Exposed: EMT.
   b. Concealed: EMT.
   c. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
   d. Damp or Wet Locations: Rigid steel conduit.
   e. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
   f. Damp or Wet Locations: NEMA 250, Type 4, stainless steel or nonmetallic as shown on drawings.
   g. Others as approved elsewhere in this specification.

C. INSTALLATION

1. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
2. Minimum Raceway Size: 3/4-inch trade size.
3. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.
4. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
5. Install raceways level and square and at proper elevations. Provide adequate headroom.
6. Complete raceway installation before starting conductor installation.
7. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
8. Use temporary closures to prevent foreign matter from entering raceways.
9. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
10. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
11. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.
12. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
13. Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.
    a. Secure raceways to reinforcing rods to prevent sagging or shifting during

concrete placement.

b. Space raceways laterally to prevent voids in concrete.

c. Run conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

d. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.

14. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

    a. Run parallel or banked raceways together, on common supports where practical.

    b. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

15. Join raceways with fittings designed and approved for the purpose and make joints tight.

    a. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.

    b. Use insulating bushings to protect conductors.

16. Tighten set screws of threadless fittings with suitable tools.

17. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

18. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

19. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200lb tensile strength. Leave at leaswt 12 inches of slack at each end of the pull wire.

20. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

21. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-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 at the following points:

    a. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.

    b. Where otherwise required by NFPA 70.

22. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the

floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

23. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission,movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.
24. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
25. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying the raceways to receptacle or fixture ground terminals.
    a. Select each surface raceway outlet box, to which a lighting fixture is attached, of sufficient diameter to provide a seat for the fixture canopy.
    b. Where a surface raceway is used to supply a fluorescent lighting fixture having central stem suspension with a backplate and a canopy (with or without extension ring), no separate outlet box is required.
    c. Provide surface metal raceway outlet box, and the backplate and canopy, at the feed in location of each fluorescent lighting fixture having end-stem suspension.
    d. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, no additional surface-mounted outlet box is required. Provide a backplate slightly smaller than the fixture canopy.
26. Set floor boxes level and adjust to finished floor surface.
27. Set floor boxes level and trim after installation to fit flush to finished floor surface.
28. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

D. PROTECTION

1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.
    a. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
    b. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

E. CLEANING

1. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.9 WIRING DEVICES

A. INSTALLATION

1. Install devices and assemblies plumb and secure.
2. Install wall plates when painting is complete.
3. Install wall dimmers to achieve indicated rating after de-rating for ganging as instructed by manufacturer.

4. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
5. Protect devices and assemblies during painting.
6. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

B. IDENTIFICATION
1. Comply with Division 16 Section "Basic Electrical Materials and Methods."

C. CONNECTIONS
1. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
2. Tighten electrical connectors and terminals according to manufacturers published torque tightening values. If manufacturers torque values are not indicated, use those specified in UL 486AandUL486B.

D. FIELD QUALITY CONTROL
1. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
3. Replace damaged or defective components.

E. CLEANING
1. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

3.10 FUSED POWER CIRCUIT DEVICES

A. INSTALLATION
1. Mount individual wall mounting switches with tops at uniform height, unless otherwise indicated. Anchor floor mounting switches to floor or equipment base.
2. Provide one set of spare fuses.

B. FIELD QUALITY CONTROL
1. Inspect interior of switch enclosures for the following:
   a. Mechanical and electrical connections
   b. Switch and relay type and labeling verification
   c. Rating of installed fuses.
   d. Proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer’s certification.

3.11 PANELBOARDS

A. INSTALLATION
1. Install panelboards and accessories according to NEMA PB 1.1.
2. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
3. Circuit Directory: Create directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a

computer or typewriter to create directory; handwritten directories are not acceptable.

4. Install filler plates in unused spaces.
5. Provision for Future Circuits at Flush Panelboards: 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.
6. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

B. IDENTIFICATION

1. Identify field installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section “Basic Electrical Materials and Methods.”
2. Panelboard Nameplates: Label each panelboard with engraved metal or laminated plastic nameplate mounted with corrosion resistant screws.

C. CONNECTIONS

1. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.
2. Tighten electrical connectors and terminals according to manufacturer’s published torque tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

D. FIELD QUALITY CONTROL

1. Prepare for acceptance tests as follows:
   a. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   b. Test continuity of each circuit.
2. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   a. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded case circuit breakers. Certify compliance with test parameters.
   b. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, otherwise, replace with new units and retest.
   a. Measure as directed during period of normal system loading.
   b. Perform load balancing circuit changes outside normal occupancy/working schedules of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
   c. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
   d. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

E. ADJUSTING

1. Set field-adjustable switches and circuit breaker trip ranges.

F. CLEANING

1. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris, do not use compressed air to assist in cleaning.

3.12 FUSES

A. EXAMINATION

1. Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.
2. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. FUSE APPLICATION

1. Main Service: Class L, fast acting.
2. Main Feeders: Class J, time delay.
3. Motor Branch Circuits: Class RK1, time delay.
4. Other Branch Circuits: Class RK.5, non-time delay.

C. INSTALLATION

1. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.

D. IDENTIFICATION

1. Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

3.13 DISCONNECT SWITCHES AND CIRCUIT BREAKERS

A. INSTALLATION

1. Install disconnect switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.
2. Install disconnect switches and circuit breakers level and plumb.
3. Install wiring between disconnect switches, circuit breakers, control, and indication devices.
4. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer.
5. Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
6. Identify each disconnect switch and circuit breaker according to requirements specified in Division 16 Section "Basic Electrical Materials and Methods."

B. FIELD QUALITY CONTROL

1. Testing: After installing disconnect switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3. Perform visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for disconnect switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

C. ADJUSTING

1. Set field adjustable disconnect switches and circuit breaker trip ranges as indicated.

D. CLEANING

1. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

3.14 INTERIOR LIGHTING

A. INSTALLATION

1. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.
2. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
   a. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
   b. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.
   c. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
3. Suspended Fixture Support: As follows:
   a. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
   b. Stem Mounted, Single Unit Fixtures: Suspend with twin stem hangers.
   c. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
   d. Continuous Rows: Suspend from cable installed according to fixture manufacturer's written instructions and details on Drawings.

B. CONNECTIONS

1. Ground equipment.
   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.

C. FIELD QUALITY CONTROL

1. Inspect each installed fixture for damage. Replace damaged fixtures and components.
2. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.
3. Corrosive Fixtures: Replace during warranty period.

D. CLEANING AND ADJUSTING

1. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.
2. Adjust aimable fixtures to provide required light intensities.

3.15 EXTERIOR LIGHTING

A. INSTALLATION
1. Luminaire Attachment: Fasten to indicated structural supports.
2. Luminaire Attachment with Adjustable Features or Aiming: Attach luminaires and supports to allow aiming for indicated light distribution.
3. Lamp luminaires with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

B. FIELD QUALITY CONTROL
1. Inspect each installed unit for damage. Replace damaged units. Advance Notice: Give dates and times for field tests. Provide instruments to make and record test results.
2. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source, and as follows:
   a. Measure light intensities at night if specific illumination performance is indicated. Use photometers with calibration referenced to NIST standards.
   b. Check intensity and uniformity of illumination.
3. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

C. CLEANING AND ADJUSTING
1. Clean units after installation. Use methods and materials recommended by manufacturer.
2. Adjust amiable luminaires and luminaires with adjustable lamp position to provide required light distributions and intensities.

3.16 ELECTRIC WIRING OF MOTORS AND EQUIPMENT

A. Power wiring and disconnect switches for the proper isolation of each piece of equipment shall be provided under the electrical sections of the specifications, as necessary for operation in the "HAND" position of the HAND-OFF-AUTO control switch.

B. The electrical design is based on the equipment listed in the schedules. Parties furnishing equipment-requiring changes in the electrical design shall pay costs involved in modifying the electrical design to accommodate the equipment involved.

C. Control and interlock wiring for the mechanical systems shall be provided under the mechanical sections of the specifications, as necessary for operation in the "AUTO" position of the HAND-OFF-AUTO control switch. Wiring shall be in strict accordance with wiring diagrams, previously submitted and reviewed "acceptable." Systems include:
1. Plumbing.
2. Fire Protection.
3. Heating, Ventilating, Cooling.
4. Temperature Controls.

D. Furnish complete integrated systems wiring diagrams showing the detailed power wiring, the interlock wiring, and the controls wiring, each relating to the exact equipment purchased for the installation. Include diagram wiring for smoke (or products of combustion) and heat detection devices and equipment furnished in connection with air distribution systems and as well as diagram wiring as required to cause fans to stop if vibration switches are activated by excessive vibration.

E. Wiring diagrams shall be submitted within not more than thirty-five (35) days after equipment selections have been accepted. The diagrams shall be complete integrated wiring diagrams, not manufacturer's equipment drawings.

F. At the completion of the project, and before final inspection, those parties having detailed responsibility for (1) temperature control and interlock wiring diagrams; (2) equipment controlled by the temperature control system; and (3) installation of the temperature control and interlock wiring shall meet at the job site and jointly checkout, test and inspect each control circuit, each interlock and each power circuit to each piece of equipment, and shall advise in writing that each piece of equipment meets their joint approval insofar as performance, operation and interconnect are concerned. This "EQUIPMENT COMMISIONING' form shall be jointly signed by each responsible individual and included in record documents.

3.17 EXCAVATION AND BACKFILL

A. Perform excavation and backfill required for the installation of underground conduit.

B. Cut trenches true and straight and grade bottom to afford uniform bearing of barrel on firm soil. Stack the excavation material in a suitable location. Shore trenches and excavated areas as required for safety, and for security of adjacent earth and structures.

C. Cut through walks, roads, and other structures as necessary for the installation.

D. Install underground electrical conduits in accordance with NEC.

E. Do not place backfill until the work has been inspected, tested and accepted.

F. Backfill material shall be free of cinder or rocks, and free of clods or lumps larger than 1-inch, up to 12-inches above top of pipe, and 2-inches in remainder. If the excavated material is not suitable, provide adequate material from other locations.

G. Backfill by installing clean earth in accordance with the above Specifications in layers no more than 6-inches thick, tamping (and wetting down, if necessary). Place and tamp each layer of initial backfill in 4-inch layers up to pipe centerline, and in 6-inch layers up to 12-inches above the top of pipe. Complete backfill to grade and create a substantial, well-compacted trench to 95 percent compaction by the standard Proctor test.

H. Remove surplus earth or materials remaining after backfilling from the site.

I. Repair utilities, lines, walks, and roads, and other surfaces and structures damaged by these operations to match conditions existing prior to excavation.

3.18 EQUIPMENT SPACE

A. The Drawings indicate scheduled products physically arranged in the spaces, based on catalog data of specific manufacturers.

B. Prepare Shop Drawings indicating the exact physical space requirements for equipment and servicing of equipment actually purchased for each item of equipment involved, and electrical connections, and be fully responsible for costs or modifications required for the installation.

3.19 EQUIPMENT FOUNDATIONS

A. Floor mounted electrical equipment shall be mounted on concrete housekeeping pads at least 4-inches high, poured integral with the floor slab wherever practicable.

B. Pads shall extend a minimum of 15-inches in front of equipment where necessary to afford operating surface no more than 78-inches beneath the center of the highest operating handle in its position.

C. Coordinate pad sizes locations and mounting channel imbeds.

D. Furnish templates for channel imbeds.

E. Provide isolation materials and inertia blocks; see Vibration Isolation Section for specific requirements.

F. Provide necessary supporting steel required for the electrical systems.

G. Set equipment, and grout the equipment to the base, and fill void spaces with no shrinking grout. Dowel direct driven equipment and driving motors to their common mounting frame after final alignment and run-in.

3.20 SUPPORTS, SEISMIC DESIGN

A. Provide anchors, connections, bracing or other supports necessary to prevent damage to electrical systems or equipment, or to the building structure from such, as a result of an earthquake producing design horizontal seismic forces. Obtain building seismic rating from architect/ structural engineer.

3.21 INTERFERENCES

A. Relocate or reroute wiring, as required to facilitate construction of finished work as planned. Restore surfaces, insulation, and finish to match condition of adjacent work.

3.22 CUTTING AND PATCHING

A. Assume costs and responsibility for cutting and patching required to complete the installation.

B. Patch surfaces to the condition of the adjacent surfaces.

3.23 PAINTING AND FINISHING AND CLEANING

A. Finish painting (other than factory applied) and electrical equipment, and its associated conduit and devices are specified elsewhere in the Specifications. Provide touch-up painting of pre-finished electrical products.

B. Leave surfaces clean and remove debris.

3.24 OPTION TO RELOCATE OUTLETS AND RELATED DEVICES

A. Lighting fixtures, convenience outlets, floor outlets, telephone outlets may, at the Owners option, be relocated to a point within 10 feet of the location indicated on the Drawings, at no additional cost to the Owner, provided the Contractor is advised of this relocation before Shop Drawing preparation or roughing-in begins.

B. Only work, which must be re-performed in this connection, will be considered extra.

3.25 EQUIPMENT CONNECTIONS

A. Provide wiring for the connection of motors and control equipment and control wiring as indicated on the Electrical Drawings.

1. Equipment installed under other sections of the Specifications - wiring shall be extended to the equipment, and proper connections made thereto.

2. Flexible connections of short lengths - Shall be provided for equipment subject to vibration or movement and for motors. Liquid-tight conduit shall be used in wet locations. A separate ground conductor shall be provided across flexible connections.

a. Length of flexible connections for motors shall be at least 11-inches plus 1/4-inch per horsepower up to 100 hp, and need not be longer than 36-inches unless otherwise indicated.

b. Length of flexible connections for transformers shall be at least 11 -inches plus 1/4-inch per kVA up to 100 kVA, and need not be longer than 36-inches unless otherwise indicated.

3. Power connections to any vibration isolated equipment shall be made with a length of flexible conduit having a 90 degree bend in it between the junction box on the equipment and any non-flexible conduit.

4. Owner furnished equipment: Wiring shall be extended to the equipment, and proper connections made thereto.

3.26 OUTLET BOXES

A. Wall switches shall be mounted on the strike side of the doors, as finally hung, whether so shown on the Drawings or not.

B. More than one conduit connection to outlet or junction boxes smaller than 4 x 4 x 11/2-inches is prohibited.

C. Outlet boxes shall be placed at heights as scheduled and to meet ADA requirements. Otherwise, install at the following heights, center of box to finished floor level:

1. Wall switches - 4'-O".

2. Convenience outlets and telephones - l'-6".

3. Wall bracket outlets - 6'-6".

3.27 CONDUIT INSTALLATION

A. Coordinate installation of raceways with building structure and other mechanical trades, complete with bends, fittings, and junction and pull boxes to meet codes and make complete operating systems. Raceways 1-inch and larger shall not be run in concrete slabs without approval of structural engineer.

B. Complete continuous raceway shall be provided for pulling and installation of wires. All wiring shall be run in raceways unless otherwise specified.

C. In general, conduits shall be concealed in finished areas, and may be exposed in unfinished areas, run square to the building construction, and continuous from outlet to outlet, connected mechanically and electrically to assure grounding. Conduits shall be cut square, reamed to full size, shouldered without butting into couplings or fittings. The threads shall be of standard length and diameter required for the size of the conduit used, and graphite bearing thread lubricant shall be used in making up the threads. Running threads will not be acceptable. Conduits shall have a smooth interior surface free of obstructions, shall be capped with conduit seals during the construction period, shall be uniformly sloped to eliminate trapped condensation, shall be thoroughly cleaned and dry before pulling any wire. Conduit installation shall clear hot pipes not less than 6-inches.

D. Rigid conduit or electrical metallic tubing shall not be rigidly connected to vibrating equipment. Use flexible conduit or Sealtite.

E. Conduit installation above accessible ceilings shall be such that there will be no interference with the installation of lighting fixtures, air outlets or other devices.

F. Conduit installed underground, in concrete or masonry:

1. Joints shall be made liquid-tight and shall engage not less than five threads.
2. Conduit in concrete shall be placed so that no portion of the conduit or couplings are exposed, and at a sufficient depth to prevent cracking or spalling. Conduit 1-inch or larger shall not be placed in walls or slabs except as specifically indicated.
3. Provide red colored concrete encasement for scheduled conduit systems installed underground.
4. Steel conduit underground, which is not concrete encased, shall be given cold applied protective tape coating, applied in accordance with manufacturer's instructions.
5. Conduits embedded in slabs except as specifically indicated or written approval is obtained shall not cross structural expansion joints. Provide conduit expansion joints in the event such crossings are permitted.
6. Place all conduit concealed in poured-in-place structure behind reinforcement bars.

G. Exposed conduit shall be parallel with or at right angles to, building lines, beams or ceilings with symmetrical ends or metal boxes placed at changes in direction or at taps.

H. Connections to wiring enclosures - Secure conduits to outlet boxes or wiring enclosures with double lock nuts. Where conduit boxes with threaded hubs are used, conduits shall engage at least five threads in the hubs. Provide plastic insulating bushings for rigid conduits (similar to O.Z. Type A). Provide connectors with plastic insulated throats for electrical metallic tubing termination.

I. Provide cable supports at the top of vertical runs for conductors 4 AWG and larger, and otherwise where required by NEC.

J. Minimum size conduit is 1/2-inch.

3.28 FASTENINGS

A. Fastenings for raceways and boxes shall be made by means of toggle or expansion bolts sized for the loads imposed based on manufacturer's recommendations.

B. Fastenings to masonry or concrete shall be made by means of machine screws sized for the loads imposed based on manufacturer's recommendations.

C. Outlet box supported fixtures - Lighting outlets rigidly supported independently by means of expandable bar hangers or metal strut framing system affording a safe and substantial support for the equipment, and utilizing manufacturer's recommendations for the loads and conditions imposed. Fixtures will not be supported solely from the box cover bolts.

D. Outlet, pull, or junction boxes shall be supported from joists or other structural framing (not finish wall or ceiling panels) by expandable bar hangers or metal strut framing system.

E. Panels may be attached directly only to permanent structural walls. Support panels located on nonpermanent partition walls independent of the wall with metal strut framing system attached to permanent structure (slab or framing members).

3.29 RACEWAY SYSTEMS

A. Provide grounded raceway systems with conduit, cabinets, outlet boxes, junction boxes, backboards, and miscellaneous appurtenances required for complete system. Leave empty raceway systems complete with poly 200 lb nylon pull cord or #10 gage pull wire, minimum 2 feet extra length at each end, properly tagged to indicate terminal points and length of runs (at junction boxes as well as terminations).

B. Systems shall meet requirements of, be accepted by, and be approved by the code authority, utility, equipment supplier, Owner, Contractor or subcontractor furnishing system equipment and wiring for the system involved.

C. Provide minimum 3/4-inch size empty conduit unless otherwise indicated.

D. Partial raceway systems include systems that allow open wiring installed above accessible ceilings utilized as plenums (with special plenum cables) or where the ceiling cavity is not utilized as an air plenum. Hollow walls with system wall outlets may serve as raceway where approved by code. Provide wall plaster frames, coverlets, and pull wire from box to above accessible ceilings.

E. Furnish and install empty conduit, cabinets, outlet boxes junction boxes, backboards and other miscellaneous appurtenances required for the systems specified. Conduit shall be as specified, and empty systems left complete, with 14-gage steel pull wire in each unit, ends properly tagged. Backboard shall be as specified, and cabinets shall be complete with doors and snap latches as specified for "distribution Panel boards".

F. Underground conduit intended for future use shall be identified by permanent concrete markers indicating location and intended use. Locate at each end and at each change of direction as a minimum.

3.30 CONDUCTOR INSTALLATION

A. Wire and cable No. 10 and smaller shall be factory color-coded. Provide factory color-coding for No. 8 and No. 6 wire and cable or mark conductors on each end and in all

junctions or pull boxes with three-inch band of colored pressure sensitive plastic tape or by the use of brilliant waterproof lacquer properly applied. Colors for each phase and the neutral shall be consistent throughout the system.

B. When voltage to ground does not exceed 120 volts, the minimum size conductor for use in lighting and power branch circuits shall be No. 12 AWG, except that the minimum size for control circuits (switch legs) shall be No. 14 AWG. Home runs longer than 100 feet actual wire length from panel shall be no smaller than No. 10 AWG.

C. Cable terminals, taps and splices No. 6 and larger shall be made secure with UL listed solder less indenter compression barrel type connectors wherever practicable. UL listed setscrew lugs may be used on circuit breakers, motor starters, and switches not available with indenter connections. Joints in conductors No. 8 and smaller shall be made by applying a UL listed insulated, cadmium plated, live steel spring type connector in sizes up to the catalog capacity of the connector.

D. If permanently installed, do not install wires in conduit until entire system of conduit and outlet boxes is in place. Conductors shall be pulled using a UL listed wire lubricant.

E. Conductors in conduits shall be continuous and without splices except in junction boxes. Indenter compression barrel type lugs shall be used for stranded conductor terminations except UL listed bolted compression type connectors or lugs, factory furnished on such devices as circuit breakers, switch units and motor starters, may be utilized. Indenter compression type connections shall be used to make splices, taps and motor connections.

F. Insulate splices, taps, and connections such that the insulation of the joint is no less than the insulation of the wire. Insulate with manufactured lock-on splice caps or build up with rubber tape applied directly to the joint, and then cover with thermoplastic electrical tape.

G. Exercise care when installing wire in conduit so as to prevent injury to the conductor insulation. Mechanical means of pulling shall not be used unless approved. Conductors shall be pulled using UL listed lubricant.

H. Whenever wiring leaves the conduit and terminates at a terminal board, the wiring shall be formed and laced with waxed twine, or plastic wire ties.

I. In the event circuits feed through outlet boxes, provide splice and pigtail for device connection, with sufficient slack to pull splice out of box at least 6-inches (for inspection).

J. Switched duplex receptacles: The ungrounded pole of each receptacle shall be provided with a separate terminal. Bottom receptacle shall be switched when installed.

3.31 ELECTRICAL TESTING

A. This Section applies to the testing of systems in Division 16 of the Specifications.

B. Qualifications:

1. Competent and experienced personnel, having done similar work in the past, and whose qualifications shall be subject to approval, shall perform testing of systems.

2. Submit names and qualifications of all persons proposed for testing of electrical systems and equipment.

C. Reports:

1. Provide reports and certificates required in each category of testing, adjusting and balancing, signed by both the technician performing the work and the Contractor as representing accurate, factual data, based on readings in the field.
2. Reports shall be in triplicate on 8-1/2 x 11 -inch white bond paper. Submit format for recording data for approval prior to use.

D. Equipment and Material:

1. Provide all meters, instruments, equipment and materials necessary for performance of tests.
2. Testing apparatus, not part of the permanent installation, shall remain the property of the Contractor.
3. Provide gaskets, lubricants and other expendable materials required to be replaced during the execution of the work.
4. Provide fuel, if any, as required for tests.

E. Equipment:

1. Test and adjusted all electrical equipment to insure correct functional performance. Inspect, lubricate, test and adjust equipment and correct defects or damages before connecting the equipment to the system.

F. Wiring:

1. Test power, lighting and control wiring or bus duct for continuity, short circuits and improper grounding.
2. Test each grounding circuit separately for continuity.
3. Values of insulation resistance shall meet the standards established by the National Electrical Code.
4. If faults are detected, the point or points of such fault shall be located and the defective wiring replaced at the Contractor's expense.

G. Acceptance Tests:

1. Leave the entire electrical system installed under this Contract in proper working order. Upon completion of the installation, an acceptance test shall be run to ascertain that starters, circuit breakers, motors, relays, indicating lights, pushbuttons, alarm devices and other electrical equipment and controls are operating correctly as required for the overall operation of the facility.

H. Submit certified reports indicating full compliance with test requirements.

I. Make replacements or repairs to tested products, which are damaged as result of tests.

J. Schedule tests at a time convenient to required witnesses or persons affected by the tests.

K. Give written notification for test procedures, prior to the test.

L. Upon completion of the work, recheck electrical connections, cable to bus, cable to panels, bus to bus, throughout the job for tightness.

M. Check motors for correct rotation.

N. Test electrical systems grounding prior to completion of the work. Note ground resistance together with method of testing. For ground rods, note the soil condition at the time measurements were made. Ground resistance shall not exceed 25 ohms.

O. Test feeder and power circuits No. 8 AWG or larger with a "Megger" from each conductor to ground and between conductors. Record each reading. At the completion of work certify the results of the "Megger" testing.

P. After the electrical equipment and the wiring is installed, and prior to energizing for the first time any section of the electrical system, test phase-to-phase and phase-to-ground insulation on feeders and sub-feeders switchboards, dry-type transformers, motors, and other pieces of electrical equipment to assure that they have the proper insulation and are free of grounds. Systems rated above 250 volts shall be tested with a 1000-volt Megger. Circuits rated at or below 250 volts shall be tested with a 500-volt Megger.

Q. Energize each receptacle outlet and test each outlet with a plug-in receptacle circuit tester with indication for "correct wiring", "open ground', "hot ground", "reversed polarity", "open neutral', "hot unwired", "hot and ground reversed", "GFCI trip', and "GFCI test'. Correct any deficiencies discovered during testing.

R. Light and test each lamp. Prove and test energy available at the load side of disconnects switches, breakers and the final point of connection to driven equipment. Make such reasonable tests required to assure a complete electrical installation in first class condition and ready for operation.

S. Branch circuits served from lighting panel boards vary in loading. When entire load is turned on and system is operating at 100 percent demand, the initial unbalance should not exceed 10 percent. In the event greater unbalance exists, report the measured individual branch circuit loads and panel feeder loads and request instructions.

T. Furnish at the completion of the Project a final inspection certificate from the local inspecting authority.

U. Perform the following testing and certify test results-

1. Phase-to-phase and phase-to-ground resistance
   a. At the supply line terminals of each item of electrical distribution system equipment.
   b. At supply side of each feeder and sub-feeder.
   c. At high voltage and at low terminals of each transformer.
   d. At line terminals of each motor.
   e. At any other point required by the Architect.
2. Ground resistance at each panel neutral bus.
3. Voltage to ground on each secondary leg of each transformer at no load and full load.
4. Service voltage at switchboard at full load between phases and to ground.
5. Line current in each line of each power transformer and at switchboard at full load, taken at completion of project.

V. Failures or improper operations shall be corrected. Furnish necessary test equipment and pay cost of testing, replacing and repairing.

3.32 TELECOMMUNICATIONS

1. The Contractor shall remove all oil, grease, or other stains resulting from his work performed in the building or the exterior thereof.

2. The Electrical Systems and associated materials shall be covered by the warranty for a period of one year. All materials, installation, and workmanship shall be warranted during the warranty period. That is, any item will be repaired at no charge for any defects for one year after the date of acceptance.

END OF SECTION

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SECTION 311000 - 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. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities.
7. Temporary erosion and sedimentation control.

B. Related Requirements:
1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.
2. Section 024116- Structure Demolition for coordination with removed structures
3. Section 312300-Earthwork for coordination of removal and clearing related to earth moving and excavation.

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.

D. 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 (50 mm) in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 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 per Section 013233 Construction Photographs.
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. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 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.

1.7 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 traffic-ways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises.

C. Utility Locator Service: Notify Dig Safe System for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. 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 312300 "Earthwork."

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.

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 according to requirements specified elsewhere in the Contract Documents.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
   1. Arrange with utility companies to shut off indicated utilities. Owner will assist with contact information.

B. Locate, identify, and disconnect utilities indicated to be abandoned in place.

C. Interrupting Existing Utilities: Do not interrupt utilities serving adjacent properties, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

   1. Notify Owner and OPM not less than (7) seven days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

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 2 inches (50 mm) in diameter, obstructions, and debris to a depth of 18 inches (450 mm) 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.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth > 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 (50 mm) 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 (1800 mm).
   2. Do not stockpile topsoil within protection zones.
   3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction including yellow concrete benches.

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.

3.8 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 nonrecyclable 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 311000

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SECTION 312300 - EARTHWORK

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. The work of the Section consists of all earthwork and related items as indicated on the Drawings and/or as specified herein including, but is not necessarily limited to, the following:
   1. General excavation for work indicated.
   2. Trench excavation for work indicated.
   3. Providing, placing and compacting fill materials.
   4. Drainage and dewatering for work indicated.
   5. Off-site disposal of excess or unsuitable material.
   6. Rough grading.

B. Related Requirements:
   1. Section 024116- Structure Demolition for coordination with removed structures
   2. Section 131520-Swimming Pool Construction and Coordination of Pool tank and earthwork requirements
   3. Section 311000- Site Clearing for coordination with removal of existing soils and removal of structures

1.3 STANDARDS AND DEFINITIONS

A. The following standards and definitions are applicable to the work of this Section to the extent referenced herein:
   1. ASTM: American Society for Testing and Materials.
   2. AASHTO: American Association of State Highway and Transportation Officials.
   3. Rock Excavation: Rock shall be defined as bedrock or original ledge which cannot be removed by conventional excavating equipment (Komatsu PC650LC-8 with a 4.98 cubic yard bucket or equivalent) and which requires the use of drills, explosives and/or a rock splitter, as well as individual boulders over two cubic yards in open excavation and over one cubic yard in trenches that are removed by power excavating equipment without the use of drills or explosives.
   4. Unsuitable material: is material that is not satisfactory for its intended purpose. Material such as but not limited to loam, subsoil, organic material, debris, frozen material or weak, soft, and uncompacted soil, including fill, or material containing roots or other organic matter all as determined by the Architect shall be considered unsuitable for supporting structures and pavements. Material that is rendered unsuitable through the Contractor's means and methods of construction will not be considered unsuitable for payment

purposes even though the Contractor is required to remove and replace the unsuitable material.

1.4 SITE CONDITIONS

A. The Contractor shall fully inform himself of existing conditions at the site and shall be responsible for carrying out all site work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.

B. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best of the Architect's knowledge, but the Contractor shall have examined them for himself during the bidding period and formed his own conclusions as to the full requirements of the work involved.

1.5 PERMITS, CODES, AND SAFETY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of the Town of Hamilton , the Commonwealth of Massachusetts, and all other authorities having jurisdiction over the Project Site. The Contractor shall provide all labor, materials, equipment and services necessary to make the work comply with these requirements without additional cost to the Owner.

B. Comply with the provisions of the Manual for Accident Prevention in Construction of the Associated General Contractors of America, Inc., and the requirements of the Occupational Safety and Health Administration, United States Department of Labor.

C. The Contractor shall obtain all permits and licenses required for the complete work specified herein and shown on the Drawings. Fees for permits issued by the Town of Hamilton have been waived.

D. The Contractor shall not close or obstruct any street, sidewalk, or passageway without written permission from authorities having jurisdiction. The Contractor shall so conduct his operations as to interfere as little as possible with the use of roads, driveways, or other facilities near enough to the work to be affected by the work.

E. Any apparent conflict between the Drawings and Specifications and the applicable Codes and Regulations shall be referred to the Architect in writing, for resolution before the work is started.

F. Contact Dig-Safe at 811 prior to start of excavation work. M.G.L §40A-40E requires notification a minimum of 3 business days before start of work.

1.6 LAYOUT AND GRADES

A. The Contractor shall maintain and existing benchmarks and survey monuments shown on the Drawings or establish new temporary benchmarks and layout points found to provide a base

reference for the construction. Refer to Section 017300- Execution for construction layout requirements.

B. The words "finished grades" as used herein shall mean final grade elevations indicated on the Drawings. Spot elevations shall govern over proposed contours. Where not otherwise indicated, project site areas shall be given uniform slope between points for which finished grades are indicated or between such points and existing established grades.
   1. Refer to all Documents including building, pool, and deck plans for grading.

1.7 PROTECTION OF EXISTING CONDITIONS

A. The Contractor shall observe all rules and regulations governing the respective utilities in executing work under this Section. All work shall be executed in such a manner as to prevent any damage to existing buildings, streets, curbs, paving, service utility lines, structures and adjoining property.

B. Locate and mark underground utilities to remain in service before beginning the work. Protect all existing utilities to remain in service during operations. Do not interrupt existing utilities except when authorized in writing by authorities having jurisdiction.

C. When an active utility line is exposed during construction its location and elevation shall be plotted on the Record Drawings by the Contractor and both the Architect and the Utility Owner notified in writing.

D. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged, capped or filled. The location of such utilities shall be noted on Record Drawings and reported in writing to the Owner.

E. Provide barricades, fences, lights, signs, and all other safety devices required for the protection of the public.

F. In case of any damage or injury caused in the performance of work the Contractor shall, at his own expense make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing streets, sidewalks and curbs damaged during the project work shall be repaired or replaced to their condition prior to commencement of earthwork operations.

1.8 SUBMITTALS

A. Issue submittals in accordance with Division 1. Submittals under this Section shall include manufacturer's specifications and installation instructions

1.9 TESTING

A. The Owner will retain a Testing Agency to perform on-site observation and testing during the construction operations. The Contractor shall coordinate the individual's required presence on the site with the Town and the construction activities. The services of the shall include the following:

1. Assessing conditions at the bottom of excavations for foundations, pool bottoms, and slab subgrade.
2. Field testing to assess degree of compaction.
3. Laboratory testing and analysis of fill materials specified, as required.

B. The Testing Agency's presence does not include supervision or direction of the actual work by the Contractor, his employees, or agents. Neither the presence of the Testing Agency nor any observations and testing performed by their representatives, nor any notice or failure to give notice, shall excuse the Contractor from defects discovered in the Work.

C. The Contractor shall provide a 50-pound sample of each fill material from each proposed source of supply. The Contractor shall include the name of the source and identify the specification item for which the material is proposed. Allow sufficient time for testing and evaluation of results before materials are needed. Once a source of supply for a specific material has been accepted for use on the project, the Contractor will bear the cost of testing for any additional materials submitted for the same use. This also includes the event where the gradation of the material within the source changes.

D. Architect will be sole and final judge of suitability of all material.

E. The Testing Agency will determine the maximum modified dry density and optimum water content of fill materials in accordance with ASTM D1557, Method D, and the in-place density in accordance with ASTM D1556 or ASTM D2167.

F. Tests of materials as delivered may be made from time to time. Materials in question shall not be used pending test results. The Contractor shall remove and legally dispose of off-site all rejected materials and replace with new, whether in stockpiles or in-place.

G. The Contractor shall bear the cost of testing materials that fail to conform to the Specifications.

1.10 RECORD DRAWINGS

A. See SECTION 017839- Project Record Documents for provisions relative to record drawings.

1.11 CONTRACT WORK

A. All excavated material is unclassified general excavation and shall be removed and disposed of as required under this section.

B. If any part of the excavation is carried through error beyond the depth directed by the Architect and the dimensions indicated on the Drawings, or called for in the specifications, the Contractor, at his own expense shall furnish and install compacted gravel fill as directed by the Architect up to the required level and/or dimensions.

C. Excavation, removal, and/or disposal of unsuitable materials below the grades called for on the Drawings and specified herein, and additional rock as herein defined, shall be paid for in accordance with the "Contract Unit Price " or as determined by provisions of the Contract and Conditions of the Contract, after removal of such materials has been authorized by the Architect. The quantities of excavation, removal, disposal and backfilling involving an ad-

justment of the Contract Price shall be subject to measurement verification and approval by the Architect, prior to the removal of such materials. The Contractor shall not be compensated for removal of material lower than the depths determined by the Architect. The Contractor shall backfill unauthorized excavations with material and in a manner acceptable to the Architect.

D. Base Contract: The following lines shall be used to determine volume of materials to be excavated, removed or backfilled within the Base Contract. No additional payment shall be made for material lying within the specified limits.
   1. Footings and slabs: A vertical line twelve inches from the toe of the footings. The depth shall be measured to the 12-inches below the bottom of footings and slabs or as shown on the drawings, whichever is greater.
   2. Pool Excavation: A line below the finish pool bottom established by the depth of the pool structure, sumps, piping and fittings and crushed stone drainage course below the pool.
   3. Surface areas outside of structures: To the depth of the required subgrade.
   4. Utility structures: Twenty-four inches outside of the walls and to the bottom of the structures.
   5. Utility trenches: Width shall be the outside diameter of the pipe plus two feet. Maximum depth shall not exceed the bottom of the pipes, etc. Banks of trenches shall be measured vertically; if depth of excavation exceeds safety standards, cutback of excavation to establish a safe angle of repose or use of trench box shall be included in the Base Contract.

E. Compensation for all work required under this Section and not specifically covered elsewhere, shall be included in the Base Contract.

F. Rock excavation : It is assumed that rock excavation is not part of the work.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Fill materials shall conform to the following material descriptions. Gradation requirements shall be determined by ASTM D422 unless specified otherwise.

B. All material shall be well graded between the gradation limits shown.

C. Material termed “recycled”, “reprocessed”, or the like containing ground building debris, bituminous pavement or other similar non-soil materials or material coming from sources other than natural sand or gravel borrow pits free of hazardous residue shall not be used on this project without approval by the Architect.

D. On-site material for use in compacted fill shall meet the requirements specified herein for the intended material.

E. Processed Gravel: Shall consist of inert material that is hard, durable stone and course sand, free of loam and clay, surface coatings and other deleterious material. Approved source of bank run gravel my mechanical process meeting the requirements of M1.03.1.

U.S. Sieve No.	Percent Finer by Weight
3"	100
1/2"	70-100
¼ inch	50-85
No. 04	30-60
No. 200	0-10

F. Gravel borrow shall consist of inert natural non-recycled material that is hard, durable stone, gravel and coarse sand, free from loam and clay, surface coatings, and deleterious materials. The material shall be well graded between the following limits:

U.S. Sieve No.	Percent Finer by Weight
3"	100
1/2"	50-85
No. 4	40-75
No. 10	30-60
No. 40	10-35
No. 100	5-20
No. 200	2-10
The amount passing the No. 100 sieve shall be between 40% and 70% of that amount passing the No. 40 sieve	

G. Dense graded crushed stone shall consist of angular material derived from a stone quarry that is hard, durable and free of deleterious materials. Material shall be free from clay, loam or other plastic material. Gradation shall conform to MHD Specification Designation, M2.01.7, and the following:

U.S. Sieve No.	Percent Finer by Weight
2"	100
1-1/2"	70-100
3/4"	50-85
No. 4	30-55
No. 50	8-24
No. 200	3-10

A. Granular fill shall consist of inert natural non-recycled material that is hard, durable stone, gravel and coarse sand, free from loam and clay, surface coatings, and deleterious materials. The material shall be well graded between the following limits:

U.S. Sieve No.	Percent Finer by Weight
2/3 loose lift thick-ness	100
10	30-95

40	10-70
200	0-15

H. Crushed stone shall consist of inert angular material derived from a stone quarry that is hard, durable, washed stone, free of deleterious materials. Gradation shall conform to MHD Specification Designation, M2.01.2 (1 ½ inch) , M2.01.4 (¾ inch), and the following:

U.S. Sieve No.	M2.01.4 Percent Finer by Weight	M2.01.2 Percent Finer by Weight
2”		100
1.5”		95-100
1"	100	35-70
3/4"	90-100	0-25
1/2"	10-50	
3/8"	0-20	
No. 4	0-5	

I. Ordinary borrow shall be well graded, natural inorganic soil, meeting the following requirements:
1. It shall be free of organic or other weak or compressible materials, of frozen materials, and stones larger than six inches maximum dimension and not more than 35 percent passing the number 200 sieve.
2. It shall be of such nature and character that it can be placed in embankments and compacted to the specified density in a reasonable length of time.
3. It shall be free from highly plastic clays, from all materials subject to decay, decomposition, or dissolution and from cinders or other materials that will corrode piping or other metal.
4. It shall have a maximum dry density of not less than 110 lbs. per cubic foot.
5. Material from excavation on the site may be used as ordinary borrow if it meets the above requirements and is approved by the Architect.

H. Sand for Pipe Bedding: Material for pipe bedding shall meet the requirements specified in ASTM C144

I. Unsuitable Material: Material containing organic matter, frozen materials, debris, clay, materials subject to decomposition and silts too wet to be stabilized which, in the opinion of the Soils Engineer, do not satisfy the design requirement, shall be unsuitable material.

2.2 GEOTEXTILE FABRIC BELOW CRUSHED STONE

A. Geotextile Fabric shall consist of Mirafi 140N or approved equal.
1. A needle-punched nonwoven geotextile composed of polypropylene fibers, formed into a stable network such that the fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids. Fabric must meet AASHTO M288-06 Class 3 for Elongation > 50%.

2.3 DRAIN PIPE AT EDGE OF POOL DECK

A. Drainpipe shall consist of four-inch diameter perforated PVC drainpipe as shown on the drawings and normally used for underdrains. The pipe shall meet the requirements of Section M5.03.7 of the MHD Specifications. Perforated pipe shall have 2 rows of ½-inch diameter holes spaced on not more than 6-inch centers.

B. Drainpipe Option: 4-inch corregated HDPE slotted drain pipe covered with a black synthetic sock Slot perforation pattern rotated 60 degrees very other valley.
   1. Equal to ADS Pipe No. 04730100BSor equal

2.4 USE OF MATERIALS

A. Fill materials listed above shall be utilized as follows and as otherwise indicated on the Drawings, specified or directed.
   1. Processed Gravel:
      a. Base for concrete pavements and slab.
      b. Sub-base for bituminous concrete road and parking lot pavements.
      c. Backfill at foundation walls and pool perimeters.
   2. Dense Graded Crushed Stone:
      a. Base for bituminous concrete pavement where indicated.
   3. Granular Fill:
      a. All fill within the structure and as backfill adjacent to walls not specifically designated as Gravel Borrow or Crushed Stone.
      b. Trench backfill for drainage and utility structures.
      c. Trench backfill for drain, sewer and water pipe.
      d. Sub-base for bituminous concrete road and parking lot pavements where indicated.
   4. Crushed Stone:
      a. ¾”-size: below pool, 12 inches.
   5. Sand for Pipe Bedding:
      a. Bedding and blanket for utility lines or as shown on the drawings.
   6. Ordinary Borrow:
      a. For general site fill where other material is not specified.
   7. Geotextile Fabric:
      a. Below the crushed stone layer below the pool, wrapped around crushed stone at foundation drains, or where otherwise shown on the drawings or directed.

2.5 EQUIPMENT

A. Compaction equipment shall consist of power-driven vibratory equipment and/or hand-guided mechanical tampers as approved by the Architect and capable of achieving the required degree of compaction in a reasonable length of time.

B. Provide sufficient numbers of equipment units of suitable types to spread, level, and compact fill promptly upon delivery of materials.

2.6 PERMANENT MONITORING/WELL POINTS

A. In order to provide monitoring points and locations to place submersible pumps in the future buy the Owner, well points are required where indicated on the drawings: Well points include:
   1. 18-inch diameter HDPE piping, installed vertically from top of 12 inch crushed stone drainage course to below finish grade or Portland cement pavement. Coordinate height with frame and cover specified herein.
   2. Wrap bottom of pipe with geotextile fabric specified above.
   3. Cast a 30 by 30 inch wide, by 18 inch deep concrete collar around top of pipe.
   4. Provide FRP Composite Access Cover equal to Fibrelite FL 180, 18-inch diameter flat composite access cover and frame.
      a. Skid resistant surface
      b. Color to be UV stable “concrete color” within concrete decks and green within lawn areas.
   5. Provide No. 2 will backfill an finish around valve box.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The Drawings indicate, in general, alignments, grade elevations and invert elevations. Establish the lines and grades in conformity with the Drawings. The Architect, however, may make such adjustments in the field in grades and alignments as are found necessary in order to avoid interference with any special conditions encountered.

B. Spot elevations shall govern over proposed contours. Where not otherwise indicated, project site areas shall be given uniform slopes between points and existing established grades.

C. Establish and maintain suitable stakes over all areas to be graded as directed, specified or required. Maintain sufficient reference points at all times during construction to properly perform the contract installation.

D. Mucky, soft, loose or spongy soils or other material designated by the Architect shall be considered unsuitable for construction purposes and shall be removed from the site. Material rendered unsuitable by the Contractor's methods of construction shall not be defined as unsuitable soil for payment purposes.

E. The Contractor shall take all required measures to avoid disturbance of the subgrade particularly in consideration of the susceptibility of on-site soils to disturbance in the presence of surface water and groundwater.

F. Any excess excavation that has been carried, through error, beyond specified depths or dimensions shall be backfilled by the Contractor at his own expense with compacted gravel, with concrete, or with other material as directed by the Architect.

G. No excavation shall be deposited or stockpiled at any time so as to endanger portions of new or existing structures, either by direct pressure or indirectly by overloading banks contiguous to the operation. Material, if stockpiled, shall be stored so as not to interfere with the established

sequence of the construction. If there is not sufficient area available for stockpiling within the limits of the project, the Contractor will be required to furnish his own area for stockpiling.

H. When the plans require excavation in areas in close proximity to existing buildings, roads, structures and utilities it shall be the responsibility of the Contractor at his expense to use satisfactory means and methods to protect and maintain the stability of such roads, and structures located immediately adjacent to but outside the limits of excavation.

I. Do not excavate to full depth for footings in freezing weather unless concrete or backfill can be placed immediately. Following the placement of concrete footings, soil beneath footings shall be adequately protected from frost.

J. All foundations and slab shall bear directly upon the natural undisturbed soil or rock. In the case of rock, the material shall be sound and removed to a depth of 12-inches below the bottom of the footing. Crushed stone or gravel borrow backfill shall be used between the rock and footings as directed by the Architect or shown on the Drawings

K. All soil bearing surfaces shall be carefully hand-cleaned of all loose soil. The final cut to expose foundation bearing surfaces consisting of soil shall be made utilizing a smooth edged excavating bucket or a bucket with teeth placed horizontally to prevent disturbance of the bearing surface. Upon completion of excavation to the final footing subgrade, a 3-inch thickness of crushed stone or a lean concrete mud mat shall be placed to protect the bearing surface from disturbance. All disturbed bearing surfaces shall be repaired and recompacted to the specified density.

L. Rock bearing surfaces shall have all loose and/or displaced rock fragments removed and shall be leveled to a maximum slope of 1 vertical to 12 horizontal across the footing area. Cleaning shall be done with high pressure air jets, water jets, brooms or by any other method acceptable to the Engineer. All additional dental concrete required to replace overbreak rock shall be provided by the Contractor at no additional cost to the Owner. Rock surfaces that are steeper than 1 vertical to 12 horizontal may require pinning if directed by the Architect.

M. No excavation shall be made below the groundwater level without lowering the groundwater level. The bottom of the excavation must be free of standing water and visible.

3.2 GENERAL EXCAVATION

A. All materials required to be excavated to permit construction of the proposed building and associated site improvements shall be included in the Contract Price as stated in the Measurement and Payment Section.

B. General excavation shall consist of all excavation not included as trench excavation.

C. Work of cutting and filling shall be scheduled to efficiently use all acceptable excavated materials as directed by the Architect. If necessary, such materials shall be temporarily stockpiled between excavation and filling operations. The Architect shall approve locations for stockpiles.

D. Temporary ditches shall be made as needed to drain off surface water to avoid damage to areas of cut or fill. Such ditches shall be maintained as required for efficient operation, at no additional cost to the Owner.

E. When excavations have reached the required depths, the Architect shall be notified and will make an inspection of the conditions. After inspection, the Contractor will receive approval to proceed if conditions meet design requirements.

F. No excavation will be permitted below a line drawn downwards at 2 horizontal to 1 vertical from the underside of the closest edge of any in-place footing or utility at a higher elevation without providing adequate sheeting and bracing as defined above to prevent all movement of the in-place footing or utility.

G. Removal of existing paving, sidewalk, and curb shall be for the full depth thereof and shall include any base courses. The Contractor shall use power saws or other suitable tools, equipment, and methods for cutting and trimming, that will remove the materials to the neat lines as shown on the Drawings, or as directed by the Architect, with a minimum damage to pavement, sidewalk, and curbs that are to remain. Damage done at these locations shall be repaired and restored by the Contractor at his expense.

H. The ground adjacent to all excavation shall be graded or shall have a bituminous concrete berm to prevent surface water from running into the excavation. Keep excavations free from water. No claims for additional cost will be allowed for pumping and draining required for excavations.

I. It is assumed that the Contractor has fully familiarized himself with subsurface conditions and that the Contract Sum has included all necessary drainage costs for the Work under this Section.

3.3 TRENCH EXCAVATION

A. Excavate as necessary for all drainage pipes, utilities and related structures and appurtenances, and for any other trenching necessary to complete the work.

B. Definitions:
   1. Trench shall be defined as an excavation of any length where the width is less than twice the depth and where the shortest distance between payment lines does not exceed ten (10') feet. All other excavations shall be defined as open excavations.
   2. The words "invert" or "invert elevation" as used herein shall be defined as the elevation at the inside bottom surface of the pipe or channel.
   3. The words "bottom of the pipe" as used herein shall be defined as the base of the pipe at its outer surface.

C. In general, machine excavation of trenches will be permitted with the exception of preparation of pipe beds which will be hand work. Excavate by hand or machine methods to at least six (6") inches below the bottom of pipe or as shown on the Drawings. Excavation to final grade shall be made in such a manner as to maintain the undisturbed bearing character of the soils exposed at the excavation level.

D. Utilities or piping shall not be laid directly on boulders, cobbles or other hard material. This material shall be removed to a minimum of six inches below the bottom of pipe at all points and backfilled or compacted as specified.

E. In general, the width of trenches shall be kept to a minimum and in the case of piping shall not exceed the sum of the pipe's outside diameter plus 2'0" to at least twelve (12") inches above the pipe.

F. Provide shoring, sheeting, and/or bracing at excavations, as required, to assure complete safety against collapse of earth at the side of excavations. Provide shoring of public utility lines where exposed in or near excavations in accordance with rules and regulations of the local authorities, at no additional cost to the Owner.

3.4 SHORING AND SHEETING

A. Shoring and bracing of trenches and other excavations shall be in accordance with all applicable federal, state and local requirements and regulations to provide safe working conditions and protect property. The contractor is solely responsible for jobsite safety.

B. Provide shoring of existing utility lines where exposed in new excavations in accordance with rules and regulations of the local authorities or utility owner, at no additional cost to the Owner.

C. All sheeting, shoring, and bracing involved shall be removed by the Contractor after the completion of the permanent structures, in a manner so as not to disturb or mar the structures. Sheeting may be left in place only by written permission from the Architect, subject to such conditions as the Architect may require. No payment will be made by the Owner for such sheeting and shoring and bracing left in place.

3.5 PROOF-ROLLING

A. All areas to receive fill or support footings shall be proof-rolled prior to placing fill or constructing the footings as indicated below unless otherwise directed by the Architect.

B. Proof-rolling foundation subgrade in trenches shall be accomplished by making at least 5 passes over the area using a vibratory plate compactor. In open areas, proof-rolling shall be accomplished using a suitable heavy vibratory drum compactor making at least 4 complete passes over the area.

C. Proof-rolling pavement subgrade or areas to receive fill shall be proof-rolled using a suitable heavy vibratory drum compactor making at least 4 passes of the area.

D. Proof-rolling shall be visually observed by the Testing Agency. No proof-rolling shall be accomplished without observation of the Testing Agency.

E. Soil that exhibits soft, weaving or other instability as determined by the Engineer shall be removed and replaced with compacted Gravel Borrow at no additional cost to the Owner.

3.6 FILLING, BACKFILLING AND COMPACTION

A. Provide material conforming to these specifications and referenced Standards for all additional required fill at no additional cost to the Owner if sufficient quality or quantity of suitable material is not available on site.

B. Finished grades not otherwise indicated shall be uniform levels or slopes between points where levels are given or between such points and existing finished grades.

C. All areas to be filled or backfilled shall be free of construction debris, refuse, compressible or decayable materials and standing water. Do not place fill when materials or material below it are frozen. No fill material containing ice or frozen lumps shall be used.

D. Material shall be placed in evenly distributed horizontal layers over entire area, spread and compacted as specified.
   1. Remove all debris, organic materials or otherwise unsuitable materials from areas to be backfilled or filled.
   2. Deposit fill and backfill in successive layers having a loose lift thickness not more than 6-inches for hand operated equipment and 12-inches for heavy (10-ton) vibratory rollers. Each layer shall moistened and thoroughly compacted by roller, pneumatic tamper, or other approved method.
   3. Moisture-density determinations shall be performed on representative soil samples in accordance with ASTM D1557, Method D.
   4. Field density tests shall be taken in accordance with ASTM D1556. The following percentages of maximum dry densities shall be achieved for fill materials or prepared subgrades.
      a. Under structures, footings, paved surfaces, drainage piping, utilities and other improvements:
         1) All fills.....95%
         2) Top twelve inches of subgrades in cut.....95%
      b. Within lawn and planting areas:
         1) All fill within eighteen inches of finished subgrade.....92%
         2)
         3) All fill below 18 inches from finished grade 90%

E. Filling shall be done only after the area to be filled has been observed by the Architect. The Contractor shall notify the Architect when excavation is ready for formal inspection. All areas to receive fill shall be proof-rolled by at least two passes of the compaction equipment to be utilized for controlled placement of compacted fill, or other approved equipment.

F. All fill is to be placed "in the dry" to which end, dewatering may be required. The Contractor shall dewater excavated areas as required to perform the work and in such a manner as to preserve the undisturbed condition of the excavated subgrade.

G. In freezing weather, a layer of fill shall not be left in an uncompacted state at the close of a day's operations. Prior to terminating the operations for the day, the final layer of fill, after compaction, shall be rolled with a steel-wheeled roller to eliminate ridges of soil left by compaction equipment.

H. Before filling against walls, the permanent structure must be completed and sufficiently aged to attain strength required to resist fill pressures without damage. Temporary bracing of the

permanent structure walls will not be permitted. Correct any damage to structure caused by filling operations at no cost to the Owner. Place no stones over 4 inches in diameter closer than 18 inches to wall surfaces.

I. In the case of lawn and planting areas, compaction requirements for subgrades and fills shall be considered minimums and maximums within the density percentages called for, and any over-compaction of subgrades or fills which would be detrimental to lawn or planting objectives shall be corrected by loosening subgrades or fills through tilling or other means and recompacting to specified compaction limits.

J. If fill is placed adjacent to a slope, then the slope shall be adequately benched to receive fill. All fill shall be placed in horizontal layers against the slope.

3.7 BACKFILLING OF TRENCHES AND STRUCTURES INCLUDING SWIMMING POOL TANKS

A. All requirements for description, placement, compaction and spreading of fill materials as specified herein shall be applicable to backfilling operations.

B. Backfill materials as specified herein shall be used as bedding and backfill around drainage pipes, around structures and for other uses as illustrated on the Drawings.

C. Do not commence backfilling operations for trenches and structures until all piping, etc., has been installed, tested and approved, and the locations of all pipe and appurtenances have been recorded. Backfill carefully by hand around pipe to depth on one foot above top of pipe using material specified herein, and tamping firmly in layers not exceeding six inches, compacting with hand rammers or mechanical tampers.

D. Backfill materials as specified shall be placed to the full width of the trench as indicated on Drawings. After a pipe is bedded, the trench shall be filled to the centerline of the pipe with fill as specified except at the joint. After the joint is inspected, that portion shall be filled in. Material under and around the pipe shall be carefully and thoroughly compacted to the densities specified herein.

E. From the centerline of the pipe to a point twelve inches above the top of the pipe the backfill shall be placed by hand and compacted with mechanical tampers to not less than 95% of maximum density at optimum moisture content of the material. Above this point, backfill may be placed by machine in layers six inches (6") deep and compacted to the densities specified herein. This backfill shall be extended as shown on the Detail Drawings. Backfill simultaneously all sides of pipe or structure.

3.8 DRAINAGE, DEWATERING AND FROST PROTECTION

A. The Contractor shall control the grading in areas under construction on the site so that the surface of the ground will properly slope to prevent accumulation of water in excavated areas and adjacent properties.

B. Should surface, rain or groundwater be encountered during the operations, the Contractor shall furnish and operate pumps and related equipment, including standby equipment, and all

necessary piping to keep all excavations clear of water at all times and shall be responsible for any damage to the subgrade, completed work or adjacent properties from such water. All piping exposed above surface for this use shall be properly covered to allow traffic to pass without obstruction. Dispose of water through temporary pipelines or ditches with outfall to natural drainage courses. Prevent erosion and siltation of surrounding areas.

C. The presence of groundwater in soil will not constitute a condition for which an increase in the Contract price may be made. Under no circumstances place concrete fill, lay piping or install appurtenances in excavations containing free water.

D. Frost Protection: Do not excavate to full indicated depth when freezing temperatures may be expected, unless work can be completed to subgrade or piping can be installed and backfilled the same day. Protect the excavation from frost if placing of concrete or piping is delayed, as approved by Landscape Architect. Protect foundation soils from frost penetration after the footings have been cast.

E. The Contractor shall keep the area under this Contract clear and free of accumulation of snow, ice and frozen ground within the Limit of Contract lines as required to carry out the work at no additional cost to the Contract. The Contractor will be solely responsible for preventing frost penetration into the foundation soil below footings and slab for the duration of this Contract.

F. No work shall be installed on frozen ground.

3.9 ROUGH GRADING

A. Rough grading shall include the shaping, trimming, rolling, and refinishing of all surfaces of the subbase, shoulders, and earth slopes, and the preparation of grades as shown on the Drawings. The grading of shoulders and sloped areas may be done by machine methods. All ruts shall be eliminated. Traffic of men and equipment across soil subgrade areas shall be prohibited following excavation to the required lines and grades.

B. If, during the progress of the Work any pipe, drain or other construction is damaged due to operations under this Contract, the Contractor shall repair all damage at no additional cost to the Owner and restore damaged areas to their original conditions.

C. Do all other cutting, filling and grading to the lines and grades indicated on the Drawings. Grade evenly to within the dimensions required for grades shown on Drawings and as specified herein. No stones larger than four inches (4") in largest dimension shall be placed in upper six inches of fill. Fill shall be left in a compacted state at the end of the work day and sloped to drain.

D. The Contractor shall bring all areas to grades as shown on the Drawings and in the details. The Architect, however, may make such adjustments in grades and alignments as are found necessary to avoid special conditions encountered.

E. No rubbish of any description shall be allowed to enter fill material. Such material shall be removed from the site.

F. Wherever streets, lawns, or sidewalks or other items contained within or outside the Limit of Contract lines have been excavated in fulfilling the work required under this Contract, this

Contractor shall furnish and install all materials necessary to bring finish surfaces level with the existing adjacent surfaces. All work shall be installed to match the existing conditions in accordance with the governing authority. Notify the proper authorities prior to restoring surfaces outside the Contract Limit Lines.

G. Placed fill materials, which become disturbed, shall be regraded and recompacted. Fill materials, which become contaminated, shall be removed and replaced, as directed by the Architect.

3.10 DUST CONTROL

A. The Contractor shall employ all possible methods and/or materials to prevent the spread of dust. Chemical materials may not be used on subgrades of areas to be seeded or planted. Contractor shall provide dust control on a daily basis as required and when directed by the clerk, OPM, or Architect.

3.11 REMOVAL OF SURPLUS AND UNSUITABLE MATERIALS AND CLEANUP

A. Surplus excavated materials not required to complete site construction and unsuitable excavated materials shall, unless directed otherwise by the Architect, become the property of the Contractor who shall remove and legally dispose of such materials from the site at no additional cost to the Owner.

B. At the end of all excavation, filling and grading operations and before acceptance of the work, the Contractor shall remove all debris, rubbish, etc., from the site. He shall dispose of them in a manner satisfactory to the Architect. The premises shall be left clean, presentable, and satisfactory.

3.12 DEFICIENCY OF FILL MATERIAL

A. Provide required additional acceptable fill material from off-site borrow sources to complete the work if a sufficient quantity of suitable material is not available from the required excavation on the project site.

END OF SECTION 312300

SECTION 32 13 13: CONCRETE PAVING

PART 1 General

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to furnish and install CONCRETE PAVING, as indicated on the Contract Documents and as specified herein.

1.3 REFERENCES

A. The following standards shall apply to the work of this Section.

1. American Concrete Institute (ACI):

306R	Cold Weather Concreting
316R	Recommendations for Construction of Concrete Pavements and Concrete Bases.

2. American Society for Testing and Materials (ASTM):

A 185	Specification for Steel Welded Wire Fabric. Plain, for Concrete Reinforcement
A 615	Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement
C 33	Specifications for Concrete Aggregates
C 94	Specifications for Ready-Mixed Concrete
C 143	Test Method for Slump of Hydraulic Cement Concrete
C 150	Specification for Portland Cement
C 171	Specification for Sheet Materials for Curing Concrete
C 231	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
C 309	Specification for Liquid Membrane-Forming

	Compounds for Curing Concrete
C 494	Specification for Chemical Admixtures for Concrete
C 1116	Standard Specification for Fiber Reinforced Concrete & Shotcrete
D 226	Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
D 545	Test Methods for Preformed Expansion Joint Fillers for Concrete Construction (Nonextruding and Resilient Types)
D 1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort [56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)]
D 1752	Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

2. Massachusetts Department of Transportation (MassDOT):

Specifications	Standard Specifications for Highways and Bridges

1.4 SUBMITTALS

A. Description of Methods and Sequence of Placement. For each type of specially-finished concrete provide description of methods and sequence of placement.

B. Submit manufacturer's product data for the following:

1. Form release agent.
2. Prefabricated control joint.
3. Preformed joint filler.
4. Sealants.
5. Curing materials.

C. Submit samples of the following:

1. Prefabricated control joint.
2. Preformed joint filler.
3. Color chart for selection of sealant color.

D. Construct Concrete Sample Panels:

1. Construct 6 foot x 6 foot sample panels of finished concrete pavement for approval, at least 15 days prior to final concrete paving work. Samples shall not be constructed in an area of proposed finish work. Samples shall be constructed within the vicinity of the proposed finish work to facilitate comparisons during construction. The samples shall demonstrate the typical installation of concrete, including score lines, expansion joint and sealant, curing and finishing material, surface texture, color, and edge treatment. The accepted sample, upon approval, shall be maintained as the standard of minimal quality for approval of all proposed concrete pavement work required for the project. If the original sample panel is not approved, the Contractor shall provide additional sample panels, as required, at no additional cost to the Owner until an approved sample is obtained. Unacceptable sample panels shall immediately be removed from the site.

E. Test reports for concrete, per paragraph 1.6A

1.5 QUALITY ASSURANCE

A. Unless otherwise specified, work and materials for construction of the reinforced Portland cement concrete paving shall conform to ACI 316R, and applicable portions of the following:

1. MassDOT Specifications Section 400 Cement Concrete Pavement.

B. Surfaces of curb ramps and handicapped access ramps shall be stable, firm and slip resistant. Construct ramps so that water does not accumulate on ramp surfaces.

C. Paving work, base course installation, top course installation, and the like, shall be done only after excavation and construction work which might injure them have been completed. Damage caused during construction shall be repaired before acceptance.

D. Existing paving areas shall, if damaged or removed during course of this project, be repaired or replaced under this SECTION, CONCRETE PAVING. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work installed under this Contract.

E. Pavement, base, or subbase shall not be placed on a muddy or frozen subgrade.

1.6 TESTING AND INSPECTION

A. The Contractor shall perform slump and compressive strength tests for concrete paving. Slump tests shall be performed on every truck delivery. Compressive strength tests shall be performed every 50 cubic yards delivered. Compressive strength testing shall include three cylinder per test (one each for 7 day, 28 day and a reserve). All tests shall be paid by the Contractor.

PART 2 PRODUCTS

2.1 AGGREGATE BASE COURSE

A. Base course shall be existing aggegrate base re-graded and compacted. Existing base shall be supplemented with similar materials as requires to meet the proposed elevations.

2.2 STEEL REINFORCEMENT

A. Welded wire fabric (WWF) reinforcement shall conform to the applicable requirements of ASTM A 185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

1. Provide 6 inches (150 mm) x 6 inches (150 mm) W2.9 x W2.9 WWM for 6 inch (150 mm) thick concrete pavement, 6 inches (150 mm) x 6 inches (150 mm) W3.4 x W3.4 WWM for 8 inches (200 mm) thick concrete pavement and 6 inches (150 mm) x 6 inches (150 mm) W1.4 x W1.4 WWM for 4 inches (100 mm) concrete pavement .

B. Steel reinforcing bars shall conform to ASTM A 615.

1. Bars employed as reinforcement shall be deformed type.

2. Unless otherwise indicated on the Contract Documents, reinforcing bars shall be Grade 60.

C. Steel expansion dowels shall be hot-rolled plain steel rounds conforming to the requirements of AASHTO M31, Grade 60 and consisting of a 1/2 inches (12.7 mm) by 24 inches (610 mm) smooth steel dowel and compatible waxed tube sleeve, by 12 inches (305 mm) in length.

1. Dowels and sleeves shall be as furnished by A.H. Harris & Sons, Inc., by U.S. Steel Corp., by Edgecombe Steel Corp., or approved equal.

2. Dowels shall be epoxy coated.

2.3 PORTLAND CEMENT CONCRETE

A. Cast-in-place concrete shall be air-entrained concrete with minimum 28-day compressive strength of 4,000 pounds per square inch (30 MPa), conforming to the requirements and applicable provisions of MassDOT Specifications Section M02.

1. Air Entrainment: Concrete shall be air-entrained 7 percent minimum +/-1 percent, by volume.

2. Slump: Concrete shall have a slump of 2 inches (50 mm) to 4 inches (100 mm) slump.

3. Maximum Aggregate Size: Aggregate size shall be a maximum of 3/4 inches (18.8 mm).

4. Thickness of Concrete: Depths shall be as noted on the Contract Documents.

2.4 CURING MATERIALS FOR PLAIN CONCRETE

A. Curing shall be by moist curing or by use of curing compound.

B. Curing paper shall be nonstaining, fiber reinforced laminated kraft bituminous product conforming to ASTM C 171. Four mil polyethylene sheeting may be substituted for curing paper.

C. Curing compound shall be a resin-base, white pigmented compound conforming to ASTM C 309, Type 2.

2.5 EXPANSION JOINTS

A. Provide expansion joints as indicated and in accordance with the following:

1. Unless otherwise indicated on the Contract Documents, expansion joints shall be located 20 feet (6.0 m) on-center, maximum.

1. Location of expansion joints are indicated on the Contract Documents.

B. Expansion Joint Filler:

1. Closed cell polymer foam meeting requirements of ASTM D 1752, Sections 3.1 to 3.4, based on compression requirement of 10 pounds per square inch minimum and 25 pounds per square inch maximum. Recovery rate following 50 percent compression shall exceed 99 percent recovery, per ASTM D 545. Foam shall be equal to Ceramar Foam Filler, manufactured by W.R. Meadows. Inc., or an approved equal.

2. Expansion joint filler shall have a removable cap cover for the joint filler with integral permanent plastic bond breaker such as Snap-Cap from Seal Tight manufactured by W.R. Meadows, Inc., or approved equal. Cover width shall be sized to match width of joint filler.

2.6 CONTROL JOINTS

A. Control joints in concrete shall be made using a preformed contraction joint equal to the Plastic Contraction Joint distributed by A.H. Harris & Sons, Inc., Medfield, MA 02052, or approved equal.

1. Preformed contraction joint shall be specifically designed to form construction and weaken plane joints.

2. Dimension of prefabricated joint former shall be as indicated on the Contract Documents.

3. Joints shall be placed 5 feet zero inches on center.

2.7 CONSTRUCTION JOINTS

A. Transverse construction joints shall be placed whenever placing of concrete is suspended

for more than 30 minutes.

1. Butt joint with dowels or thickened edge joint shall be used if construction joints occurs at location of control joint. Submit sketch to Owner's Representative for review and acceptance of proposed system.

2. Keyed joints with tiebars shall be used if the joint occurs at any other location.

2.8 SEALANT

A. Joint sealant and primer shall be polyurethane-based, one component, elastomeric sealants, complying with Fed. Spec. TT-S-00230C, Class A Type 1. Color shall be as selected by the Owner. Sealants shall be self-leveling pour grade type.

1. Vulkem 45, as manufactured by Mameko International, 4475 East 175th Street, Cleveland Ohio 44182, (800) 321-6412.

2. Urexpan NR-210, as manufactured by Pecora Corporation, 165 Wambold Road, Harleysville, PA 10348, (215) 723-6051

3. PSI 951, as manufactured by Polymeric Systems Inc., Phoenixville, PA, (800) 228-5548.

B. Provide only materials which are known to be fully compatible with the actual installation condition, as shown by the manufacturer's published data or certification. Use manufacturer's recommended joint primer.

PART 3 EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Subgrade of areas to be paved shall be recompacted as required to bring top 8 inches (200 mm) of material immediately below aggregate base course to a compaction at optimum moisture of at least 95 percent of maximum density, as determined by ASTM D 1557. Subgrade compaction shall extend for a distance of at least 12 inches (305 mm) beyond pavement edge.

3.2 FORMWORK

A. All forms shall be joined neatly and tightly, shall be set true to line and grade, well staked and braced, and shall have uniform bearing throughout their length. Remove all forms and miscellaneous appurtenances from pavement edges and dispose of all formwork and appurtenances at the end of the construction project.

1. Forms shall not be moved for 72 hours after the concrete has been placed, or for a longer period if directed by the Owner's Representative.

2. Remove all forms. Extreme care shall be taken in removing forms in order that no damage will be done to the concrete.

3. Under no condition shall any bar, pick or other tool be used which depends upon

leverage on the concrete for removal of the forms.

3.3 STEEL REINFORCEMENT

A. Before being placed in position, reinforcing for reinforced concrete shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material which may reduce the bond between the concrete and reinforcing. Where there is delay in placing concrete after reinforcement is in place, bars shall be re-inspected and cleaned when necessary.

B. Welded Wire Mesh: Wire mesh used for reinforcement shall be spread flat before placing concrete. Mesh reinforcement shall be held firmly in place against vertical or transverse movement by means of satisfactory devices. Where mesh reinforcement is spliced, it shall be lapped at least 12 inches (300 mm).

1. Unless designated otherwise on the Contract Documents, wire mesh shall be placed midway within the depth, and parallel to the finished surface of concrete pavements.

2. Do not pour concrete over top of reinforcement unless it is supported underneath.

3. Contractor shall pull reinforcement up immediately after pouring concrete to make sure that the reinforcement is in the middle of the slab and not sitting on the bottom.

C. Reinforcing Steel: After forms have been coated with form release agent, but before concrete is placed, reinforcing steel anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted.

1. Any bar showing cracks after bending shall be discarded.

2. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Owner's Representative.

D. Unless otherwise indicated on the Contract Documents, reinforcing shall extend within 2 inches (50 mm) of formwork and expansion joints.

1. Reinforcing shall continue through control joints.

E. The Owner may do core testing to make sure that reinforcement is in the proper position. If testing shows otherwise concrete will be rejected and the Contractor shall remove all rejected slabs and re-pour new slabs at no additional cost. Contractor shall repair cored holes as directed by the Owner's Representative.

3.4 EXPANSION JOINTS

A. Expansion joints shall be 1/2 inches (12.7 mm) wide and shall be as located on the Contract Documents. Expansion joint shall be formed in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full depth of the slab. Joint filler shall extend the full length of the expansion joint.

1. For concrete banding and concrete pavements and pads, depth of joint filler shall be as required to form a 3/4 -inch (19 mm) deep sealant recess below finished concrete surface.

B. Place expansion joints spaced on 20-foot (6.0 m) centers. When provided, clarification documents that show specific locations of expansion joints shall direct the Contractor where to place expansion joints. Such clarification documents may place joints closer than 20-foot (6.0 m) centers. In the absence of clarification documents the language of this SECTION, CONCRETE PAVING, shall govern.

1. Expansion joints shall be placed where pavement meets flush foundations and footings, concrete or bituminous concrete curbing or other vertical structures, including light bases, hydrants, walls, buildings, piers and walls, and at other conditions as shown on the Contract Documents.

2. Contractor shall request the presence of the Owner's Representative to review the layout of expansion joints prior to pouring the concrete.

3. Follow the manufacturer's application recommendations for joint filler and sealer.

4. Joint alignment shall be straight and true.

C. Where expansion dowels are use in the expansion joints, dowels and greased sleeves shall be set parallel with the top and bottom surfaces of the concrete slab.

3.5 PORTLAND CEMENT CONCRETE PAVING

A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base and the like, shall meet the requirements of ACI 316R. Pavement shall be constructed in accordance with the Contract Documents.

B. The Owner's Representative shall be notified of concrete placement sufficiently in advance of start of operation to allow his representative to complete preliminary inspection of the work, including subgrade, forms, and reinforcing steel, if used.

1. No concrete shall be deposited until the Owner's Representative has inspected the placing of reinforcement and given permission to place concrete.

C. Normal concrete placement procedures shall be followed. Concrete shall arrive at the job site so that no additional water will be required to produce the desired slump. When conditions develop that required addition of water to produce the desired slump, permission of the Owner's Representative must be obtained. The concrete shall be transported from the mixer to its place of deposit by a method that will prevent segregation or loss of material.

1. Concrete pavement shall be placed in a series of alternate pours such that every other panel bounded by expansion joints shall be poured first.

2. The intervening panels shall then be poured as a secondary operation only after the first panels have hardened sufficiently to allow the removal of all temporary transverse forming supports.

3. Concrete shall be placed in one course, to full depth, as detailed on the Contract Documents.

D. Work shall not be performed during rainy weather or when temperature is less than 40 degrees Fahrenheit (4 degrees Centigrade). In the event that unforeseen rain occurs, cover all broom finished concrete surfaces with plastic sheet covering to prevent alteration of texture. Concrete slabs with textured concrete surfaces altered by rain shall be removed from the site as directed by the Owner's Representative.

E. Adjacent work shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original conditions.

F. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall thoroughly damp when concrete is placed. There shall be no free water on surface.

G. Concrete which has set or partially set before placing shall not be employed. Retempering of concrete will not be permitted.

H. Concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.

I. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Laitance is the accumulation of fine particles on the surface of freshly poured concrete caused by an upward movement of water through the concrete. This can be caused by too much mixing water, by excessive tamping, or by vibration of the concrete. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8 inches (3.2 mm) thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.6 FINISHING

A. Concrete flatwork surfaces shall be screeded off and hand floated and finished true to line and grade, and free of hollows and bumps. Surface shall be dense, smooth, and at exact level and slope required.

1. Finished concrete surface for subbases for unit pavement systems shall be woodfloated to a slightly rough surface. Surface shall not deviate more than 1/4 inches (6mm) in 10 feet (3.00 m).

2. Finished concrete surface for concrete walks, pads, and concrete bands shall be wood-floated and steel troweled to a smooth surface. Surface shall not deviate more than 1/8 inches (3.2 mm) in 10 feet (3.05 m).

B. Unless otherwise indicated, horizontal surfaces of concrete pavement which will be exposed shall be given a light broomed finish, with direction of grooves in concrete surface perpendicular to length of concrete * (sidewalk) (band) (slab) (or) (pad) *. After concrete has set sufficiently to prevent coarse aggregate from being torn from surface, but before it has completely set, brooms shall be drawn across it to produce a pattern of small parallel grooves. Broomed surface shall be uniform, with no smooth, unduly rough or porous spots, or other irregularities. Coarse aggregate shall not be dislodged by brooming operation.

C. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

D. Immediately following finishing operations, arrises at edges and both sides of expansion joints shall be rounded to a 1/4 inches (6.0 mm) radius.

E. Control Joints:

1. Control joints shall be tooled with scored joints made by scoring into slab surface with scoring tool.

1. Control joints shall be saw cut joints as specified below.

F. All scoring, tooling and finishing of the concrete shall be subject to the review and approval of the Owner's Representative at any time during the construction project. The Contractor shall remove and replace, at no additional cost to the Owner, all concrete which is not acceptable to the Owner's Representative.

G. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

3.7 CURING

A. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.

B. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.

1. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing periodsurface shall be checked frequently, and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.

2. If concrete is cured with a curing compound, compound shall be applied at a rate of 200 square feet per gallon, in two applications perpendicular to each other.

3. Curing period shall be seven days minimum.

3.8 CONTROL JOINTS

A. Unless otherwise indicated, control joints shall be tooled into the concrete slab, with 3

inches (75 mm) wide border and troweled edges, in pattern indicated on the Contract Documents, or every 5 feet (1.50 m) on center maximum. Joint shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab, but before slab has achieved its final set.

1. Scoring shall cut into slab surface at least 1 inches (25 mm), but in no case not less than 25 percent of slab depth.

3.9 COLD WEATHER CONCRETING

A. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40 degree Fahrenheit. or is excepted to fall to below 40 degree Fahrenheit within 72 hours, and the concrete after placing shall be protected by covering, heat, or both.

B. Details of handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Owner’s Representative. Procedures shall be in accordance with provisions of ACI 306R.

3.10 HOT WEATHER CONCRETING

A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. Every effort shall be made to minimize delays which will result in excessive mixing of the concrete after arrival on the job.

B. During periods of excessively hot weather (95 degree Fahrenheit., or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 95 degree Fahrenheit., when ready for placement will not be acceptable, and will be rejected.

C. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, and the like.) and relative humidity. Records shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

3.11 PROTECTION OF CONCRETE SURFACES

A. Concrete surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary 1/2 inches (12.5 mm), thick plywood sheets shall be used to protect the exposed surface.

B. The Contractor shall provide adequate surveillance for all poured-in-place concrete pavements until concrete has set firmly, to prevent unwarranted markings of the concrete surface. Any unauthorized marking or graffiti in the finished surfaces shall be a cause for rejection by the Owner's Representative and replacement by the Contractor.

3.12 ACCEPTANCE STANDARDS

A. The following acceptance standards shall be applied to this Contract. These standards are considered superior to typical industry standards. Any portion of the concrete paving that does not come up to these required acceptance standards shall be removed at the direction of the Owner's Representative. Saw cut pavement at nearest adjacent tooled joint, remove concrete pavement and discard off site in a legal manner and replace with new concrete pavement meeting the requirements of this SECTION, CONCRETE PAVING.

1. Pavement surfaces shall be free of all cracking.
2. Pavement surfaces shall not pond water.
3. Pavement surfaces shall be free of visible high and low spots.
4. Steel mesh reinforcing shall not penetrate the surfaces or sides of the concrete slab.
5. Tooled joints and all expansion joints shall be straight, true, uniform in width and free from twists, bends, kinks and misalignments.
6. Saw cut joints shall be free of chips and spauling at joint edges.
7. Tooled edges and the associated edging patterns shall be consistent, true, crisp and complete.
8. Broom finish shall not be too coarse in the opinion of the Owner's Representative.
9. Broom finish shall be constant and complete between joints without bare spots, lifts or disconnections in broom pattern.
10. Pavement shall show no graffiti. Pavement shall show no rubbed surfaces indicative of attempts to erase graffiti.
11. Expansion joints and score joints shall be placed as required by the Contract Documents.
12. Concrete surfaces shall be free of all stains, including those created during the course of the construction by the Contractor, caused by natural events, or caused by vandalism.
13. All tooled joints and expansion joints shall be flush.
14. Stains from construction or from natural causes
15. Pours different in color as determined by the Owner's Representative.
16. Pours without expansion joints cast into them.
17. Pours not conforming to the Contract Documents.
18. All forms shall be removed from the site.

END OF SECTION 32 13 13

SECTION 32 32 00-CHAIN LINK FENCING

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. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to furnish and install the fence work of this Section, as indicated on the Contract Documents and as specified herein.

1. Vinyl-coated chain link fence and gate

1.3 QUALITY ASSURANCE

A. Prior to installation the fence contractor shall provide the fence manufacturer's notarized certification to the Owner's Representative that the vinyl-coated chain link fabric is warranted by the manufacturer for a minimum of 15 years against rust and corrosion.

1.4 REFERENCES

The following standards shall apply to the work of this Section.

1. Commonwealth of Massachusetts Department of Transportation (MassDOT):

Specifications	Standard Specifications for Highways and Bridges

2. AWS: American Welding Society

   a. D1.1 Structural Welding Code

3. ASTM: American Society for Testing and Materials

A-90/A90M-95a(1999)	Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc Alloy Coatings
A 307	Standard Specification for Carbon Steel

	Bolts and Studs, 60,000 PSI Tensile Strength
A392-96	Standard Specification for Zinc-coated Steel Chain Link Fence Fabric
A491-96	Standard Specification for Aluminum-coated Steel Chain Link Fence Fabric
A1011/A1011M	Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Allow and High Strength Low-alloy with Improved Formability
A500-99	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A900-00	Standard Specification for Industrial and Commercial Swing Gates
B-6-00	Standard Specification for Zinc
B-117-97	Standard Practice for Operating Salt Spray (Fog) Apparatus
F567	Standard Practice for Installation of Chain-Link Fence
F668-99a	Standard Specification for Poly(Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric
F964-00	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Exterior Profiles Used for Fencing
F1043-00	Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework
F1083-97	Standard Specification for Pipe, Steel, Hot- Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

1.5 SUBMITTALS

A. Submit manufacturer's product data and certification for the following:

1. Chain Link Fence: Each fence fabric type
2. Chain Link Fence: Each size of pipe
3. Chain Link Fence: Each type of hardware and fitting
4. Chain Link Fence: Gates
5. Chain Link Fence: Manufacturer's vinyl coating system

B. Submit complete shop drawings of each type of fence and gate for Owner's Representative's approval.

1. Shop drawings shall show typical materials, elevations, connections, fittings, and details for all elements as well as detailed layout showing all post locations.

2. Submit a complete schedule of all fencing and gates showing all post locations and fabric type locations on the project.

PART 2–PRODUCTS

2.1 CHAIN LINK FENCE: GENERAL

A. Material shall be new and products of recognized reputable manufacturers. Used, re-rolled or re-galvanized materials are not acceptable.

B. Like items of materials provided hereafter shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance and replacement.

C. All welding shall conform to AWS standards.

2.2 CHAIN LINK FENCE: VINYL COATED ALUMINIZED OR GALVANIZED STEEL CORE FABRIC FOR FENCE

A. Vinyl coated aluminized steel core fabric shall be a fused and adhered process in accordance with ASTM F668, Class 2b. Provide exposed fabric heights by using one section entire height. Vinyl coating shall be as specified in this Section, FENCING.

B. Fabric
Size:
1.
   a. Finished (coated) wire size 9 gauge
   b. Mesh size 1 1/4 inch
   c. Selvage top knuckled, bottom knuckled
   d. Vinyl wall thickness 0.006 inch minimum, 0.010 maximum

2.3 CHAIN LINK FENCE: VINYL COATING FOR WIRE, FRAMEWORK AND HARDWARE

A. The PVC vinyl coating shall be fused and adhered to the aluminum-coated steel wire or the zinc-coated steel wire in accordance with ASTM F668, Class 2b. The vinyl covering shall, in addition, resist attack from prolonged exposure to dilute

solutions of most common mineral acids, sea water and dilute solutions of most salts and alkali. All vinyl coating shall be black in color.

2.4 CHAIN LINK FENCE: FRAMEWORK

A. All steel pipe framework material shall be Type II SS-40 hot-dip galvanized pipe as manufactured by Allied Tube & Conduit, Harvey, Illinois (708) 339-1610 or approved equal. The base metal shall be in accordance with ASTM A-569. Pipe materials shall have a minimum yield strength of 50,000 pounds per square inch (334 MPa). The zinc coating shall be 1.0 ounces per square foot and shall be in accordance with ASTM B-6 High Grade Zinc and weight determined by ASTM A-90. The zinc coating shall have a chromate conversion coating and a final 0.5 mil coating of a clear organic coating. The interior of the pipe shall have a 91 percent zinc organic coating. The pipe shall meet corrosion tests of ASTM B-117. All framework shall be vinyl coated with 10 to 15 mils (0.254 mm to 0.38 mm) of PVC per ASTM F964.

B. Framework for fences:

1. Terminal, corner, and pull posts: Pipe 2.375 inch (60.33 mm) outside diameter, 3.12 pounds per linear foot (3.96 kg/m)
2. Line posts: Pipe 1.9 inch (48 mm) outside diameter, 2.28 pounds per linear foot (2.89 kg/m)
3. Rails (top, bottom and brace rails)

   a. Pipe 1.660 inch (42 mm) outside diameter, 1.84 pounds per linear foot (2.34 kg/m)
   b. Rails shall be connected to posts by use of brace bands and rail end cups. Unless designed otherwise, attachment bolts for bands shall be 5/16 inch by 1-½ inches (7.93 mm X 27 mm) bolts with nuts. The threads of each bolt shall be deformed after being installed. Bolts shall be rendered non-removable

G. All post tops shall have vinyl-coated caps. Caps shall be secured by use of a screw.

2.5 CHAIN LINK FENCE: HARDWARE FITTINGS AND MISCELLANEOUS MATERIALS

A. All hardware fittings and miscellaneous materials shall be vinyl coated with 10 to 15 mils (0.254 mm to 0.38 mm) of PVC per ASTM F964.

B. Fabric Ties: Tie wire for fastening 2 inch (50 mm) mesh fabric top, middle, bottom, or brace rails shall be 9 gauge (3.76 mm) galvanized vinyl coated steel tie wire placed at maximum 12 inch (300 mm) on-center intervals and twisted to form a secure connection.

C. Tension Bars: Tension (Stretcher) bars shall be one-piece lengths equal to full height of fabric with a minimum cross-section of 3/16 inch by 3/4 inch (4.76 mm X 19 mm). Provide one tension bar for each gate post and terminal post and two for each corner and pull post. Bars shall be galvanized and vinyl coated.

D. Tension Bands: Bar bands shall be heavy-pressed 12 gauge steel, 3/4 inch by 1/10 inch (19mm X 2.67 mm) nominal to secure tension bars to end, corner, pull, gate posts and embedded angles. Space bar bands not more than 12 inch on center. Bands shall be galvanized and vinyl coated.

E. Braces: Post braces shall be of the same material as the rails and shall extend from the terminal, corner, or pullpost to the first adjacent line post. Braces shall be securely fastened to the posts by heavy-pressed 12 gauge steel brace bands and malleable fittings, then securely trussed from line post to base of terminal post with a 3/8 inch truss rod equipped with a galvanized turnbuckle.

F. Bolts and Nuts: Bolts and nuts shall be in accordance with ASTM A 307 Grade A, Thermally coated to match color of fence fabric.

G. Tension Wire: Tension wire shall be galvanized steel core wire 6 gauge core wire, 5 gauge finished outside diameter. Tension wire shall be fastened to fabric at 24 inch on center with hog rings. Attach securely at all terminal, or corner posts. Hog rings shall be vinyl coated 9 gauge galvanized steel wire.

H. Cement grout for anchoring of fence posts, as necessary, shall be a pourable, quick setting, no n-metallic and non-shrinking hydraulic cement grout equal to "Por- Rok Cement" supplied by Waldo Bros., Roxbury, MA, "Rockite" as manufactured by Hartli ne Co., Cleveland, Ohio, "Wedj Rok" as manufactured by Metalcrete Manufacturing Co., Cl eveland, Ohio, or approved equal.

2.6. CHAIN LINK FENCE: GATES

A. Only products from qualified manufacturers having a minimum of 5 years experience manufacturing chain link fence gates will be accepted by the Owner's Representative. Products shall meet the following specifications for design, size, gauge of metal parts and fabrication.

B. Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source

C. Gate frames: Fabricate chain link swing gates in accordance with ASTM F 900 using galvanized steel tubular members, 2 inches (50 mm) square, weighing 2.60 pounds/foot
(3.87 kg/m). Connections shall be welded to form rigid, one-piece units. Gate frames shall be vinyl coated fused with 10 to 15 mils (0.254 mm to 0.38 mm) of PVC per ASTM F964.

D. Gate frames shall be galvanize in accordance with ASTM F669, F1083 or F1234, or a combination thereof, and shall match that selected for the adjoining fence work.

E. Chain link fence fabric shall match the fabric of the fences.

F. Hardware materials: Hot dipped galvanized steel or malleable iron shapes to suit gate

size.
Field coat moveable parts (e.g. hinges, latch, keeper, and drop bar) with PVC touch up paint, provided by manufacturer, to match adjacent finishes.

G. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-liftoff type hinge design shall permit gate to swing 180 degrees inward or 180 degrees outward. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person.

H. Exit bar: Anodized aluminum finish with black ABS cover on head and push bar. Hex Key dogging device to lock bar in open position. Exit bar shall be manufactured by Detex Corporation, New Braunfels, TX or an approved equal.

I. Latch: Forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.

J. Keeper: Provide keeper for each gate leaf over 5 feet (1500 mm) wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.

K. Gate posts: Steel pipe in accordance with ASTM F 1083 standard weight schedule 40; minimum yield strength of 25,000 psi (170 MPa) or steel square sections in accordance with ASTM A 500, Grade B having minimum yield strength of 40,000 psi (275 Mpa) size as indicated. Hot-dipped galvanized with minimum 1.8 ounce per square foot (550 kg/in^2) of zinc in accordance with ASTM F 1083.

Gate leaf single width	Post Size (Round)	Weight
5 feet or less	2.875 inch	5.79 pounds/foot

2.7 CHAIN LINK FENCE: WELDING OF GATE

A. Workmanship and finish shall be equal to the best practice of modern shops for each item of work. Exposed surfaces shall have a smooth finish and sharp, well defined lines and arrises. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves. Welding shall be in accordance with the Structural Welding Code of the American Welding Society. All welding, except as otherwise indicated, shall extend the entire length of joints. All welded face joints shall be ground flush and smooth. Welding shall conform to the requirements of ASTM F900 except as modified in this Section.

B. Welding shall be continuous. All exposed welds shall be ground smooth. Pipe joints shall be mitered or cut as "fish-mouth" pipe joints, will all connections full seam welded then ground smooth, wire brushed. All welds shall be touch-up painted with three coats of zinc rich paint, equal to "Tneme Zinc 90-93", by Tnemec Paint Co., Woburn, Massachusetts; "ZRC" cold galvanizing compound by Sealube Co., Quincy, Massachusetts; or "Zirp" by Duncan Industries, Everett Massachusetts, or approved equal, prior to application of vinyl coating.

C. Where structural joints are made by welding, the details of all joints, the techniques of welding employed, the appearance and quality of welds made, and the methods used to correct defective work shall conform to requirements of the AWS code.

D. Welds shall be made only by welders who have previously been qualified by tests as prescribed in AWS "Standard Qualification Procedure" for the type of work required.

E. The use of gas cutting torch in the field for correcting fabrication errors will be permitted only when the prior written approval of the Landscape Architect has been obtained for each specific condition.

F. Weld with uncoated wire to prevent flux deposits. If coated wire is used, all flux residue shall be thoroughly removed and bare white metal exposed. Where overlapping surfaces are welded, seal off contact area by welding all edges around contact area.

2.8 CHAIN LINK FENCE: RELATED MATERIALS

A. Concrete footings shall be constructed of minimum 4,000 psi (30 Mpa) 28 day strength air entrained, 3/4 inch (20 mm) aggregate concrete in conformance to requirements of Section M4.02 of the Standard Specifications.

B. Forms for post footings shall be sonotubes of the size for the diameter of the footings shown on the Contract Documents.

C. For touch-up to welded areas use a zinc rich paint equal to "Tneme Zinc 90-93", by Tnemec Paint Co., Woburn, Massachusetts; "ZRC" cold galvanizing compound by Sealube Co., Quincy, Massachusetts; or "Zirp" by Duncan Industries, Everett Massachusetts, or approved equal.

PART 3-EXECUTION

3.1 CHAIN LINK FENCE: PREPARATION FOR FENCE INSTALLATION

A. All Shop Drawings for fencing shall have been returned "Approved" before any fencing shall commence.

B. Contractor shall review as-built conditions in the field prior to preparing required Shop Drawings.

C. Constructed samples, as required, shall have been submitted and approved before materials are ordered or fabricated for the work as a whole.

D. Prior to the installation of any fence, all necessary clearing and grading on both sides of the fence shall be performed by the Contractor in accordance with the requirements of the Contract Documents.

3.2 CHAIN LINK FENCE: INSTALLATION

A. General: Unless modified in this Section, installation of fencing shall meet the requirements of ASTM F567. Erect fencing in straight lines between angle points by skilled mechanics experienced in this type of construction. Erect in accordance with the manufacturer's recommendations as approved and with these Specifications.

B. Grounding: All chain link fences and gates shall be grounded. Provide ground rods per Contract Documents for all gate posts, at all corners or angles in fencing, at all terminal posts, and at minimum 250 feet (75 m) on center if not required otherwise. Provide flexible grounding connection for gates in accordance with Contract Documents. Abrade vinyl fence fabric coating where necessary to make mechanical grounding connections.

C. Post holes: Post holes for fence posts shall have a minimum diameter of 12 inches and be a minimum depth of 48 inches (1200 mm) below finished grade. Set posts with plumb alignment. Concrete shall be thoroughly worked into post holes so as to leave no voids. Allow concrete to cure a minimum of one week before installing fence fabric or fittings. The top surface of post hole concrete shall have a crowned surface to shed water.

D. Space posts in the fence line with a maximum spacing of 8 feet (2400 mm) on center for 4- foot (1200 mm) height or less fences unless otherwise shown on Contract Documents.

E. Provide corner or pull posts for any change in direction of 15 degrees or more and for any abrupt change in grade, with bracing in both directions. All posts, including line posts and terminal posts, shall be installed such that if a 40-pound force is applied perpendicular to the fence-line at the top of the post, the post will deflect not more than 2 inches (50 mm) at the top.

F. Terminal Posts: Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Terminal posts shall be used at beginning and end of each continuous length of fence and at abrupt changes in vertical or change in horizontal alignment of 15 degrees or more. Terminal (braced) posts shall be installed at intervals not exceeding 500 feet (150 m). Where fence runs are greater than 500 feet (150 m), space terminal posts evenly between corner and/or end posts.

G. Rails, Braces, Tension Bars and Truss Rods: Install rails, braces, tension bars and truss rods as called for on the Contract Documents.

1. Brace gate posts diagonally to adjacent line posts to insure stability. Brace gate, corner and pull posts to adjacent line posts with a horizontal compression member and diagonal truss rods with turnbuckles used as tension members.

2. All rails, braces, tension bars and truss rods shall be installed on the side of the fence least visible to the public. Coordinate with Owner’s Representative.

H. Threaded Connectors and Accessories: After installation, all threaded connector and accessories shall be peened or tack welded, and rendered non-removable. Welds shall be cleaned and painted with 3 coats of zinc rich paint and spray painted black with an appropriate acrylic paint that will bond with galvanizing.

I. Fasten Chain link fence fabric to terminal posts, pull posts, and gate posts with tension bars and tension bands at spacing herein specified.

J. Fence Fabric shall be secured to all rails and to posts that are not terminal, gate or pull posts with steel wire ties at specified spacing. Tie down wire shall be woven through the fence fabric, completely around the rail and wire shall be twisted securely with three twists on the rails side of the fence and the tails of the wire cut off to preclude untwisting by hand. Twisted tie wire ends shall be turned under at horizontal rails. Twist shall be on non-secure side of fence. Where designated for buried portion of fence fabric bottom, secure fabric to tension wire with vinyl coated hog rings as specified.

K. Fabric shall be installed such that it will pass the fabric tension test as specified in this Section, FENCING.

3.3 CHAIN LINK FENCE: INSTALLATION OF GATES

A. Gates: Install gates in conformance with requirements of the Contract Documents and the Manufacturer's Instructions. Test swing and latch and adjust as necessary for proper operation.

B. Concrete set gate posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post, and depths approximately 6 inches (152 mm) deeper than post bottom. Set post bottom 48 inches (1200 mm) below surface. Place concrete around posts in a continuous pour. Form top 12 inches (300 mm) using appropriate sono-tube form as shown on the Contract Documents. Trowel finish around post and slope to direct water away from posts.

1. Gate posts and hardware: Set keeper, stops, sleeves into concrete. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

C. Install gates plumb, level, and secure for full opening without interference.

D. Attach hardware to prevent unauthorized removal. Deform threads of bolts to prevent removal of nuts.

E. Adjust hardware for smooth operation.

F. Touch up hardware using approved PVC paint in accordance with the requirements of Part 2 of this Section.

3.4 CHAIN LINK FENCE: TESTING OF FENCE FABRIC

A. Each fence panel shall be constructed such that it will pass the following test. Deflection of fence fabric shall be no greater than 2 inches (50 mm)when a force of 30 pounds is applied in the center of the panel, perpendicular to the plane of the fence fabric. Fabric shall return to original position when force is released.

3.5 CHAIN LINK FENCE: ACCEPTANCE STANDARDS

A. Fence layout shall conform to the requirements of the Contract Documents. Straight runs of fencing shall be straight and true without visible deviation. Curved sections of fencing shall have a smooth, continuous arc without kinks or broken backs.

B. Rails shall form a continuous smooth line parallel with the grade unless otherwise described on the Contract Documents.

C. All posts shall be plumb and cut to the same height above grade.

D. Tension bands and hog rings shall be placed on standard on-center spacing consistent between posts.

E. Post caps shall be completely secure.

F. Gates shall be plumb, level, and secure for full opening without interference. Action shall be smooth. All components of gate shall function as designed.

END OF SECTION 32 32 00

SECTION 32 91 13-PLANTING SOILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to supply and place planting soils as indicated on the Contract Documents and as specified. Supplying and placement of planting soils shall include, but not be limited to:

1. Sampling and testing of loam borrow.
2. Modifying, screening, placing, spreading and grading of loam borrow.
3. Providing all other sampling, testing, supplying, placing, spreading and grading of planting soils as required by this Section.

1.3 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section, EARTH MOVING.
2. Section 32 92 19, LAWNS.

1.4 REFERENCES

1. American Society for Testing and Materials (ASTM):

D 75	Practice for Sampling Aggregates
D 422	Test Method for Particle-Size Analysis of Soils
D698-00a	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft- lbf/ft^3)
D1557	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb Rammer and 18-in.

Drop

3. A.O.A.C.: Association of Official Agricultural Chemists.

1.5 SUBMITTALS

A. At least 30 days prior to ordering materials, the Contractor shall submit to the Owner's Representative representative samples, certifications, manufacturer's product data and certified test results for materials as specified below for approval in conformance with the requirements of Section, SUBMITTALS, of this Specification. No materials shall be ordered or delivered until the required submittals have been reviewed and approved by the Owner's Representative. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Owner's Representative reserves the right to reject, on or after delivery, any material that does not meet these Specifications.

1. Loam Borrow: The Contractor shall provide a one cubic foot representative sample for testing. All stockpile sampling shall be per ASTM D 75 and Appendixes for securing samples from stockpiles**.**

   Testing will be at the Contractor's expense. Contractor shall deliver all samples to testing laboratories via overnight courier and shall have the testing report sent directly to the Owner's Representative. Perform all tests for gradation, organic content, soil chemistry and pH by UMASS Soil and Plant Tissue Laboratory, West Experiment Station, North Pleasant Street, University of Massachusetts, Amherst, MA 01003, (413) 545-2311.

   Testing reports shall be dated within 30 days of submission to the Owner’s Representative. Testing reports beyond 30 days old will be rejected and new testing reports mandated.

   Testing reports shall include the following tests and recommendations. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the Owner's Representative from the Soil and plant Tissue Laboratory. Testing reports shall include the following tests and recommendations.

   a. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D 422 after destruction of organic matter by H_2O_2. To facilitate review and approval of sieve analysis, provide a computer generated gradation curve from UMASS Soil & Plant Tissue Laboratory.

   b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples minus #10 material shall be oven-dried to a constant weight at a temperature of 450 degrees Fahrenheit (752 degrees Centigrade).

c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, extractable Aluminum, Lead, Zinc, Cadmium, Copper, Soluble Salts, and pH and buffer pH. A Conductivity Meter

shall be used to measure Soluble Salts in 1:2 soil/water (v/v). Except where otherwise noted, nutrient tests shall be for available nutrients.

d. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish lawn and planting work as specified.

2. Peat Moss: Submit a one cubic foot sample and supplier's certification of contents.

3. Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications.

4. Acidulant: Submit supplier's certification that the acidulant being supplied conforms to these Specifications.

5. Fertilizer :

a. Submit product data of seeding and planting fertilizer and certificates showing composition and analysis. Submit fertilization rates for fertilizer product based upon soil testing, analysis, and recommendations as specified, performed and paid for under in this Section, PLANTING SOILS.

b. Submit the purchasing receipt showing the total quantity purchased for the project prior to installation.

6. Gypsum: Submit manufacturer's product data and 2 pound (1 kilogram) sample.

7. All additives needed to amend a specific soil in order to meet these specifications.

1.6 EXAMINATION OF CONDITIONS

A. All areas of the existing site where topsoil is to sampled for testing shall be inspected by the Contractor before starting work and any issues that might inhibit or prevent the sampling operation shall be reported to the Owner's Representative prior to beginning this work.

B. The Contractor and any sub-Contractor responsible for the execution of the Work of this Section, PLANTING SOILS, shall review and confirm in writing that the subsoil elevations have been brought to the proper subgrade elevations prior to proceeding with the spreading of the loam borrow.

PART 2 - PRODUCTS

2.1 LOAM

A. Loam borrow shall be one of the following loamy sands and sandy loams; “loamy sand”, “loamy fine sand”, “loamy very fine sand”, or “coarse sandy loam”: determined by mechanical analysis (ASTM D 422) and based on the "USDA Classification System" and as defined in this Section. It shall be of uniform composition, without admixture of

subsoil. It shall be free of stones greater than 0.75 inches (19 mm) lumps, plants and their roots, debris and other extraneous matter as determined by the Owner's Representative.

Planting soil for lawn areas shall have the following grain size distribution for material passing the #10 (2.0 mm) sieve:

Millimeter	Percent Passing by Weight	
	Maximum	Minimum
2	-------	100
1	100	82
0.5	87	65
0.25	72	49
0.10	45	30
0.05	32	22
0.002	5	2

1. Maximum size shall be one and one quarter inches largest dimension. The maximum retained on the #10 sieve shall be 25% by weight of the total sample.

2. The ratio of the particle size for 80% passing (D_{80}) to the particle size for 30% passing (D_{30}) shall be 6.0 or less. ($D_{80}/D_{30} < 6.0$).

3. In addition to the foregoing, all loam borrow to be used for loaming and seeding shall be mechanically screened processed loam borrow that passes a 3/4 inch by 6 inch (19 mm by 150 mm) screen size.

B. Organic content and pH for specific planting use shall be as follows:

1. Areas planted with turf grasses per the Section 32 92 19, LAWNS, of this Specification:

   a. pH: 6.0 through 7.0

   b. Organic Content 4.0 - 6.0 percent as determined by the loss on ignition of oven- dried samples passing #10 sieve (Muffle furnace temperature: 450 +/- 10 degrees C for 8 hours)

2. Top 18 inches (450 mm) of areas planted with tree and shrub as described in the Section 32 90 00, PLANTING, of this Specification:

   a. pH: 5.5 through 6.5 for non-acid loving plants

   b. pH: 4.5 through 5.5 for *Ericaceae* and other acid-loving plants

   c. Organic Content 4.0 - 6.0 percent as determined by the loss on ignition of oven- dried samples passing #10 sieve (Muffle furnace temperature: 450 +/- 10 degrees C for 8 hours)

3. Loam borrow shall be pH adjusted for particular planting applications and shall be adjusted prior to delivery to the Project sites as recommended by UMASS Soil & Plant Tissue Laboratory test results.

   a. When pH of loam borrow is equal to or greater than 7 use aluminum sulfate to adjust pH downward to required levels.

   b. When pH of loam borrow is less than 7 use either sulfur or ferrous sulfate to adjust pH downward to required levels.

   c. When pH of loam borrow must be raised to the required levels use limestone.

   d. Regardless of amendment Contractor chooses to use, Contractor, not the Owner, shall be responsible for obtaining specified pH by seeding and/or planting time.

C. All loam borrow proposed for use shall be tested for conformance to the specifications. Soil additives shall be used to counteract soil deficiencies as recommended by the soils analysis and as supplements for lawn construction as specified herein.

C. The Owner's Representative reserves the right to reject on or after delivery to the project site any material which does not, in his opinion, meet these specifications.

PART 3 - EXECUTION

3.1 FILLING AND COMPACTION

A. Subsoil or ordinary borrow shall have been excavated and filled as required by the Contract Documents and specified and paid for under the Section, EARTH MOVING, of this Specification. Do not damage the work previously installed. Maintain all required angles of repose of materials adjacent to the loam as shown on the Contract Documents. Do not over excavate compacted subgrades of adjacent pavement or structures during loaming operations.

B. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the Contract Documents.

C. Clear the subgrade of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout or other material harmful to plants have

been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Such construction debris, trash, rubble and foreign material shall be removed from the site and disposed of in a legal manner. Fill any over excavation with approved fill and compact to the required subgrade compaction levels.

D. Do not proceed with the installation of loam borrow until all utility work in the area has been installed.

E. Protect adjacent walls, walks and utilities from damage or staining by the loam borrow. Use 0.5-inch (13 mm) plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.

3.2 FINE GRADING

A. Place loam in two lifts. Place the first lift to a depth of 2 inches and harrow or till the loam into the underlying subsoil to a depth of 2 inches, creating a blended interface of loam and subsoil approximately 4 inches deep. Spread the second lift of loam to a minimum depth of 4 inches or greater as shown on the Contract Documents.

B. No loam borrow shall be handled, planted, or seeded in any way if it is in a wet or frozen condition. A moist loam borrow is desirable.

C. Soil additives shall be spread and thoroughly incorporated into the layer of loam borrow by harrowing or other methods reviewed by the Owner's Representative. The following soil additives shall be incorporated:

1. Ground limestone or acidulant as required by soil analysis to achieve the required pH.

2. Fertilizer at the rate and of analysis recommended by the soil analysis

3. Other soil amendments as required by soil analysis.

D. Sufficient grade stakes shall be set for checking the finished grades. Stakes must be set in the bottom of swales and at the top of slopes. Deviation from indicated elevations that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.

E. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional loam borrow and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.

F. The Contractor shall install loam borrow in successive horizontal lifts no thicker than 6 inches (150 mm) in turf areas and 12 inches (300 mm) in plant bed areas to the desired compaction as described herein. The Contractor shall install the soil at a higher level to anticipate any reduction of loam borrow volume due to compaction, settling, erosion, decomposition, and other similar processes during the warranty period. The Owner's Representative will ensure that the full depths of loam borrow for lawn and plant beds are obtained by digging holes in the loam borrow at the same frequency as for compaction testing.

1. Compact loam to the required density as specified herein.
2. Maximum dry density for topsoils and loam shall be determined in accordance with ASTM D698. The following percentages of minimum to maximum dry densities shall be achieved for fill materials or prepared subgrades.

   In lawn and plant beds:

	Minimum	Maximum
a. Fills within seeding and planting areas in top eighteen inches of finished grade	80%	85%

3. The surface area of each lift hall shall be scarified by raking prior to placing the next lift.

G. Select equipment and otherwise phase the installation of the loam borrow to ensure that wheeled equipment does not travel over subsoil, placed fills or ordinary borrow or already installed soil.

H. Disturbed areas outside the limit of lawn work shall be graded smooth and spread with a minimum of 6 inches (150 mm) of loam borrow to the finished grade.

3.3 ACCEPTANCE

A. Confirm that the final grade of the loam borrow is at the proper finish grade elevations. Adjust grade as required to meet the contours and spot elevations noted on the Plans. Request the presence of the Owner's Representative to inspect final grade. Do not proceed with the remaining work of this Contract until the Owner's Representative has given his/her written approval of the final grade.

END OF SECTION 32 91 13

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SECTION 32 92 19-LAWNS

PART 1-GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all lawn installation and fine grading work and related items as indicated on the Contract Documents and/or as specified in this Section and includes, but is not necessarily limited to, the following:

1. Seeding
2. Maintenance and protection

1.3 RELATED WORK UNDER OTHER SECTIONS

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section 32 91 13, PLANTING SOILS

1.4 REFERENCES

A. Not Applicable.

1.5 SUBMITTALS

A. At least 90 days prior to the first day of the seeding season described in this Section, submit to the Owner's Representative proof of certification of Foreman or Crew Leader as Massachusetts Certified Landscape Professional or Massachusetts Certified Horticulturist in accordance with QUALITY ASSURANCE paragraph of this Section.

B. Submit proof of landscape contractor's experience to the Owner's Representative in accordance with QUALITY ASSURANCE paragraph of this Section.

C. At least 30 days prior to intended use, the Contractor shall provide the following samples and submittals for approval in conformance with the requirements of Section, SUBMITTALS. Do not order materials until Owner's Representative's

approval of samples, certifications or test results has been obtained. Delivered materials shall closely match the approved samples. Acceptance shall not constitute final acceptance. The Owner's Representative reserves the right to reject on or after delivery any material that

does not meet these Specifications.

1. Material Sampling and Testing of Loam Borrow from Off-Site Sources shall be specified, performed and paid for under Section 32 91 13, PLANTING SOILS, of this Specification.

2. Fertilizer:

   a. Submit product literature of seeding fertilizer and certificates showing composition and analysis.
   b. Submit the purchasing receipt showing the total quantity purchased for the project prior to installation.

3. Seed: Submit a manufacturer's Certificate of Compliance to the Specifications with each shipment of each type of seed. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.

4. Hydroseeding: Prior to the start of hydroseeding, submit a certified statement for approval as to the number of pounds of materials to be used per 100 gallons of water.

5. Wood Cellulose Fiber Mulch: Submit 4 copies of manufacturer's literature and one material sample.

6. Sod: certificate of sod composition with percentages of each grass type indicated.
   Include USDA soil classification for soil sod was grown on.

7. Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications.

8. All additives needed to amend a specific soil in order to meet these specifications.

9. Erosion control matting: Submit 4 copies of manufacturer's literature and one material sample.

D. Maintenance Instructions: At the time of Acceptance, the Contractor shall submit complete maintenance instructions for seeded area care for the Owner's use. The instructions shall be reviewed for approval by the Owner's Representative as a pre-condition for Acceptance.

1.6 EXAMINATION OF CONDITIONS

A. All areas to be improved shall be inspected by the Contractor before starting work and any defects such as incorrect grading, or drainage problems shall be reported to the Owner's Representative prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be improved, and he shall assume full responsibility for the work of this Section, LAWNS.

B. The Contractor shall be solely responsible for judging the full extent of work requirements

involved.

1.7 QUALITY ASSURANCE

A. Qualification of Landscape Contractor: The work of this Section, LAWNS, shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years experience. Proof of this experience shall be submitted per SUBMITTALS paragraph of this Section, LAWNS.

B. Qualification of Foreman or Crew Leader: All work of seeding shall be supervised by a foreman or crew leader who is a certified landscape professional or a certified horticulturist.

1. Landscape professional shall be a Massachusetts Certified Landscape Professional certified by the Associated Landscape Contractors of Massachusetts.

2. Horticulturist shall be a Massachusetts Certified Horticulturist as certified by the Massachusetts Nursery and Landscape Association.

3. Certification shall be current. Proof of certification shall be submitted per SUBMITTALS paragraph of this Section, LAWNS.

C. The ratio of laborers to certified landscape professionals or certified horticulturist shall not exceed twelve to one. Certified Landscape Professional or Certified Horticulturist shall be on the project site throughout the day to day performance of the work described in this Section, LAWNS.

PART 2 - PRODUCTS

2.1 LOAM

A. Loam borrow shall be specified, provided, installed and paid for under the work of the Section 32 91 13, PLANTING SOILS, of this Specification.

2.2 SOIL ADDITIVES

A. Soil additives shall be specified, and provided under Section 32 91 13, PLANTING SOILS

2.3 SEED

A. Seed mixture shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and in no case shall the weed seed content exceed 0.25% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed that has become wet, moldy or otherwise damaged shall not be acceptable. Chewings fescue, hard fescue, tall fescue and ryegrass shall contain *Acromonium* endophytes. Seed containing endophyte

must be kept cool and dry at all times; do not stockpile in the sun.

1. Seed Mixture Composition (Sun)

Common Name	Proportion By Weight	Germination Minimum	Purity Minimum
Creeping Red Fescue	30%	85%	95%
Kentucky Bluegrass	60%	85%	90%
Perennial Rye	10%	90%	90%

a. Bluegrass and rye grass varieties shall be within the top 50 percent and 25 percent respectively, of varieties tested in National Turfgrass Evaluation Program.

b. Seeding rate shall be 6 pounds per 1,000 square feet.

2.4 FERTILIZERS

A. Fertilizer shall be a commercial product complying with the State and United States fertilizer laws. Deliver to the site in the original unopened containers that shall bear the manufacturer's certificate of compliance covering analysis. Fertilizer shall contain not less than the percentages of weight of ingredients as recommended by the soil analysis specified, performed and paid for under the Section 32 91 13, PLANTING SOILS, of this Specification.

B. Phosphorus shall be superphosphate or triple superphosphate.

2.5 LIMESTONE

A. Ground limestone for adjustment of loam borrow pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40 percent will

pass through 100 mesh sieve and 95 percent will pass through a 20 mesh sieve. Contractor shall be aware of loam borrow pH and the amount of lime needed to adjust pH to specification in accordance with testing lab recommendations.

2.6 WOOD CELLULOSE FIBER MULCH

A. Mulch to cover hydroseeded areas with slopes less than 3 to one shall be fiber processed from whole wood chips and clean recycled newsprint in a 1:1 proportion manufactured specifically for standard hydraulic mulching equipment. Fiber shall not be produced from recycled material such as sawdust, paper, or cardboard.

B. Moisture content shall not exceed 10 percent, plus or minus 3 percent as defined by the pulp and paper industry standards. Fiber shall have a water holding capacity of not less than 900 grams water per 100 grams fiber.

C. The mulch shall be of such character that the fiber will be dispersed into a uniform slurry when mixed with water. It shall be nontoxic to plant life or animal life.

D. The mulch shall contain a non-petroleum based organic tackifier and a green dye to allow for easy visual metering during application but shall be non-injurious to plant growth.

2.7 EROSION CONTROL MATTING

A. Matting for erosion control on slopes equal to and steeper than four to one (4:1) and in drainage swales shall be Model SC150BN manufactured by North American Green, Inc., 14649 Highway 41 North, Evansville, IN 47725, phone: (800) 772-2040 or approved equal. Matting shall have a functional longevity of 18 months and shall be a machine- produced 100% biodegradable organic fiber netting with a 70% agricultural straw fiber and 30% coconut fiber blend matrix. Matting shall be of consistent thickness with the straw evenly distributed over the entire area of the matting. Matting shall be covered on the top and bottom sides with 100% biodegradable organic woven fiber netting. Netting shall consist of machine directional strands formed from two intertwined yarns with cross directional strands interwoven through the twisted machine strands (commonly referred to as a Leno weave) to form an approximate 0.50 inch x 1.00 inch mesh. Netting, both sides, shall weigh approximately 9.30 pounds per 1000 square feet. The matting shall be sewn on
1.50 inch centers (50 stitches per roll width) with biodegradable thread. The matting shall be manufactured with a colored line or thread stitched along both edges (approximately 2 to 5 inches from the edge) to ensure proper material overlapping. The matrix shall be 70% straw fiber with a weight of 0.35 pounds per square yard blended with 30% coconut fiber with a weight of 0.15 pounds per square yard.

1. Matting shall meet the following requirements per roll:

a.	Width	6.67 feet plus or minus 5%
b.	Length	108.00 feet plus or minus 5%
c.	Weight	53.50 pounds plus or minus 10%
d.	Area	80.00square yards

e. Stitch Spacing 1.50 inches

2. Matting fasteners shall be 6 inch long wooden stakes as manufactured by North American Green, Inc., 14649 Highway 41 North, Evansville, IN 47725, phone: (800) 772-2040 or approved equal.

2.8 HERBICIDES, CHEMICALS AND INSECTICIDES

A. Provide chemicals and insecticides as needed for fungus or pest control. All chemicals and insecticides shall be approved by the Massachusetts Department of Food and Agriculture for the intended uses and application rates.

B. Provide post emergent crab grass control throughout the maintenance period to ensure a germinated and mown lawn free of crab grass.

C. No herbicides, chemicals or insecticides shall be used within 100' of the wetland resource areas.

2.9 WATER

A. The Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. If possible, the Owner shall furnish the Contractor upon request with an adequate source and supply of water at no charge. However, if the Owner's water supply is not available or not functioning, the Contractor shall be responsible to furnish adequate supplies at his own cost. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

PART 3-EXECUTION

3.1 FILLING AND COMPACTION

A. Filling and compaction of loam shall be specified, performed and paid for under the work of the Section 32 91 13, PLANTING SOILS, of this Specification.

3.2 FINE GRADING

A. Fine grading shall be specified, performed and paid for under the work of the Section 32 91 13, PLANTING SOILS, of this Specification.

3.3 SEEDING

A. Contractor shall obtain Owner's Representative's written approval of fine grading and bed preparation before doing any seeding.

B. Limit of grading and earthwork shall be limit of seeding unless otherwise indicated on the Contract Documents. All areas disturbed outside the limit of seeding shall be prepared and seeded as specified herein at no additional cost.

C. The season for seeding shall be from April 1 to June 1 and from August 15 to September
30. The actual planting of seed shall be done, however, only during periods within this season which are normal for such work as determined by weather conditions and by accepted practice in this locality. To prevent loss of soil via water and wind erosion and to prevent the flow of sediment, fertilizer, and pesticides onto roadways, sidewalks, and into catch basins, seed loam areas within 5 Days of spreading the loam.

D. Seed only when the bed is in a friable condition, not muddy or hard.

E. Seeding shall be by Hydroseeding Method specified as follows:

1. Prior to the start of work, furnish a certified statement as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of hydroseeding that can be covered with the quantity of solution in the hydroseeder.

2. Hydroseed with wood cellulose fiber mulch at a rate of 46 pounds per 1,000 square feet or 2000 pounds per acre.

3. For the hydroseeding process, a mobile tank with a capacity of at least 500 gallons shall be filled with water and the mixture noted above in the specified proportions. The resulting slurry shall be thoroughly mixed by means of positive agitation in the tank. Apply the slurry by a centrifugal pump using the hose application techniques from the mobile tank. Only hose application shall be permitted. At no time shall the mobile tank or tank truck be allowed onto the prepared hydroseed beds. The hose shall be equipped with a nozzle of a proper design to ensure even distribution of the hydroseeding slurry over the area to be hydroseeded and shall be operated by a person thoroughly familiar with this type of seeding operation.

4. Contractor shall obtain Owner's Representative's written approval of fine grading and bed preparation before doing any hydroseeding.

5. Limit of grading and earthwork shall be limit of hydroseeding unless otherwise indicated on the Contract Documents. All areas disturbed outside the limit of hydroseeding shall be hydroseeded.

6. Seed only when the bed is in a friable condition, not muddy or hard. Construction methods shall conform to hydraulic method requirements specified in the Standard Specification.

7. Hydroseeding shall be a two-step process.

   a. Step one shall consist of spreading 100 percent of the required seed uniformly over the prepared loam bed so that the seed comes into direct contact with the soil. To mark the progress of the hydroseeding operation the Contractor may add 10 percent of the wood cellulose fiber mulch to the slurry.

b. Step two shall consist of a separate application of wood cellulose fiber mulch immediately following the first step of hydroseeding noted above. Apply the wood cellulose fiber mulch at a rate of 2,000 pounds per acre.

3.4 EROSION CONTROL MATTING

A. Erosion control matting shall be installed immediately after seeding in the areas designated on the Contract Documents, on slopes four to one (4:1) or steeper, within surface drainage swales, and around surface drains.

B. Matting shall be installed perpendicular to slopes, and shall extend at least 3 feet beyond slope crest. Provide check slot at top of slope and anchor slot at bottom of slope where indicated.

C. Roll out the matting perpendicular to the slope. Do not stretch the fabric. In drainage swales, center the fabric along the flow line. Install the matting in a check slot at the top and bottom of the slope of the area to be covered. Check slots shall be 6 inches deep and 6 inches wide. Fabric shall extend down one wall of the check slot and across the full width of the base. Overlap edges of matting rolls 4 inches minimum and overlap the ends 18 inches at a minimum.

D. Install stakes in check slots, edges, center and ends of rolls by driving specified wood stakes 2 feet on center over the entire area to be covered, except at check slots and ends of rolls, where stakes shall be placed 6 inches on center.

E. Fill check slots with loam and tamp firmly.

F. Following matting installation, roll the entire area with a smooth drum roller weighing between 50 and 75 pounds per linear foot of roller. The finished installation of matting shall be firmly in contact with the soil and provide a smooth, finished appearance free from lumps or depressions.

3.5 LAWN MAINTENANCE (SEED)

A. Maintenance shall begin immediately after any area is seeded and shall continue for a 60 day active growing period for seeded areas or until Final Acceptance, whichever is longer ; following the completion of all lawn construction work, and until final acceptance of the project. [* In the event that seeding operations are completed too late in the Fall for adequate germination and growth of grass, then maintenance shall continue into the following Spring for the minimum 60 Day period. In addition, install blankets or netting to prevent loam degradation and movement over the winter. Submit product literature and samples to the Owner's Representative for review. Blankets and netting shall be placed in a timely manner at no additional cost to the Owner.

B. Maintenance shall include reseeding , mowing, watering, weeding, fertilizing a

minimum of two times in addition to the fertilizer incorporated by harrowing into the spread loam, and resetting and straightening of protective barriers. Lawn work maintenance shall also include chemical treatments as required for fungus and/or pest control.

C. During the maintenance period, any decline in the condition of seeded areas shall require immediate action to identify potential problems and to undertake corrective measures.

D. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the

finished surface by the watering equipment.

1. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary to maintain moist soil to a depth of at least 2 inches for seeded areas.

2. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply water to the required soil depths each 8-hour period.

E. Protection

1. Lawn areas shall be protected by a 3-foot high barrier constructed of 2 inch by 2 inch hardwood stakes or iron pipes set 18 inches in the ground at 10 foot intervals and connected by No. 10 wire. Flags of white cloth shall be secured to the wire at center points between stakes.

2. Barriers must be raised immediately after lawn construction and shall be maintained until Acceptance.

F. After the grass in seeded areas has germinated, reseed all areas and parts of areas that fail to show a uniform stand of grass. Reseed such areas and parts of areas repeatedly until all areas are covered with a satisfactory growth of grass with no less than 20 grass shoots per square inch and 2880 grass shoots per square foot. Reseeding together with necessary grading, fertilizing, and trimming shall be done at the Contractor's expense.

G. Mowing and Edging:

1. The Contractor shall keep lawn areas mowed until Acceptance of the contract by cutting to a height of 2 inches when growth reaches 3 inches or as directed by the Owner's Representative.

2. At each mowing, all edges of walks, drives, plant beds and other border conditions shall be edge trimmed by hand or machine to produce straight and uniform edge conditions.

3. Remove and discard from paved areas only clippings and debris generated by each mowing and edging operation legally off-site. Owner's Representative, if practical and aesthetic, may allow sweeping (not blowing) clippings back into grass. Mowers shall be equipped with mulching blades. Do not remove from grass areas any clippings that have been generated by mowing operations. Do not mow grass when wet.

H. Fertilizing: The first application of fertilizer is specified, provided, performed and paid for under the Section 32 91 13, PLANTING SOILS. A second application of fertilizer shall be applied to seeded areas at the time of the first mowing and shall be performed and paid for under this Section, LAWNS. This second application shall be applied at a rate that ensures

that one-half pound of nitrogen is applied per 1,000 square feet. Phosphorus and potassium shall be applied proportionally in accordance with the recommendations of the soil tests and the quantities previously integrated into the soil during the first application. A third application of nitrogen fertilizer shall be applied to seeded areas approximately two months after the second application and shall be paid for under this Section, LAWNS. This third application shall correspond to the following application rates dependent upon the month of application.

1. May 1-15: Apply 1.0 pound of nitrogen per 1,000 square feet.

2. June 15-30: Apply 1.0 pound of nitrogen per 1,000 square feet.

3. August 15 through September 15: Apply 1.0 pound of nitrogen per 1,000 square feet.

4. November 1-15: Apply 1.5 pounds of nitrogen per 1,000 square feet.

Nitrogen fertilizer shall be composed of 50 percent slowly soluble or slow release nitrogen fertilizer.

3.6 APPLYING LIMESTONE

A. The Contractor shall return to the site at the beginning of the next seeding season and spread limestone across all lawn areas installed under this Contract. The work of liming the fields shall be as specified under Section 32 91 13, PLANTING SOILS, of this Specification, and performed and paid for under this Section, LAWNS. Limestone shall be spread at rates determined by the soil tests specified, performed and paid for under Section 31 91 13, PLANTING SOILS.

3.7 ACCEPTANCE OF SEED

A. Following the minimum required maintenance periods for lawn construction, the Contractor shall request the Owner's Representative in writing for a formal inspection of the completed work. Request for inspection shall be received by the Owner's Representative at least 10 Days before anticipated date of inspection.

B. Acceptance Requirements

1. At the end of the maintenance period, seeded areas shall have a close stand of grass as defined above with no weeds present and no bare spots greater than 3 inches in diameter over greater than 5 percent of the overall seeded area. At least 90 percent of the grass established shall be permanent grass species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until

deficiencies are corrected. Seeded areas to be corrected shall be prepared and reseeded in accordance with the requirements of this Section, LAWNS.

2. At the time of acceptance, the Contractor shall remove temporary barriers used to protect lawn areas.

C. Furnish full and complete written instructions for maintenance of the seeded areas to the Owner at the time of acceptance in conformance with Submittals requirements.

D. Owner's Representative's inspection shall determine whether maintenance shall continue in any part.

3.9 CLEAN UP

A. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition, as directed by the Owner's Representative, at no cost to the Owner.

END OF SECTION 32 92 19

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