MASSACHUSETTS DEPARTMENT OF MENTAL HEALTH
OFFICE OF ENGINEERING AND FACILITIES MANAGEMENT

BID PACKAGE

FOR

2022-031A Cooling Towers Replacement
S.C. Fuller Mental Health Center
85 East Newton Street
Boston, Massachusetts 02118

Out to Bid: January 19, 2022

BID PACKAGE

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DMH PROJECT# 2022-031A
COOLING TOWERS REPLACEMENT
FULLER MENTAL HEALTH CENTER
85 EAST NEWTON STREET
BOSTON, MA 02118

NOTICE TO CONTRACTORS
CLASSIFIED LEGAL ADVERTISEMENT

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE FOR HEALTH AND HUMAN SERVICES
DEPARTMENT OF MENTAL HEALTH – FACILITIES MANAGEMENT

General Bids Submission Deadline: **2:00 P.M. Friday February 11, 2022**

Filed Sub-bids (Electrical) Submission Deadline: **2:00 P.M. Wednesday February 2, 2022**

The Category of Work is: **MECHANICAL (General Contractor and sub bidders must be DCAMM Certified)**

Project Name: **2022-031A Cooling Towers Replacement**

Project Location: **S.C. Fuller Mental Health Center, 85 East Newton Street, Boston, MA 02118**

Estimated Construction Cost: **$2,200,000.^{00}**

Replacement of rooftop cooling tower units and their associated electrical/mechanical components in accordance with the plans and project specifications of this project.

Minimum rates of wages to be paid on the project have been determined by the Commissioner of the Division of Occupational Safety under the provisions of Sections 26 and 27, Chapter 149 of the General Laws and will be included in the bid package.

Proposals will ONLY be submitted online via COMMBUYS website by the General Bids & Sub-bids Submission Deadline date on forms furnished by the Department of Mental Health (DMH) and clearly identified as a bid, endorsed with the name and address of the bidder, and the project name.

Each general bid and sub-bid proposal must be secured by an uploaded photocopy of an accompanying **deposit of 5%** of the total bid amount, including all alternates, in the form of a bid bond, a certified treasurer's or cashier's check issued by a responsible bank or trust company made payable to the Commonwealth of Massachusetts. Awarded vendor will then mail the original 5% deposit bond or check to the Department of Mental Health, Office of Engineering and Facilities Management, 167 Lyman Street, Room 158, Westborough, MA 01581. The Department reserves the right to waive any informality in or reject any or all Bids if it is in the public interest to do so.

Plans and Specifications will **ONLY** be available at **COMMBUYS** from **1/19/2022** thru general bid opening. Bid must be submitted electronically on COMMBUYS by the Submission Deadlines dated above. If you have any questions or concerns with using COMMBUYS, please contact the COMMBUYS help desk at 617-720-3197 (8am - 5pm EST Monday thru Friday).

Pre-Bid Conference: A Pre-Bid Site Visit is **MANDATORY** for General Contractor (Mechanical) and **OPTIONAL** for the File sub-bidders (Electrical) and will be held **10:00AM on Thursday 1/27/2022. Contractors shall meet the Project Engineer at the main lobby at Fuller MHC located at 85 East Newton Street, Boston** to review project details. Please contact DMH Project Engineer, Gerald McCullough, at (508) 616-2248. **After attending the Pre-Bid Conference, all sub-bid questions must be E-mailed to gerald.mccullough@mass.gov by 12:00 P.M. on Friday 1/28/2022 and general bid questions E-mailed to gerald.mccullough@mass.gov by 12:00 P.M. on Monday 2/07/2022.**

Covid-19 Precaution Notice: Anyone attending site viewing(s) will be required to follow state and city precaution guidelines by wearing the necessary face mask and practicing safe distancing. Contractors will also need to follow building COVID-19 protocols.

Estimated Project Duration is eighteen (18) months from Notice to Proceed.

MBW/WBE Contractors are encouraged to inquire about this project.

DEPARTMENT OF MENTAL HEALTH
BROOKE DOYLE, COMMISSIONER

DEPARTMENT OF MENTAL HEALTH
OFFICE OF FACILITIES MANAGEMENT
HADLEY BUILDING
167 LYMAN STREET
WESTBOROUGH, MASSACHUSETTS 01581

COOLING TOWERS REPLACEMENT
AT
S.C. FULLER MENTAL HEALTH CENTER
85 EAST NEWTON STREET
BOSTON, MA 02118

(DMH Project #2022-031A)

NOTICE OF PRE-BID CONFERENCE

THE PRE-BID SITE VISIT IS MANDATORY FOR GENERAL CONTRACTOR (MECHANICAL) AND OPTIONAL FOR THE FILED SUB-BIDDERS (ELECTRICAL)

ALL CONTRACTORS INTERESTED IN BIDDING ON THIS PROJECT ARE HEREBY NOTIFIED OF A PRE-BID CONFERENCE AND WALK-THROUGH

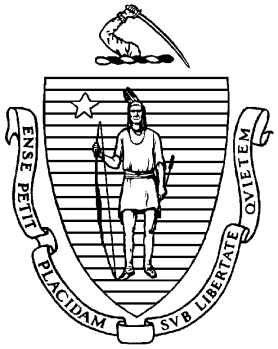
ON

THURSDAY JANUARY 27, 2022

AT

10:00 A.M.

CONTRACTORS ARE TO MEET IN THE MAIN LOBBY OF S.C. FULLER MENTAL HEALTH CENTER LOCATED AT 85 EAST NEWTON STREET BOSTON, MASSACHUSETTS 02118



BID PACKAGE

PART I

INSTRUCTIONS TO BIDDERS

2022-031A Cooling Towers Replacement
S.C. Fuller Mental Health Center
85 East Newton Street
Boston, Massachusetts 02118

Instructions to Bidders

Attachment A:
Prevailing Wage Schedule – Bidder Acknowledgement Document Form
Prevailing Wage Report

Attachment B: Form Used During Bidding
Form for General Bid
General Bidder Check List
General Bidder Documents to Upload into COMMBUYS Check list

Attachment C: Form Used During Bidding
Form for Sub Bid
Sub Bid Checklist
Sub Bidder Documents to Upload into COMMBUYS Checklist
Form for Sub-Bidder Update Statement

COMMONWEALTH OF MASSACHUSETTS
INSTRUCTIONS TO BIDDERS

Awarding Authority:
Department of Mental Health
Office of Engineering and Facilities Management
Hadley Building
167 Lyman Street
Westborough, MA 01581
508-616-2248

Project Title: **2022-031A Cooling Towers Replacement**
S.C. Fuller Mental Health Center
85 East Newton Street Boston, Massachusetts 02118

Category of Work: **MECHANICAL (General Contractor and Sub bidders must be DCAMM Certified)**

Project Description and Scope:

Contractor is to replace the rooftop cooling tower units and their associated electrical/mechanical components in accordance with the plans and specifications of this project.

Deadline for filing General bids is at: 2:00 PM Friday February 11, 2022

Deadline for filing Sub-bids is at: 2:00 PM Wednesday February 2, 2022

The minimum wage rate requirements for this Contract are located in Attachment A to these Instructions to Bidders.

Pursuant to M.G.L. c. 30, §39S(a) (2) all employees to be employed on the project must have successfully completed a course in construction safety and health approved by OSHA and of at least 10 hours in duration.

The Contractor must provide written verification as detailed in the General Conditions of compliance with Federal Department of Homeland Security Requirements, including but not limited to the Employment Eligibility Verification (Form I-9) Process.

Bid forms for this Contract are located in Attachments B and C to these Instructions to Bidders.

The work is to be accomplished within eighteen (18) calendar months from a Notice To Proceed, and will be specified in Article 2 of the Owner - Contractor Agreement for the successful bidder. Liquidated damages for failure to complete work on time is $500 per day, and will be stated in Article 2 of the Owner - Contractor Agreement.

Bidding Documents must be obtained via COMMBUYS website. If you need assistance with COMMBUYS, please call the COMMBUYS help desk at (617) 720-3197. COMMBUYS Job Aids for Vendors on how to use COMMBUYS are available by clicking the link below.

https://www.mass.gov/lists/job-aids-for-vendors-using-commbuys

The filed subtrades for this project are as follows:

Section #	Bid Package Part#	Filed Sub-trade	All Bid Deposits 5% of Bid Amount
260001 & Plans	Part 4 & Plans	ELECTRICAL	

As used herein, capitalized terms shall have the meaning assigned to them in the General Conditions of the Contract and the Owner - Contractor Agreement unless the context clearly indicates otherwise.

SECTION I - BIDDER'S REPRESENTATION

1.1 Each general bidder or sub-bidder (hereinafter sometimes referred to as "Bidder) by making a bid or sub-bid (hereinafter sometimes referred to as "Bid") represents and warrants that Bidder has visited and examined the Site and the Contract Documents, that Bidder is familiar with the local conditions under which the Work is to be performed, that Bidder has correlated personal observations with the requirements of the Contract Documents, and that where the Contract Documents require, in any part of the Work, a given result to be produced, the Contract Documents are adequate and that Bidder will produce the required result within the Bid price and that the Bid is made in accordance therewith.

1.2 Failure to so examine the Contract Documents and the Site will not relieve any Bidder from any obligation under the Bid as submitted. Neither the Commonwealth nor the Designer will be responsible for errors, omissions and/or charges for extra work arising from Bidder's failure to familiarize itself with the Contract Documents or existing conditions.

SECTION 2 -- GENERAL BIDDERS - CERTIFICATE OF ELIGIBILITY AND UPDATE STATEMENT

2.1 Every general bidder must submit the following with its general bid:

--A Prime/General Contractor Certificate of Eligibility issued by the Division of Capital Asset Management and Maintenance (DCAMM), showing that the Bidder has been approved to bid on projects for the category of work required and that the Bidder has a single project limit in an amount no lower than the amount of its Bid including all "add" alternates.
--A fully completed Prime/General Contractor Update Statement.

2.2 It is the Bidder's responsibility to obtain the necessary forms from DCAMM and to submit its Application for Certificate of Eligibility so as to allow sufficient time for DCAMM's evaluation of the application and issuance of a Certificate of Eligibility prior to the deadline for bidding.

2.3 The Prime/General Contractor Update Statement is not a public record as defined in M.G.L. c. 4, § 7 and will not be open to public inspection.

SECTION 3 – FILED SUB-BIDDERS - CERTIFICATE OF ELIGIBILITY AND UPDATE STATEMENT

3.1 Every filed sub-bidder must submit the following with each filed sub-bid:
--A Sub-Bidder Certificate of Eligibility issued by the Division of Capital Asset Management and Maintenance (DCAMM) for that sub-bid trade, showing that the sub-bidder has been approved to bid on projects of the category of work required.
--A fully completed Sub-Bidder Update Statement.

3.2 It is the sub-bidder's responsibility to obtain the necessary forms from DCAMM and to submit its Application for Sub-bidder Certificate of Eligibility so as to allow sufficient time for DCAMM's evaluation of the application and issuance of a Sub-Bidder Certificate of Eligibility prior to the deadline for bidding.

3.3 The Sub-Bidder Update Statement is not a public record as defined in M.G.L. c. 4, §7 and will not be open to public inspection.

SECTION 4 -- REQUESTS FOR INTERPRETATION

4.1 Any questions by prospective Bidders concerning interpretation of the Contract Documents must be E-mailed to **gerald.mccullough@mass.gov** and shall be in his possession **by the General Bid Questions deadline of 12:00PM Monday February 7, 2022**, or, if a question pertains to filed sub-Bid work, **by the filed Sub-Bids deadline of 12:00PM Friday January 28, 2022**. The Awarding Authority will post any addenda or written interpretations on COMMBUYS that it deems necessary to Bidders at least 48 hours before the General Bids Submission Deadline Date. Bidders may NOT rely upon oral communications or interpretations from the Awarding Authority or the Designer and the Awarding Authority shall not be bound by them.

4.2 It is the sole responsibility of the Bidder to ascertain the existence of any addenda issued by the Awarding Authority on COMMBUYS, by Bidder.

4.3 Wherever in the Contract Documents reference is made to Massachusetts General Laws, it shall be construed to include all amendments thereto effective as of the date of the issuance of the invitation to bid on the proposed work.

SECTION 5 -- PREPARATION OF BIDS; ALTERNATES

5.1 General Bids and Sub Bids shall be submitted on the Form for General Bid or Form for Sub-bid respectively included in Attachments B and C to these Instructions to Bidders.

5.2 All entries on the Bid form shall be typewritten or in ink.

5.3 Where so indicated on the Bid form, sums shall be expressed in both words and numerals. Where there is a discrepancy between the Bid sum expressed in words and the Bid sum expressed in figures, the Bid sum expressed in words shall control unless the intention of the Bidder clearly is otherwise as determined by the Awarding Authority in its sole discretion.

5.4 Each General Bidder shall acknowledge all required alternates in Section C on the Form for General Bid by entering the dollar amount of addition or subtraction necessitated by each alternate. General Bidders shall enter on the Form for General Bid a single amount for each alternate that shall consist of the sub-bidders' amounts and the amount for work performed by the General Bidder. Each Sub-bidder shall acknowledge all required alternates in Part A on the Form for Sub-Bid by entering the dollar amount of addition or subtraction necessitated by each alternate.

5.5 If an alternate includes work within the Bidder's scope of work and does not involve a change in the cost of the Bid, the Bidder shall so indicate by writing "No Change" or "N/C" or "0" in the space provided for that alternate. Sub-bidders shall enter on the Form for Sub-Bid the amount of addition or subtraction necessitated only for those alternates expressly identified in the Bid Documents as part of the sub-bidder’s category of work. If the alternate is not identified in the Bid Documents as affecting the sub-Bidder’s category of work then the sub-Bidder shall so indicate by writing “N/A” and only “N/A” or leaving the alternate blank.

5.6 The lowest Bidder will be determined on the basis of the sum of the base Bid and the accepted alternates accepted by the Awarding Authority.

5.7 If the space for indicating a requirement for payment and performance bonds for filed Sub-Bidders is left blank by the General Bidder on the Form for General Bid, the Awarding Authority shall interpret this as a "NO”.

5.8 Costs for the selected filed sub-bidder’s bond premiums shall be paid for by the selected general Contractor bidder in accordance with M.G.L. c. 149, § 44F unless the project is a project in which contractor and subcontractor prequalification are required pursuant to M.G.L. 149, §§ 44D1/2 or 44D3/4.

5.9 If the general bidders are instructed to carry an amount for a given sub-trade, General Bidders shall list the subtrade and the amount provided by the Awarding Authority. The line under "bonds required" on the Form for General Bid should be left blank or marked "N/A" in order for subsection 5.10 to apply.

5.10 Upon solicitation of a subcontractor to perform the work required with respect to a subtrade referenced in subsection 5.9, the general Bidder's Contract Price shall be adjusted by the following: a) the difference between the subcontract amount and the amount carried in the general Bid; b) the total cost of the subcontractor's bonds, if the general Bidder requires such bonds after the solicitation is completed and if the general Bidder complied with 5.9 above; c) the

documented increased costs for the general Bidder's bonds, if any, attributable to the incremental difference between the amount carried for the given subtrade and the actual subcontract amount.

5.11 Overhead and profit for supervision of the subtrade mentioned in subsections 5.9 and 5.10 above shall be included by all general Bidders in Item 1 of the subdivision of the Contract Price. No additional overhead or profit will be paid on the incremental difference between the amount carried for the subtrade and the subcontract amount as stated in M.G.L. c. 149, § 44F(4)(a)(2).

5.12 Sub-Bidders should not list Paragraph E sub-subcontractors unless requested to do so by the Awarding Authority.

5.13 Each General Bid and each Bid of a filed subcontractor must be accompanied by a bid deposit in the form of a bid bond; cash; or a check certified by, or a treasurer's or cashier's check issued by, a responsible bank or trust company, payable to the Commonwealth of Massachusetts. Any bid bond shall be (a) in a form satisfactory to the Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth and (c) conditioned upon the faithful performance by the principal of the agreements contained in the Bid.

5.14 The amount of such bid deposit shall be **5% five per cent** of the value of the Bid including alternates.

SECTION 6 - SUBMISSION OF BIDS

6.1 Each General Bidder or Sub Bidder is to **include a photo copy of the bid deposit** of which shall be uploaded into COMMBUYS.

General and Sub Bid for:

Project Title: **2022-031A Cooling Towers Replacement**
S.C. Fuller Mental Health Center
85 East Newton Street
Boston, Massachusetts 02118

General or Sub Bidders name, business address, and telephone number below:

_____

6.2 All Bids must be received by the Awarding Authority via the COMMBUYS Website no later than the **Deadline for Filing Sub-bids and the Deadline for Filing General Bid dates** specified on page 1 of these Instructions to Bidders. Any Bid received after these deadline dates and times will not be accepted.

6.3 Bidding results will not be given out over the telephone prior to 1:00 PM of the day following the General Bid opening.

SECTION 7 - WITHDRAWAL OF BIDS; REJECTION OF BIDS

7.1 Any Bid may be withdrawn prior by E-mailing Gerald McCullough at **gerald.mccullough@mass.gov** prior to the **Deadline for filing General Bid date on page one.**

7.2 A Bidder may withdraw its Bid without penalty by E-mailing Gerald McCullough at **gerald.mccullough@mass.gov** at any time up to the time of Award as defined below in subsection 9.1 only upon demonstrating to the satisfaction of the Awarding Authority that a death or disability has occurred or a bona fide clerical or mechanical error of a substantial nature was made during the preparation of the bid. Failure to demonstrate conclusively that a bona fide clerical or mechanical error of a substantial nature was made may result in forfeiture of the Bid deposit.

7.3 The Awarding Authority reserves the right to waive any informality in or to reject any and all Bids if it is in the public interest to do so. Without limiting the foregoing, the Awarding Authority reserves the right to reject unit prices which it deems unduly high or unduly low as unbalanced.

SECTION 8 - MBE AND WBE PARTICIPATION (not applicable)

SECTION 9 -- CONTRACT AWARD

9.1 "Award" means the determination, selection, and notification of the lowest, responsible and eligible Bidder by the Awarding Authority.

9.2 The Awarding Authority will award the Contract within thirty days, Saturdays, Sundays, and legal holidays excluded after the opening of Bids in accordance with M.G.L. c.149 §44A.

9.3 The Contract will be awarded to the lowest responsible and eligible Bidder as determined by the Awarding Authority, except in the event of substitution as provided under M.G.L. c.l49, §§44E and 44F, in which cases the procedure as required by said sections shall govern the award of the Contract.

9.4 As used herein, the term "lowest responsible and eligible Bidder" shall mean the general Bidder whose Bid is the lowest of those Bidders who, in the Awarding Authority's opinion, are ready, willing and able to comply with all requirements of the Contract Documents and demonstrably possess the skill, ability, and integrity necessary for the faithful performance of the Work, based on the determination of past performance and financial soundness under (i) M.G.L. c.l49 §44A and following sections, (ii) the rules, regulations, orders, guidelines and policies promulgated from time to time by the Commissioner of the Division of Capital Asset Management and Maintenance ("DCAMM") and (iii) any other relevant criteria that the Commissioner may prescribe. If the Awarding Authority determines that any non-filed subcontractor chosen by a Bidder is not qualified or responsible, then the Bidder shall obtain another subcontractor satisfactory to Awarding Authority and the contract price shall not be adjusted.

9.5 The general Bid price shall be the price set forth in paragraph C of the Form for General Bid. No general Bid shall be rejected (i) because the sum of the prices set forth in Item 1 and 2 does not equal the general Bid price set forth in said paragraph C or (ii) because of one or more errors in setting forth the name, the sub-Bid price of a sub-Bidder, or the total of Item 2, provided that the sub-Bidder or sub-Bidders designated are clearly identifiable, or (iii) because the plans and specifications do not accompany the Bid or are not submitted with the Bid.

9.6 Should the Contract Documents 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 Awarding Authority, provided that no such ruling shall result in an unfair advantage to the Bidder.

9.7 The Awarding Authority also reserves the right to reject any sub-Bid if it determines that such sub-Bid does not represent the Bid of a person competent to perform the work as specified, or if fewer than three sub-Bids are received for a sub-trade, and the Bid prices are not reasonable for acceptance without further competition.

9.8 If the Awarding Authority decides to reject all General Bids or if the Awarding Authority does not receive any general Bids, the Awarding Authority may retain and use the Sub-Bids received for a second opening of general Bids; provided, however, that there are no changes in the work involved for the subtrades for which the sub-Bids are so retained and used; and provided, further, that the Awarding Authority shall obtain the consent of each sub-Bidder included in any award of a general Contract made pursuant to the second opening of general Bids if such award is not made within ninety days, Saturdays, Sundays and legal holidays excluded, after the opening of such sub-Bids.

SECTION 10 - EXECUTION OF CONTRACTS

10.1 If a selected filed sub-Bidder fails, within five days, Saturdays, Sundays and legal holidays excluded, after presentation of a Subcontract by the general Bidder to which the Contract was awarded, to perform its agreement to execute a Subcontract in the form provided by the Awarding Authority with such general Bidder contingent upon the execution of the general Contract, and, if requested to do so by such general Bidder in the general Bid, to furnish a performance and a payment bond as stated in its filed sub-Bid, such general Bidder and the Awarding Authority shall select from the other filed sub-Bids duly filed with the Awarding Authority for such subtrade and not rejected the lowest responsible and eligible filed sub-Bidder at the amount named in its filed sub-Bid as so filed against whose standing and ability the general Contractor makes no objection, and the Contract price shall be adjusted by the difference between the amount of such filed sub-bid and the amount of the sub-bid of the delinquent filed sub-Bidder.

10.2 Upon receipt of the Award, the general Bidder awarded the Contract shall submit properly executed originals of each of the following documents prior to execution of the Contract by the Awarding Authority. All such documents shall be in the form prescribed by the Awarding Authority.

1. Owner-Contractor Agreement
2. 100% Performance and 100% Payment Bonds with power of attorney attached
3. Certificates of Insurance evidencing coverages in amounts required by the Contract Documents
4. Written representation by the General Contractor to the effect that it has presented subcontracts to all selected filed sub-Bidders and a statement as to whether or not each such selected filed sub-Bidder has executed its subcontract such that the Awarding Authority may release the Bid deposit with respect to the same. **Misrepresentation of the foregoing shall render the general Contractor liable to the Awarding Authority for the sum of any Bid deposit released by the Awarding Authority with respect to a filed sub-Bidder that fails to execute its subcontract.**

5. Any other documents that the Awarding Authority may reasonably require in connection with the Contractor's execution of the Contract.

10.3 Please note that **NO part of the General Contractor's work may be subcontracted without the prior written approval of the Awarding Authority.** If the General Contractor desires to subcontract any part of the Work, other than work covered by Item 2, filed sub-Bidders, the General Contractor must promptly forward to the Awarding Authority a list in triplicate designating the work to be performed and the name of each proposed subcontractor for approval by the Awarding Authority. Approved subcontractors are eligible for direct payments under M.GL. 30, § 39F, as amended. Material suppliers not involving site labor need not be submitted for approval.

SECTION 11 - RETURN OF BID DEPOSITS

11.1 If no award is made, upon the expiration of the time prescribed in M.G.L. c. 149, § 44A for making an award; except that, if any general Bidder fails to perform its agreement to execute the Contract and furnish 100% Performance and 100% Payment Bond as stated in its Bid, then said general Bidder's Bid deposit shall become the property of the Commonwealth as liquidated damages; provided that the amount of the Bid deposit that becomes the property of the Commonwealth shall not exceed the difference between the Contractor's Bid price and the Bid price of the next lowest responsible and eligible Bidder; and provided further that, in the case of death, disability, bona fide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the general Bidder, such general Bidder's Bid deposit shall be returned.

11.2 If a selected sub-Bidder fails to perform its agreement to execute a sub-contract with the general Bidder selected as the general Contractor, contingent upon the execution of the General Contract, and, if requested to do so in the general Bid by such general Bidder, to furnish a Performance and Payment Bonds as stated in its sub-Bid in accordance with M.G.L. c. 149, § 44F(2), the Bid deposit of such sub-Bidder shall become the property of the Commonwealth as liquidated damages, provided that the amount of the Bid deposit that shall become the property of the Commonwealth shall not exceed the difference between its sub-Bid price and the sub-Bid price of the next lowest responsible and eligible sub-Bidder.

11.3 In addition to the provisions for the return of Bid deposits as provided above, upon receipt of a Bid Bond in an amount not less than the amount of the required Bid deposit, the Awarding Authority shall return any Bid deposit of a Bidder forthwith after the public opening of Bids.

ATTACHMENT A

PREVAILING WAGE SCHEDULE

The minimum wage rates provided in the following pages have been provided by the Division of Occupational Safety of the Massachusetts Department of Labor and Workforce Development. The Awarding Authority is not responsible for errors or omissions in such wage rates.

M.G.L. c. 149, §§ 26 and 27 provide as follows:

". . . Payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans under collective bargaining agreements or understandings between organized labor and employers shall be included for the purpose of establishing minimum wage rates as herein provided.

. . . The aforesaid rates of wages in the schedule of wage rates shall include payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans as provided in said section twenty-six, and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to a health and welfare plan, a pension plan and a supplementary unemployment benefit plan, where such payments are included in said rates of wages, shall pay the amount of said payments directly to each employee engaged in said construction"

Wage Request Number: 20220106-008

The undersigned hereby certifies that it 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 it will comply fully with all laws and regulations applicable to awards made subject to section 39M of Chapter 30 of the General Laws.

Bidder acknowledges receipt of the most recent prevailing wage rates and has incorporated said rates into their proposed bid(s).

Signature:_____

Name and Title:_____

CIRCLE: GENERAL SUB-BIDDER

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

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

ROSALIN ACOSTA
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority: Department of Mental Health

Contract Number: 2022-031A **City/Town:** BOSTON

Description of Work: Replacement of two roof top cooling tower units and associated mechanicals.

Job Location: S.C. Fuller Mental Health Center 85 East Newton St, Boston, 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 Department of Labor Standards, Division of Apprentice Standards (DLS/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. **Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency 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.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2021	$37.05	$13.41	$16.01	$0.00	$66.47
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2021	$37.12	$13.41	$16.01	$0.00	$66.54
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2021	$37.24	$13.41	$16.01	$0.00	$66.66
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 1*	12/01/2021	$41.93	$9.10	$17.57	$0.00	$68.60
	06/01/2022	$42.93	$9.10	$17.57	$0.00	$69.60
	12/01/2022	$43.93	$9.10	$17.57	$0.00	$70.60
	06/01/2023	$44.93	$9.10	$17.57	$0.00	$71.60
	12/01/2023	$46.18	$9.10	$17.57	$0.00	$72.85
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$41.93	$9.10	$17.57	$0.00	$68.60
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	12/01/2020	$38.10	$12.80	$9.45	$0.00	$60.35
ASPHALT RAKER *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$51.38	$14.00	$16.05	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$51.38	$14.00	$16.05	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 1*	12/01/2021	$41.93	$9.10	$17.57	$0.00	$68.60
	06/01/2022	$42.93	$9.10	$17.57	$0.00	$69.60
	12/01/2022	$43.93	$9.10	$17.57	$0.00	$70.60
	06/01/2023	$44.93	$9.10	$17.57	$0.00	$71.60
	12/01/2023	$46.18	$9.10	$17.57	$0.00	$72.85
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)* For apprentice rates see "Apprentice- LABORER (Heavy and Highway)	12/01/2021	$41.93	$9.10	$17.57	$0.00	$68.60
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2020	$46.10	$7.07	$17.98	$0.00	$71.15

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$29.97	$7.07	$11.69	$0.00	$48.73
2	65	$29.97	$7.07	$11.69	$0.00	$48.73
3	70	$32.27	$7.07	$12.59	$0.00	$51.93
4	75	$34.58	$7.07	$13.49	$0.00	$55.14
5	80	$36.88	$7.07	$14.38	$0.00	$58.33
6	85	$39.19	$7.07	$15.29	$0.00	$61.55
7	90	$41.49	$7.07	$16.18	$0.00	$64.74
8	95	$43.80	$7.07	$17.09	$0.00	$67.96

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (BOSTON)*	08/01/2021	$57.15	$11.39	$22.25	$0.00	$90.79
	02/01/2022	$57.74	$11.39	$22.25	$0.00	$91.38

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.58	$11.39	$22.25	$0.00	$62.22
2	60	$34.29	$11.39	$22.25	$0.00	$67.93
3	70	$40.01	$11.39	$22.25	$0.00	$73.65
4	80	$45.72	$11.39	$22.25	$0.00	$79.36
5	90	$51.44	$11.39	$22.25	$0.00	$85.08

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.87	$11.39	$22.25	$0.00	$62.51
2	60	$34.64	$11.39	$22.25	$0.00	$68.28
3	70	$40.42	$11.39	$22.25	$0.00	$74.06
4	80	$46.19	$11.39	$22.25	$0.00	$79.83
5	90	$51.97	$11.39	$22.25	$0.00	$85.61

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$50.83	$14.00	$16.05	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$42.33	$9.10	$17.72	$0.00	$69.15
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.18	$9.10	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.18	$9.10	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 1 (Metro Boston)*	09/01/2021	$53.27	$8.58	$19.82	$0.00	$81.67
	03/01/2022	$54.12	$8.58	$19.82	$0.00	$82.52
	09/01/2022	$55.02	$8.58	$19.82	$0.00	$83.42
	03/01/2023	$55.87	$8.58	$19.82	$0.00	$84.27

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER - Zone 1 Metro Boston*

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.64	$8.58	$1.73	$0.00	$36.95
2	60	$31.96	$8.58	$1.73	$0.00	$42.27
3	70	$37.29	$8.58	$14.63	$0.00	$60.50
4	75	$39.95	$8.58	$14.63	$0.00	$63.16
5	80	$42.62	$8.58	$16.36	$0.00	$67.56
6	80	$42.62	$8.58	$16.36	$0.00	$67.56
7	90	$47.94	$8.58	$18.09	$0.00	$74.61
8	90	$47.94	$8.58	$18.09	$0.00	$74.61

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.06	$8.58	$1.73	$0.00	$37.37
2	60	$32.47	$8.58	$1.73	$0.00	$42.78
3	70	$37.88	$8.58	$14.63	$0.00	$61.09
4	75	$40.59	$8.58	$14.63	$0.00	$63.80
5	80	$43.30	$8.58	$16.36	$0.00	$68.24
6	80	$43.30	$8.58	$16.36	$0.00	$68.24
7	90	$48.71	$8.58	$18.09	$0.00	$75.38
8	90	$48.71	$8.58	$18.09	$0.00	$75.38

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $34.28/ 3&4 $41.28/ 5&6 $62.23/ 7&8 $69.29

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME *CARPENTERS -ZONE 1 (Wood Frame)*	10/01/2021	$33.89	$7.21	$8.80	$0.00	$49.90
	04/01/2022	$34.54	$7.21	$8.80	$0.00	$50.55
	10/01/2022	$35.14	$7.21	$8.80	$0.00	$51.15
	04/01/2023	$35.79	$7.21	$8.80	$0.00	$51.80

All Aspects of New Wood Frame Work

Apprentice - *CARPENTER (Wood Frame) - Zone 1*

Effective Date - 10/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$16.95	$7.21	$0.00	$0.00	$24.16
2	50	$16.95	$7.21	$0.00	$0.00	$24.16
3	55	$18.64	$7.21	$2.00	$0.00	$27.85
4	55	$18.64	$7.21	$2.00	$0.00	$27.85
5	70	$23.72	$7.21	$6.80	$0.00	$37.73
6	70	$23.72	$7.21	$6.80	$0.00	$37.73
7	80	$27.11	$7.21	$7.80	$0.00	$42.12
8	80	$27.11	$7.21	$7.80	$0.00	$42.12

Effective Date - 04/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$17.27	$7.21	$0.00	$0.00	$24.48
2	50	$17.27	$7.21	$0.00	$0.00	$24.48
3	55	$19.00	$7.21	$2.00	$0.00	$28.21
4	55	$19.00	$7.21	$2.00	$0.00	$28.21
5	70	$24.18	$7.21	$6.80	$0.00	$38.19
6	70	$24.18	$7.21	$6.80	$0.00	$38.19
7	80	$27.63	$7.21	$7.80	$0.00	$42.64
8	80	$27.63	$7.21	$7.80	$0.00	$42.64

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $22.46/ 3&4 $27.85/ 5&6 $37.73/ 7&8 $42.12

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (BOSTON)*	01/01/2020	$49.07	$12.75	$22.41	$0.62	$84.85

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

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.54	$12.75	$15.41	$0.00	$52.70
2	60	$29.44	$12.75	$17.41	$0.62	$60.22
3	65	$31.90	$12.75	$18.41	$0.62	$63.68
4	70	$34.35	$12.75	$19.41	$0.62	$67.13
5	75	$36.80	$12.75	$20.41	$0.62	$70.58
6	80	$39.26	$12.75	$21.41	$0.62	$74.04
7	90	$44.16	$12.75	$22.41	$0.62	$79.94

Notes:

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

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$52.38	$14.00	$16.05	$0.00	$82.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$33.69	$14.00	$16.05	$0.00	$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2022	$53.66	$8.65	$23.05	$0.00	$85.36
	07/01/2022	$54.86	$8.65	$23.05	$0.00	$86.56
	01/01/2023	$56.06	$8.65	$23.05	$0.00	$87.76
	07/01/2023	$57.26	$8.65	$23.05	$0.00	$88.96
	01/01/2024	$58.46	$8.65	$23.05	$0.00	$90.16
	07/01/2024	$59.66	$8.65	$23.05	$0.00	$91.36
	01/01/2025	$60.86	$8.65	$23.05	$0.00	$92.56

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.83	$8.65	$0.00	$0.00	$35.48
2	55	$29.51	$8.65	$6.27	$0.00	$44.43
3	60	$32.20	$8.65	$6.84	$0.00	$47.69
4	65	$34.88	$8.65	$7.41	$0.00	$50.94
5	70	$37.56	$8.65	$19.63	$0.00	$65.84
6	75	$40.25	$8.65	$20.20	$0.00	$69.10
7	80	$42.93	$8.65	$20.77	$0.00	$72.35
8	90	$48.29	$8.65	$21.91	$0.00	$78.85

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.43	$8.65	$0.00	$0.00	$36.08
2	55	$30.17	$8.65	$6.27	$0.00	$45.09
3	60	$32.92	$8.65	$6.84	$0.00	$48.41
4	65	$35.66	$8.65	$7.41	$0.00	$51.72
5	70	$38.40	$8.65	$19.63	$0.00	$66.68
6	75	$41.15	$8.65	$20.20	$0.00	$70.00
7	80	$43.89	$8.65	$20.77	$0.00	$73.31
8	90	$49.37	$8.65	$21.91	$0.00	$79.93

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 1*	12/01/2021	$41.33	$9.10	$17.57	$0.00	$68.00
	06/01/2022	$42.33	$9.10	$17.57	$0.00	$69.00
	12/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	06/01/2023	$44.33	$9.10	$17.57	$0.00	$71.00
	12/01/2023	$45.58	$9.10	$17.57	$0.00	$72.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 1*	12/01/2021	$42.33	$9.10	$17.57	$0.00	$69.00
	06/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	12/01/2022	$44.33	$9.10	$17.57	$0.00	$71.00
	06/01/2023	$45.33	$9.10	$17.57	$0.00	$72.00
	12/01/2023	$46.58	$9.10	$17.57	$0.00	$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 1*	12/01/2021	$42.08	$9.10	$17.57	$0.00	$68.75
	06/01/2022	$43.08	$9.10	$17.57	$0.00	$69.75
	12/01/2022	$44.08	$9.10	$17.57	$0.00	$70.75
	06/01/2023	$45.08	$9.10	$17.57	$0.00	$71.75
	12/01/2023	$46.33	$9.10	$17.57	$0.00	$73.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 1*	12/01/2021	$42.33	$9.10	$17.57	$0.00	$69.00
	06/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	12/01/2022	$44.33	$9.10	$17.57	$0.00	$71.00
	06/01/2023	$45.33	$9.10	$17.57	$0.00	$72.00
	12/01/2023	$46.58	$9.10	$17.57	$0.00	$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 1*	12/01/2021	$42.08	$9.10	$17.57	$0.00	$68.75
	06/01/2022	$43.08	$9.10	$17.57	$0.00	$69.75
	12/01/2022	$44.08	$9.10	$17.57	$0.00	$70.75
	06/01/2023	$45.08	$9.10	$17.57	$0.00	$71.75
	12/01/2023	$46.33	$9.10	$17.57	$0.00	$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 1*	12/01/2021	$41.33	$9.10	$17.57	$0.00	$68.00
	06/01/2022	$42.33	$9.10	$17.57	$0.00	$69.00
	12/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	06/01/2023	$44.33	$9.10	$17.57	$0.00	$71.00
	12/01/2023	$45.58	$9.10	$17.57	$0.00	$72.25
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$50.83	$14.00	$16.05	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$68.70	$9.40	$23.12	$0.00	$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$73.60	$9.40	$23.12	$0.00	$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *DRAWBRIDGE - SEIU LOCAL 888*	07/01/2020	$26.77	$6.67	$3.93	$0.16	$37.53
ELECTRICIAN *ELECTRICIANS LOCAL 103*	09/01/2021	$56.36	$13.00	$20.54	$0.00	$89.90
	03/01/2022	$57.32	$13.00	$20.82	$0.00	$91.14
	09/01/2022	$58.76	$13.00	$20.86	$0.00	$92.62
	03/01/2023	$60.43	$13.00	$20.91	$0.00	$94.34

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$22.54	$13.00	$0.68	$0.00	$36.22
2	40	$22.54	$13.00	$0.68	$0.00	$36.22
3	45	$25.36	$13.00	$15.36	$0.00	$53.72
4	45	$25.36	$13.00	$15.36	$0.00	$53.72
5	50	$28.18	$13.00	$15.84	$0.00	$57.02
6	55	$31.00	$13.00	$16.31	$0.00	$60.31
7	60	$33.82	$13.00	$16.77	$0.00	$63.59
8	65	$36.63	$13.00	$17.25	$0.00	$66.88
9	70	$39.45	$13.00	$17.71	$0.00	$70.16
10	75	$42.27	$13.00	$18.19	$0.00	$73.46

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$22.93	$13.00	$0.69	$0.00	$36.62
2	40	$22.93	$13.00	$0.69	$0.00	$36.62
3	45	$25.79	$13.00	$15.62	$0.00	$54.41
4	45	$25.79	$13.00	$15.62	$0.00	$54.41
5	50	$28.66	$13.00	$16.10	$0.00	$57.76
6	55	$31.53	$13.00	$16.58	$0.00	$61.11
7	60	$34.39	$13.00	$17.04	$0.00	$64.43
8	65	$37.26	$13.00	$17.52	$0.00	$67.78
9	70	$40.12	$13.00	$17.98	$0.00	$71.10
10	75	$42.99	$13.00	$18.46	$0.00	$74.45

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*	01/01/2022	$65.62	$16.03	$20.21	$0.00	$101.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.81	$16.03	$0.00	$0.00	$48.84
2	55	$36.09	$16.03	$20.21	$0.00	$72.33
3	65	$42.65	$16.03	$20.21	$0.00	$78.89
4	70	$45.93	$16.03	$20.21	$0.00	$82.17
5	80	$52.50	$16.03	$20.21	$0.00	$88.74

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*	01/01/2022	$45.93	$16.03	$20.21	$0.00	$82.17
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2021	$46.53	$13.75	$15.80	$0.00	$76.08
	05/01/2022	$47.86	$13.75	$15.80	$0.00	$77.41
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2021	$48.06	$13.75	$15.80	$0.00	$77.61
	05/01/2022	$49.22	$13.75	$15.80	$0.00	$78.77
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2021	$23.16	$13.75	$15.80	$0.00	$52.71
	05/01/2022	$23.83	$13.75	$15.80	$0.00	$53.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 103*	09/01/2021	$56.36	$13.00	$20.54	$0.00	$89.90
	03/01/2022	$57.32	$13.00	$20.82	$0.00	$91.14
	09/01/2022	$58.76	$13.00	$20.86	$0.00	$92.62
	03/01/2023	$60.43	$13.00	$20.91	$0.00	$94.34
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING*ELECTRICIANS LOCAL 103*	09/01/2021	$43.40	$13.00	$18.37	$0.00	$74.77
	03/01/2022	$44.71	$13.00	$18.74	$0.00	$76.45
	09/01/2022	$46.42	$13.00	$18.87	$0.00	$78.29
	03/01/2023	$48.34	$13.00	$19.01	$0.00	$80.35
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$41.76	$14.00	$16.05	$0.00	$71.81
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$24.50	$9.10	$17.57	$0.00	$51.17
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	09/01/2021	$49.38	$8.58	$20.12	$0.00	$78.08
	03/01/2022	$50.18	$8.58	$20.12	$0.00	$78.88

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.69	$8.58	$1.79	$0.00	$35.06
2	55	$27.16	$8.58	$1.79	$0.00	$37.53
3	60	$29.63	$8.58	$14.75	$0.00	$52.96
4	65	$32.10	$8.58	$14.75	$0.00	$55.43
5	70	$34.57	$8.58	$16.54	$0.00	$59.69
6	75	$37.04	$8.58	$16.54	$0.00	$62.16
7	80	$39.50	$8.58	$18.33	$0.00	$66.41
8	85	$41.97	$8.58	$18.33	$0.00	$68.88

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.09	$8.58	$1.79	$0.00	$35.46
2	55	$27.60	$8.58	$1.79	$0.00	$37.97
3	60	$30.11	$8.58	$14.75	$0.00	$53.44
4	65	$32.62	$8.58	$14.75	$0.00	$55.95
5	70	$35.13	$8.58	$16.54	$0.00	$60.25
6	75	$37.64	$8.58	$16.54	$0.00	$62.76
7	80	$40.14	$8.58	$18.33	$0.00	$67.05
8	85	$42.65	$8.58	$18.33	$0.00	$69.56

Notes: Steps are 750 hrs.
% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $32.59/ 3&4 $39.26/ 5&6 $59.69/ 7&8 $66.41

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$51.38	$14.00	$16.05	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$33.69	$14.00	$16.05	$0.00	$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 1)*	01/01/2022	$48.95	$8.65	$23.05	$0.00	$80.65
	07/01/2022	$50.15	$8.65	$23.05	$0.00	$81.85
	01/01/2023	$51.35	$8.65	$23.05	$0.00	$83.05
	07/01/2023	$52.55	$8.65	$23.05	$0.00	$84.25
	01/01/2024	$53.75	$8.65	$23.05	$0.00	$85.45
	07/01/2024	$54.95	$8.65	$23.05	$0.00	$86.65
	01/01/2025	$56.15	$8.65	$23.05	$0.00	$87.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 35 Zone 1*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.48	$8.65	$0.00	$0.00	$33.13
2	55	$26.92	$8.65	$6.27	$0.00	$41.84
3	60	$29.37	$8.65	$6.84	$0.00	$44.86
4	65	$31.82	$8.65	$7.41	$0.00	$47.88
5	70	$34.27	$8.65	$19.63	$0.00	$62.55
6	75	$36.71	$8.65	$20.20	$0.00	$65.56
7	80	$39.16	$8.65	$20.77	$0.00	$68.58
8	90	$44.06	$8.65	$21.91	$0.00	$74.62

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.08	$8.65	$0.00	$0.00	$33.73
2	55	$27.58	$8.65	$6.27	$0.00	$42.50
3	60	$30.09	$8.65	$6.84	$0.00	$45.58
4	65	$32.60	$8.65	$7.41	$0.00	$48.66
5	70	$35.11	$8.65	$19.63	$0.00	$63.39
6	75	$37.61	$8.65	$20.20	$0.00	$66.46
7	80	$40.12	$8.65	$20.77	$0.00	$69.54
8	90	$45.14	$8.65	$21.91	$0.00	$75.70

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$51.38	$14.00	$16.05	$0.00	$81.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$28.26	$14.00	$0.00	$0.00	$42.26
2	60	$30.83	$14.00	$16.05	$0.00	$60.88
3	65	$33.40	$14.00	$16.05	$0.00	$63.45
4	70	$35.97	$14.00	$16.05	$0.00	$66.02
5	75	$38.54	$14.00	$16.05	$0.00	$68.59
6	80	$41.10	$14.00	$16.05	$0.00	$71.15
7	85	$43.67	$14.00	$16.05	$0.00	$73.72
8	90	$46.24	$14.00	$16.05	$0.00	$76.29

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2021	$51.95	$13.80	$25.60	$2.74	$94.09
	02/01/2022	$53.70	$13.80	$25.60	$2.79	$95.89
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	09/01/2021	$56.36	$13.00	$20.54	$0.00	$89.90
	03/01/2022	$57.32	$13.00	$20.82	$0.00	$91.14
	09/01/2022	$58.76	$13.00	$20.86	$0.00	$92.62
	03/01/2023	$60.43	$13.00	$20.91	$0.00	$94.34
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2021	$51.95	$13.80	$25.60	$2.74	$94.09
	02/01/2022	$53.70	$13.80	$25.60	$2.79	$95.89
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 1*	12/01/2021	$41.93	$9.10	$17.57	$0.00	$68.60
	06/01/2022	$42.93	$9.10	$17.57	$0.00	$69.60
	12/01/2022	$43.93	$9.10	$17.57	$0.00	$70.60
	06/01/2023	$44.93	$9.10	$17.57	$0.00	$71.60
	12/01/2023	$46.18	$9.10	$17.57	$0.00	$72.85
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$41.93	$9.10	$17.57	$0.00	$68.60
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2021	$51.40	$13.80	$17.14	$0.00	$82.34
	09/01/2022	$53.85	$13.80	$17.14	$0.00	$84.79

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.70	$13.80	$12.42	$0.00	$51.92
2	60	$30.84	$13.80	$13.36	$0.00	$58.00
3	70	$35.98	$13.80	$14.31	$0.00	$64.09
4	80	$41.12	$13.80	$15.25	$0.00	$70.17

Effective Date - 09/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.93	$13.80	$12.42	$0.00	$53.15
2	60	$32.31	$13.80	$13.36	$0.00	$59.47
3	70	$37.70	$13.80	$14.31	$0.00	$65.81
4	80	$43.08	$13.80	$15.25	$0.00	$72.13

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (BOSTON AREA)*	09/16/2020	$48.66	$8.10	$25.10	$0.00	$81.86

Apprentice - *IRONWORKER - Local 7 Boston*

Effective Date - 09/16/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$29.20	$8.10	$25.10	$0.00	$62.40
2	70	$34.06	$8.10	$25.10	$0.00	$67.26
3	75	$36.50	$8.10	$25.10	$0.00	$69.70
4	80	$38.93	$8.10	$25.10	$0.00	$72.13
5	85	$41.36	$8.10	$25.10	$0.00	$74.56
6	90	$43.79	$8.10	$25.10	$0.00	$76.99

Notes:
** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER	12/01/2021	$41.18	$9.10	$17.57	$0.00	$67.85
LABORERS - ZONE 1	06/01/2022	$42.18	$9.10	$17.57	$0.00	$68.85
	12/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	06/01/2023	$44.18	$9.10	$17.57	$0.00	$70.85
	12/01/2023	$45.43	$9.10	$17.57	$0.00	$72.10

Apprentice - *LABORER - Zone 1*

Effective Date - 12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$24.71	$9.10	$17.57	$0.00	$51.38
2	70	$28.83	$9.10	$17.57	$0.00	$55.50
3	80	$32.94	$9.10	$17.57	$0.00	$59.61
4	90	$37.06	$9.10	$17.57	$0.00	$63.73

Effective Date - 06/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$25.31	$9.10	$17.57	$0.00	$51.98
2	70	$29.53	$9.10	$17.57	$0.00	$56.20
3	80	$33.74	$9.10	$17.57	$0.00	$60.41
4	90	$37.96	$9.10	$17.57	$0.00	$64.63

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY)	12/01/2021	$41.18	$9.10	$17.57	$0.00	$67.85
LABORERS - ZONE 1 (HEAVY & HIGHWAY)						

Apprentice - *LABORER (Heavy & Highway) - Zone 1*

Effective Date - 12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$24.71	$9.10	$17.57	$0.00	$51.38
2	70	$28.83	$9.10	$17.57	$0.00	$55.50
3	80	$32.94	$9.10	$17.57	$0.00	$59.61
4	90	$37.06	$9.10	$17.57	$0.00	$63.73

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER	12/01/2021	$41.18	$9.10	$17.57	$0.00	$67.85
LABORERS - ZONE 1	06/01/2022	$42.18	$9.10	$17.57	$0.00	$68.85
	12/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	06/01/2023	$44.18	$9.10	$17.57	$0.00	$70.85
	12/01/2023	$45.43	$9.10	$17.57	$0.00	$72.10

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 1*	12/01/2021	$41.18	$9.10	$17.57	$0.00	$67.85
	06/01/2022	$42.18	$9.10	$17.57	$0.00	$68.85
	12/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	06/01/2023	$44.18	$9.10	$17.57	$0.00	$70.85
	12/01/2023	$45.43	$9.10	$17.57	$0.00	$72.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 1*	12/01/2021	$41.33	$9.10	$17.57	$0.00	$68.00
	06/01/2022	$42.33	$9.10	$17.57	$0.00	$69.00
	12/01/2022	$43.33	$9.10	$17.57	$0.00	$70.00
	06/01/2023	$44.33	$9.10	$17.57	$0.00	$71.00
	12/01/2023	$45.58	$9.10	$17.57	$0.00	$72.25
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	06/01/2024	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 1*	12/01/2021	$41.18	$9.10	$17.57	$0.00	$67.85
	06/01/2022	$42.18	$9.10	$17.57	$0.00	$68.85
	12/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	06/01/2023	$44.18	$9.10	$17.57	$0.00	$70.85
	12/01/2023	$45.43	$9.10	$17.57	$0.00	$72.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 1*	12/01/2021	$41.18	$9.10	$17.57	$0.00	$67.85
	06/01/2022	$42.18	$9.10	$17.57	$0.00	$68.85
	12/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	06/01/2023	$44.18	$9.10	$17.57	$0.00	$70.85
	12/01/2023	$45.43	$9.10	$17.57	$0.00	$72.10
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2021	$43.69	$11.39	$20.30	$0.00	$75.38
	02/01/2022	$44.16	$11.39	$20.30	$0.00	$75.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.85	$11.39	$20.30	$0.00	$53.54
2	60	$26.21	$11.39	$20.30	$0.00	$57.90
3	70	$30.58	$11.39	$20.30	$0.00	$62.27
4	80	$34.95	$11.39	$20.30	$0.00	$66.64
5	90	$39.32	$11.39	$20.30	$0.00	$71.01

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.08	$11.39	$20.30	$0.00	$53.77
2	60	$26.50	$11.39	$20.30	$0.00	$58.19
3	70	$30.91	$11.39	$20.30	$0.00	$62.60
4	80	$35.33	$11.39	$20.30	$0.00	$67.02
5	90	$39.74	$11.39	$20.30	$0.00	$71.43

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2021	$57.17	$11.39	$22.24	$0.00	$90.80
	02/01/2022	$57.74	$11.39	$22.24	$0.00	$91.37

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

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.59	$11.39	$22.24	$0.00	$62.22
2	60	$34.30	$11.39	$22.24	$0.00	$67.93
3	70	$40.02	$11.39	$22.24	$0.00	$73.65
4	80	$45.74	$11.39	$22.24	$0.00	$79.37
5	90	$51.45	$11.39	$22.24	$0.00	$85.08

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.87	$11.39	$22.24	$0.00	$62.50
2	60	$34.64	$11.39	$22.24	$0.00	$68.27
3	70	$40.42	$11.39	$22.24	$0.00	$74.05
4	80	$46.19	$11.39	$22.24	$0.00	$79.82
5	90	$51.97	$11.39	$22.24	$0.00	$85.60

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$50.83	$14.00	$16.05	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$50.83	$14.00	$16.05	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 1) *MILLWRIGHTS LOCAL 1121 - Zone 1*	01/03/2022	$45.52	$8.58	$21.57	$0.00	$75.67
	01/02/2023	$47.27	$8.58	$21.57	$0.00	$77.42

Apprentice - *MILLWRIGHT - Local 1121 Zone 1*

Effective Date - 01/03/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$25.04	$8.58	$5.72	$0.00	$39.34
2	65	$29.59	$8.58	$17.93	$0.00	$56.10
3	75	$34.14	$8.58	$18.98	$0.00	$61.70
4	85	$38.69	$8.58	$20.01	$0.00	$67.28

Effective Date - 01/02/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$26.00	$8.58	$5.72	$0.00	$40.30
2	65	$30.73	$8.58	$17.93	$0.00	$57.24
3	75	$35.45	$8.58	$18.98	$0.00	$63.01
4	85	$40.18	$8.58	$20.01	$0.00	$68.77

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 $5.72, Step 2 $6.66)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

MORTAR MIXER *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$23.48	$14.00	$16.05	$0.00	$53.53
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$28.44	$14.00	$16.05	$0.00	$58.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$50.83	$14.00	$16.05	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2022	$53.66	$8.65	$23.05	$0.00	$85.36
	07/01/2022	$54.86	$8.65	$23.05	$0.00	$86.56
	01/01/2023	$56.06	$8.65	$23.05	$0.00	$87.76
	07/01/2023	$57.26	$8.65	$23.05	$0.00	$88.96
	01/01/2024	$58.46	$8.65	$23.05	$0.00	$90.16
	07/01/2024	$59.66	$8.65	$23.05	$0.00	$91.36
	01/01/2025	$60.86	$8.65	$23.05	$0.00	$92.56

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.83	$8.65	$0.00	$0.00	$35.48
2	55	$29.51	$8.65	$6.27	$0.00	$44.43
3	60	$32.20	$8.65	$6.84	$0.00	$47.69
4	65	$34.88	$8.65	$7.41	$0.00	$50.94
5	70	$37.56	$8.65	$19.63	$0.00	$65.84
6	75	$40.25	$8.65	$20.20	$0.00	$69.10
7	80	$42.93	$8.65	$20.77	$0.00	$72.35
8	90	$48.29	$8.65	$21.91	$0.00	$78.85

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.43	$8.65	$0.00	$0.00	$36.08
2	55	$30.17	$8.65	$6.27	$0.00	$45.09
3	60	$32.92	$8.65	$6.84	$0.00	$48.41
4	65	$35.66	$8.65	$7.41	$0.00	$51.72
5	70	$38.40	$8.65	$19.63	$0.00	$66.68
6	75	$41.15	$8.65	$20.20	$0.00	$70.00
7	80	$43.89	$8.65	$20.77	$0.00	$73.31
8	90	$49.37	$8.65	$21.91	$0.00	$79.93

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 1*	01/01/2022	$50.35	$8.65	$23.05	$0.00	$82.05
	07/01/2022	$51.55	$8.65	$23.05	$0.00	$83.25
	01/01/2023	$52.75	$8.65	$23.05	$0.00	$84.45
	07/01/2023	$53.95	$8.65	$23.05	$0.00	$85.65
	01/01/2024	$55.15	$8.65	$23.05	$0.00	$86.85
	07/01/2024	$56.35	$8.65	$23.05	$0.00	$88.05
	01/01/2025	$57.55	$8.65	$23.05	$0.00	$89.25

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - Spray/Sandblast - New*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.18	$8.65	$0.00	$0.00	$33.83
2	55	$27.69	$8.65	$6.27	$0.00	$42.61
3	60	$30.21	$8.65	$6.84	$0.00	$45.70
4	65	$32.73	$8.65	$7.41	$0.00	$48.79
5	70	$35.25	$8.65	$19.63	$0.00	$63.53
6	75	$37.76	$8.65	$20.20	$0.00	$66.61
7	80	$40.28	$8.65	$20.77	$0.00	$69.70
8	90	$45.32	$8.65	$21.91	$0.00	$75.88

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.78	$8.65	$0.00	$0.00	$34.43
2	55	$28.35	$8.65	$6.27	$0.00	$43.27
3	60	$30.93	$8.65	$6.84	$0.00	$46.42
4	65	$33.51	$8.65	$7.41	$0.00	$49.57
5	70	$36.09	$8.65	$19.63	$0.00	$64.37
6	75	$38.66	$8.65	$20.20	$0.00	$67.51
7	80	$41.24	$8.65	$20.77	$0.00	$70.66
8	90	$46.40	$8.65	$21.91	$0.00	$76.96

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2022	$48.41	$8.65	$23.05	$0.00	$80.11
	07/01/2022	$49.61	$8.65	$23.05	$0.00	$81.31
	01/01/2023	$50.81	$8.65	$23.05	$0.00	$82.51
	07/01/2023	$52.01	$8.65	$23.05	$0.00	$83.71
	01/01/2024	$53.21	$8.65	$23.05	$0.00	$84.91
	01/01/2025	$55.61	$8.65	$23.05	$0.00	$87.31
	07/01/2025	$54.41	$8.65	$23.05	$0.00	$86.11

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.21	$8.65	$0.00	$0.00	$32.86
2	55	$26.63	$8.65	$6.27	$0.00	$41.55
3	60	$29.05	$8.65	$6.84	$0.00	$44.54
4	65	$31.47	$8.65	$7.41	$0.00	$47.53
5	70	$33.89	$8.65	$19.63	$0.00	$62.17
6	75	$36.31	$8.65	$20.20	$0.00	$65.16
7	80	$38.73	$8.65	$20.77	$0.00	$68.15
8	90	$43.57	$8.65	$21.91	$0.00	$74.13

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.81	$8.65	$0.00	$0.00	$33.46
2	55	$27.29	$8.65	$6.27	$0.00	$42.21
3	60	$29.77	$8.65	$6.84	$0.00	$45.26
4	65	$32.25	$8.65	$7.41	$0.00	$48.31
5	70	$34.73	$8.65	$19.63	$0.00	$63.01
6	75	$37.21	$8.65	$20.20	$0.00	$66.06
7	80	$39.69	$8.65	$20.77	$0.00	$69.11
8	90	$44.65	$8.65	$21.91	$0.00	$75.21

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	01/01/2022	$48.95	$8.65	$23.05	$0.00	$80.65
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 1*	07/01/2022	$50.15	$8.65	$23.05	$0.00	$81.85
	01/01/2023	$51.35	$8.65	$23.05	$0.00	$83.05
	07/01/2023	$52.55	$8.65	$23.05	$0.00	$84.25
	01/01/2024	$53.75	$8.65	$23.05	$0.00	$85.45
	07/01/2024	$54.95	$8.65	$23.05	$0.00	$86.65
	01/01/2025	$56.15	$8.65	$23.05	$0.00	$87.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 1 - BRUSH NEW*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.48	$8.65	$0.00	$0.00	$33.13
2	55	$26.92	$8.65	$6.27	$0.00	$41.84
3	60	$29.37	$8.65	$6.84	$0.00	$44.86
4	65	$31.82	$8.65	$7.41	$0.00	$47.88
5	70	$34.27	$8.65	$19.63	$0.00	$62.55
6	75	$36.71	$8.65	$20.20	$0.00	$65.56
7	80	$39.16	$8.65	$20.77	$0.00	$68.58
8	90	$44.06	$8.65	$21.91	$0.00	$74.62

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.08	$8.65	$0.00	$0.00	$33.73
2	55	$27.58	$8.65	$6.27	$0.00	$42.50
3	60	$30.09	$8.65	$6.84	$0.00	$45.58
4	65	$32.60	$8.65	$7.41	$0.00	$48.66
5	70	$35.11	$8.65	$19.63	$0.00	$63.39
6	75	$37.61	$8.65	$20.20	$0.00	$66.46
7	80	$40.12	$8.65	$20.77	$0.00	$69.54
8	90	$45.14	$8.65	$21.91	$0.00	$75.70

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 1*	01/01/2022	$47.01	$8.65	$23.05	$0.00	$78.71
	07/01/2022	$48.21	$8.65	$23.05	$0.00	$79.91
	01/01/2023	$49.41	$8.65	$23.05	$0.00	$81.11
	07/01/2023	$50.61	$8.65	$23.05	$0.00	$82.31
	01/01/2024	$51.81	$8.65	$23.05	$0.00	$83.51
	07/01/2024	$53.01	$8.65	$23.05	$0.00	$84.71
	01/01/2025	$54.21	$8.65	$23.05	$0.00	$85.91

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 1 - BRUSH REPAINT*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.51	$8.65	$0.00	$0.00	$32.16
2	55	$25.86	$8.65	$6.27	$0.00	$40.78
3	60	$28.21	$8.65	$6.84	$0.00	$43.70
4	65	$30.56	$8.65	$7.41	$0.00	$46.62
5	70	$32.91	$8.65	$19.63	$0.00	$61.19
6	75	$35.26	$8.65	$20.20	$0.00	$64.11
7	80	$37.61	$8.65	$20.77	$0.00	$67.03
8	90	$42.31	$8.65	$21.91	$0.00	$72.87

Effective Date - 07/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.11	$8.65	$0.00	$0.00	$32.76
2	55	$26.52	$8.65	$6.27	$0.00	$41.44
3	60	$28.93	$8.65	$6.84	$0.00	$44.42
4	65	$31.34	$8.65	$7.41	$0.00	$47.40
5	70	$33.75	$8.65	$19.63	$0.00	$62.03
6	75	$36.16	$8.65	$20.20	$0.00	$65.01
7	80	$38.57	$8.65	$20.77	$0.00	$67.99
8	90	$43.39	$8.65	$21.91	$0.00	$73.95

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$41.18	$9.10	$17.57	$0.00	$67.85
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2021	$36.88	$13.41	$16.01	$0.00	$66.30
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.54	$9.40	$23.12	$0.00	$57.06
2	60	$29.44	$9.40	$23.12	$0.00	$61.96
3	70	$34.35	$9.40	$23.12	$0.00	$66.87
4	75	$36.80	$9.40	$23.12	$0.00	$69.32
5	80	$39.26	$9.40	$23.12	$0.00	$71.78
6	80	$39.26	$9.40	$23.12	$0.00	$71.78
7	90	$44.16	$9.40	$23.12	$0.00	$76.68
8	90	$44.16	$9.40	$23.12	$0.00	$76.68

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $34.01/ 3&4 $41.46/ 5&6 $62.80/ 7&8 $69.25

Apprentice to Journeyworker Ratio:1:5

PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88

Apprentice - *PIPEFITTER - Local 537*

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$23.18	$11.70	$8.25	$0.00	$43.13
2	45	$26.07	$11.70	$20.24	$0.00	$58.01
3	60	$34.76	$11.70	$20.24	$0.00	$66.70
4	70	$40.56	$11.70	$20.24	$0.00	$72.50
5	80	$46.35	$11.70	$20.24	$0.00	$78.29

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:**

PIPELAYER *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35

For apprentice rates see "Apprentice- LABORER"

PIPELAYER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	09/01/2021	$61.79	$13.57	$17.26	$0.00	$92.62
	02/27/2022	$63.39	$13.57	$17.26	$0.00	$94.22
	09/04/2022	$65.09	$13.57	$17.26	$0.00	$95.92
	02/26/2023	$66.79	$13.57	$17.26	$0.00	$97.62
	09/03/2023	$68.54	$13.57	$17.26	$0.00	$99.37
	03/03/2024	$70.34	$13.57	$17.26	$0.00	$101.17
	09/01/2024	$72.14	$13.57	$17.26	$0.00	$102.97
	03/02/2025	$73.94	$13.57	$17.26	$0.00	$104.77

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$21.63	$13.57	$6.24	$0.00	$41.44
2	40	$24.72	$13.57	$7.08	$0.00	$45.37
3	55	$33.98	$13.57	$9.63	$0.00	$57.18
4	65	$40.16	$13.57	$11.33	$0.00	$65.06
5	75	$46.34	$13.57	$13.03	$0.00	$72.94

Effective Date - 02/27/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$22.19	$13.57	$6.24	$0.00	$42.00
2	40	$25.36	$13.57	$7.08	$0.00	$46.01
3	55	$34.86	$13.57	$9.63	$0.00	$58.06
4	65	$41.20	$13.57	$11.33	$0.00	$66.10
5	75	$47.54	$13.57	$13.03	$0.00	$74.14

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$69.00, Step5 with lic$76.87

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35

For apprentice rates see "Apprentice- LABORER"

PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWDERMAN & BLASTER *LABORERS - ZONE 1*	12/01/2021	$42.18	$9.10	$17.57	$0.00	$68.85
	06/01/2022	$43.18	$9.10	$17.57	$0.00	$69.85
	12/01/2022	$44.18	$9.10	$17.57	$0.00	$70.85
	06/01/2023	$45.18	$9.10	$17.57	$0.00	$71.85
	12/01/2023	$46.43	$9.10	$17.57	$0.00	$73.10
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$42.18	$9.10	$17.57	$0.00	$68.85
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$51.38	$14.00	$16.05	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$51.38	$14.00	$16.05	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$33.69	$14.00	$16.05	$0.00	$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY MIX CONCRETE DRIVERS after 4/30/12 (Drivers Hired After 4/30/2012)*TEAMSTERS 25 (Metro) - Aggregate*	08/01/2021	$29.15	$11.41	$15.25	$0.00	$55.81
	05/01/2022	$30.40	$11.41	$15.25	$0.00	$57.06
	08/01/2022	$30.40	$11.91	$15.25	$0.00	$57.56
READY-MIX CONCRETE DRIVER *TEAMSTERS 25 (Metro) - Aggregate*	08/01/2021	$33.66	$11.41	$15.25	$0.00	$60.32
	05/01/2022	$34.41	$11.41	$15.25	$0.00	$61.07
	08/01/2022	$34.41	$11.91	$15.25	$0.00	$61.57
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$50.83	$14.00	$16.05	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$50.83	$14.00	$16.05	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	08/01/2021	$47.03	$12.28	$18.15	$0.00	$77.46
	02/01/2022	$48.46	$12.28	$18.15	$0.00	$78.89

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 33*

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.52	$12.28	$4.56	$0.00	$40.36
2	60	$28.22	$12.28	$18.15	$0.00	$58.65
3	65	$30.57	$12.28	$18.15	$0.00	$61.00
4	75	$35.27	$12.28	$18.15	$0.00	$65.70
5	85	$39.98	$12.28	$18.15	$0.00	$70.41

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.23	$12.28	$4.56	$0.00	$41.07
2	60	$29.08	$12.28	$18.15	$0.00	$59.51
3	65	$31.50	$12.28	$18.15	$0.00	$61.93
4	75	$36.35	$12.28	$18.15	$0.00	$66.78
5	85	$41.19	$12.28	$18.15	$0.00	$71.62

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.
(Hot Pitch Mechanics' receive $1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	08/01/2021	$47.28	$12.28	$18.15	$0.00	$77.71
	02/01/2022	$48.71	$12.28	$18.15	$0.00	$79.14
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	08/01/2021	$51.95	$13.80	$25.60	$2.74	$94.09
	02/01/2022	$53.70	$13.80	$25.60	$2.79	$95.89

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$21.82	$13.80	$6.01	$0.00	$41.63
2	42	$21.82	$13.80	$6.01	$0.00	$41.63
3	47	$24.42	$13.80	$11.26	$1.48	$50.96
4	47	$24.42	$13.80	$11.26	$1.48	$50.96
5	52	$27.01	$13.80	$12.23	$1.59	$54.63
6	52	$27.01	$13.80	$12.48	$1.60	$54.89
7	60	$31.17	$13.80	$13.87	$1.77	$60.61
8	65	$33.77	$13.80	$14.84	$1.87	$64.28
9	75	$38.96	$13.80	$16.77	$2.09	$71.62
10	85	$44.16	$13.80	$18.20	$2.28	$78.44

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$22.55	$13.80	$6.01	$0.00	$42.36
2	42	$22.55	$13.80	$6.01	$0.00	$42.36
3	47	$25.24	$13.80	$11.26	$1.51	$51.81
4	47	$25.24	$13.80	$11.26	$1.51	$51.81
5	52	$27.92	$13.80	$12.23	$1.62	$55.57
6	52	$27.92	$13.80	$12.48	$1.63	$55.83
7	60	$32.22	$13.80	$13.87	$1.80	$61.69
8	65	$34.91	$13.80	$14.84	$1.91	$65.46
9	75	$40.28	$13.80	$16.77	$2.13	$72.98
10	85	$45.65	$13.80	$18.20	$2.33	$79.98

Notes:
Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2021	$37.34	$13.41	$16.01	$0.00	$66.76
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2021	$37.63	$13.41	$16.01	$0.00	$67.05
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1*	03/01/2021	$62.45	$10.00	$21.25	$0.00	$93.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SPRINKLER FITTER - Local 550 (Section A) Zone 1*

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$21.86	$10.00	$11.99	$0.00	$43.85
2	40	$24.98	$10.00	$12.70	$0.00	$47.68
3	45	$28.10	$10.00	$13.41	$0.00	$51.51
4	50	$31.23	$10.00	$14.13	$0.00	$55.36
5	55	$34.35	$10.00	$14.84	$0.00	$59.19
6	60	$37.47	$10.00	$15.55	$0.00	$63.02
7	65	$40.59	$10.00	$16.26	$0.00	$66.85
8	70	$43.72	$10.00	$16.98	$0.00	$70.70
9	75	$46.84	$10.00	$17.69	$0.00	$74.53
10	80	$49.96	$10.00	$18.40	$0.00	$78.36

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*	12/01/2021	$50.83	$14.00	$16.05	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$50.83	$14.00	$16.05	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	09/01/2021	$43.40	$13.00	$18.37	$0.00	$74.77
	03/01/2022	$44.71	$13.00	$18.74	$0.00	$76.45
	09/01/2022	$46.42	$13.00	$18.87	$0.00	$78.29
	03/01/2023	$48.34	$13.00	$19.01	$0.00	$80.35

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$19.53	$13.00	$0.59	$0.00	$33.12
2	45	$19.53	$13.00	$0.59	$0.00	$33.12
3	50	$21.70	$13.00	$14.75	$0.00	$49.45
4	50	$21.70	$13.00	$14.75	$0.00	$49.45
5	55	$23.87	$13.00	$15.12	$0.00	$51.99
6	60	$26.04	$13.00	$15.47	$0.00	$54.51
7	65	$28.21	$13.00	$15.84	$0.00	$57.05
8	70	$30.38	$13.00	$16.20	$0.00	$59.58
9	75	$32.55	$13.00	$16.57	$0.00	$62.12
10	80	$34.72	$13.00	$16.92	$0.00	$64.64

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$20.12	$13.00	$0.60	$0.00	$33.72
2	45	$20.12	$13.00	$0.60	$0.00	$33.72
3	50	$22.36	$13.00	$15.02	$0.00	$50.38
4	50	$22.36	$13.00	$15.02	$0.00	$50.38
5	55	$24.59	$13.00	$15.39	$0.00	$52.98
6	60	$26.83	$13.00	$15.74	$0.00	$55.57
7	65	$29.06	$13.00	$16.11	$0.00	$58.17
8	70	$31.30	$13.00	$16.48	$0.00	$60.78
9	75	$33.53	$13.00	$16.85	$0.00	$63.38
10	80	$35.77	$13.00	$17.20	$0.00	$65.97

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2021	$56.09	$11.39	$22.25	$0.00	$89.73
	02/01/2022	$56.68	$11.39	$22.25	$0.00	$90.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.05	$11.39	$22.25	$0.00	$61.69
2	60	$33.65	$11.39	$22.25	$0.00	$67.29
3	70	$39.26	$11.39	$22.25	$0.00	$72.90
4	80	$44.87	$11.39	$22.25	$0.00	$78.51
5	90	$50.48	$11.39	$22.25	$0.00	$84.12

Effective Date - 02/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.34	$11.39	$22.25	$0.00	$61.98
2	60	$34.01	$11.39	$22.25	$0.00	$67.65
3	70	$39.68	$11.39	$22.25	$0.00	$73.32
4	80	$45.34	$11.39	$22.25	$0.00	$78.98
5	90	$51.01	$11.39	$22.25	$0.00	$84.65

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$42.58	$9.10	$17.72	$0.00	$69.40
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.30	$9.10	$17.72	$0.00	$68.12
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2021	$41.18	$9.10	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$50.83	$14.00	$16.05	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2021	$37.92	$13.41	$16.01	$0.00	$67.34
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2021	$53.41	$9.10	$18.17	$0.00	$80.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2021	$55.41	$9.10	$18.17	$0.00	$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2021	$45.48	$9.10	$18.17	$0.00	$72.75
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2021	$47.48	$9.10	$18.17	$0.00	$74.75
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2021	$37.34	$13.41	$16.01	$0.00	$66.76
WAGON DRILL OPERATOR *LABORERS - ZONE 1*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
	06/01/2022	$42.43	$9.10	$17.57	$0.00	$69.10
	12/01/2022	$43.43	$9.10	$17.57	$0.00	$70.10
	06/01/2023	$44.43	$9.10	$17.57	$0.00	$71.10
	12/01/2023	$45.68	$9.10	$17.57	$0.00	$72.35
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 1 (HEAVY & HIGHWAY)*	12/01/2021	$41.43	$9.10	$17.57	$0.00	$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2021	$51.38	$14.00	$16.05	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	09/01/2021	$61.79	$13.57	$17.26	$0.00	$92.62
	02/27/2022	$63.39	$13.57	$17.26	$0.00	$94.22
	09/04/2022	$65.09	$13.57	$17.26	$0.00	$95.92
	02/26/2023	$66.79	$13.57	$17.26	$0.00	$97.62
	09/03/2023	$68.54	$13.57	$17.26	$0.00	$99.37
	03/03/2024	$70.34	$13.57	$17.26	$0.00	$101.17
	09/01/2024	$72.14	$13.57	$17.26	$0.00	$102.97
	03/02/2025	$73.94	$13.57	$17.26	$0.00	$104.77
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$29.67	$9.25	$1.89	$0.00	$40.81
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$42.03	$9.25	$10.27	$0.00	$61.55
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$34.62	$9.25	$10.07	$0.00	$53.94
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$27.20	$9.25	$1.82	$0.00	$38.27
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$42.03	$9.25	$14.35	$0.00	$65.63
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$37.09	$9.25	$10.87	$0.00	$57.21
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$27.20	$9.25	$1.82	$0.00	$38.27
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$22.25	$9.25	$1.82	$0.00	$33.32
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$49.45	$9.25	$17.48	$0.00	$76.18

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 08/30/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$29.67	$9.25	$3.39	$0.00	$42.31
2	65	$32.14	$9.25	$3.46	$0.00	$44.85
3	70	$34.62	$9.25	$3.54	$0.00	$47.41
4	75	$37.09	$9.25	$5.11	$0.00	$51.45
5	80	$39.56	$9.25	$5.19	$0.00	$54.00
6	85	$42.03	$9.25	$5.26	$0.00	$56.54
7	90	$44.51	$9.25	$7.34	$0.00	$61.10

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$30.73	$4.70	$3.17	$0.00	$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77

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.

ATTACHMENT B:
Form and Checklists Used For General Bids

1) Form for General Bid
2) General Bidder Check list
3) General Bidder Documents to Upload into COMMBUYS Checklist

Executive Office for Health and Human Services
Department of Mental Health
Office of Engineering and Facilities Management
Hadley Building
167 Lyman Street
Westborough, MA 01581
Telephone: (508) 616-2248

COMMONWEALTH OF MASSACHUSETTS
FORM FOR GENERAL BID

2022-031A COOLING TOWERS REPLACEMENT
S.C. FULLER MENTAL HEALTH CENTER
85 EAST NEWTON STREET
BOSTON, MASSACHUSETTS 02118

The following **must** be uploaded into **COMMBUYS** as part of this bid:

1. A photo copy of the Bid deposit meeting the requirements of Section 5.13 and 5.14 of the Instructions to Bidders uploaded into COMMBUYS.

2. Complete Statement of Prior Relevant Experience, Facilities, Equipment, References and any other information called for as further set forth in Project Specifications.

FORM FOR GENERAL BID

To the Awarding Authority: **DEPARTMENT OF MENTAL HEALTH (DMH)**

A. The undersigned proposes to furnish all labor and materials required for

Project Name: **2022-031A Cooling Towers Replacement at S.C. Fuller Mental Health Center, 85 East Newton Street, Boston, Massachusetts 02118**, in accordance with the accompanying plans and specifications prepared by Architectural Engineers for the contract price specified below, subject to additions and deductions according to the terms of the specifications.

B. This bid includes addenda numbered: (please indicate by checking the box of each addenda number)

☐ No. 1 ☐ No. 2 ☐ No. 3 ☐ No. 4 ☐ No. 5 ☐ No. 6

C. The proposed contract price is:

_____

_____
(total bid in words)

dollars ($_____).

For Alternate No. 1: Add $_____ Subtract $_____

For Alternate No. 2: Add $_____ Subtract $_____

For Alternate No. 3: Add $_____ Subtract $_____

Name of General Bidder: _____

D. The subdivision of the proposed contract price is as follows:

Item 1. The work of the general contractor, being all work other than that covered by the sub-bidders in Item 2.

_____

Item 2. Sub-bids as follows:

Section #	Subtrade	Name of Sub-Bidder	Amount	Bonds required, indicated by "Yes" or "No"

Total Item 2: _____

E. The undersigned agrees that, if it is selected as general contractor, it will within five days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the awarding authority, execute a contract in accordance with the terms of this bid and furnish a 100% performance bond and a 100% 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.

The undersigned hereby certifies that it 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 it will comply fully with all laws and regulations applicable to awards made subject to section 39M of Chapter 30 of the General Laws.

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

The undersigned further certifies under penalties of perjury that the undersigned is not debarred from doing public construction work under any law, rule or regulation of the federal government.

The undersigned hereby declares that the undersigned has carefully examined the Advertisement, Instructions to Bidders, Owner - Contractor Agreement, General Conditions of the Contract, Special Conditions (if any), Plans and Specifications, all other Contract Documents, and also the Site upon which the proposed work is to be performed. The undersigned further declares that in regard to the conditions affecting the work to be done and the labor and materials needed, this proposal is based solely on the undersigned's own investigation and research and not in reliance upon any representation of any employee, officer or agent of the Commonwealth.

The undersigned further certifies under the penalties of perjury that:

1. This bid is in all respects bona fide, fair and made without collusion or fraud with any other person;
2. We are the only persons interested in this proposal;
3. That it is made without any connection with any other person making any bid for the same work and without directly or indirectly influencing or attempting to influence any other person to bid to refrain from bidding or to influence the amount of the bid of any other person or corporation;
4. That no person acting for, or employed by, the Commonwealth of Massachusetts is directly or indirectly interested in this proposal, or in any contract which be made under it, or in expected profits to arise therefrom.
5. As used above the word "person" shall mean natural person, joint venture, partnership, corporation or other business or legal entity.

The undersigned certifies that it shall comply with the provisions of the Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program set forth in the General Conditions of the Contract.

Should the Contract Documents 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 Awarding Authority.

Date_____, **2022**.

_____
(Name of General Bidder)

By_____
(Typed/Printed Name of Person & Title Signing Bid)

By_____
(Signed Name of Person & Title Signing Bid)

_____
(Business Address, City, State)

_____
(Telephone Number)

_____
(Facsimile Number and email address)

The following information is furnished by the Bidder for the information of the Department of Mental Health.

Bidders Vendor Code / FEIN #_____
Is Bidder a corporation? ____ If so, incorporated in what state?_____
President_____
Secretary or Clerk _____
Treasurer_____
If Bidder is a foreign corporation, is it registered to do business in Massachusetts?_____
If Bidder is a foreign corporation and is selected, Bidder is required under M.G.L. c. 30, s. 39L to obtain from the Massachusetts Secretary of State, One Ashburton Place, 17th floor, a certificate stating that the corporation is registered to do business in Massachusetts, and to furnish said certificate to the awarding authority prior to the award.

Is Bidder a general partnership or joint venture? _____ If so, name each partner or venturer_____
Is Bidder a limited partnership? _____
Is Bidder registered in Massachusetts? ____ If so, name each general partner _____
_____
If Bidder is a foreign limited partnership and is selected, Bidder is required under M.G.L. c. 30, s. 39L to obtain from the Massachusetts Secretary of State, One Ashburton Place, 17th floor, a certificate stating that the partnership is registered to do business in Massachusetts, and to furnish said certificate to the awarding authority prior to the award.

For each general partner or venturer that is a corporation, provide the following information (use additional sheets if necessary):
Name of corporation _____
State of incorporation_____
President_____
Secretary or Clerk _____
Treasurer_____

Name of corporation _____
State of incorporation_____
President_____
Secretary or Clerk _____
Treasurer_____

Is Bidder an individual? _____
Residence Address_____
Name under which Bidder does business_____
_____
Business Address_____

If selected Bidder is an individual doing business under a different name then Bidder must furnish evidence of any required DBA filing.

GENERAL BIDDER CHECKLIST

This is not a contract document. It is provided to help bidders avoid common mistakes that can result in the rejection of bids. It does not modify the Contract Documents.

*****Please note that all BID documents must be uploaded into COMMBUYS*****

To ensure that your bids are acceptable to the Department, and are not rejected due to errors or omissions, we are providing this Checklist for your convenience. It does not modify the Contract Documents.

☐ 1. Have you used the correct bid form provided in Attachment B (and Attachment C if applicable) to the Instructions to Bidders?

☐ 2. Have you properly identified the project, architect, etc., on your bid form?

☐ 3. Have you acknowledged receipt of the most current prevailing Wage Rates and/or Truck Rates which have been provided by the Awarding Authority? (Done by completing the bottom of Attachment A in this Part 1 packet.)

☐ 4. Are your bid amounts, as expressed in figures and words, consistent?
The amount expressed in words will control.

☐ 5. Have you acknowledged all addenda issued by placing the number of each addenda on the Bid Form and followed the instructions contained in each one?

☐ 6. If you are a General Bidder, have you responded to every alternate? ~~If you are a sub-bidder, have you responded to all of those alternates identified as applying to the filed sub-bid section you are bidding on?~~

☐ 7. If you are a general bidder or a sub-bidder affected by an alternate and an alternate price is requested and you estimate that there is no change in price, did you indicate by writing "no change", "N/C", or "0" ? Failure to provide a price, no change, N/C or 0 for an alternate by general bidders and sub-bidders when identified as part of a sub-bidders scope of work will result in rejection of your bid.

~~☐ 8. If you are a sub-bidder and the alternate does not affect your category of work, have you left the alternate blank or written "N/A" and only "N/A" ?~~

~~☐ 9. If you are a sub-bidder and the bid documents request that you supply the name of the firm(s) that will do certain work identified as sub-subcontract paragraph E work, have you completed the Paragraph E section.~~

☐ 10. Have you added any information not called for, acknowledged an addendum that does not exist, or provided a price for an alternate not identified as part of your scope of work which can result in rejection of your bid?

☐ 11. Is your Bid Form **SIGNED and** dated?

12. **BID DEPOSITS**

☐ a. **Have you uploaded your Bid Deposit onto COMMBUYS and FEDExed your original bid bond to arrive prior to the bid opening date?**

☐ b. Is your bid deposit, if in the form of a bid bond, issued from a bonding company licensed to do business in the Commonwealth of Massachusetts? **Is it signed by the contractor and the bonding company?**

☐ c. Is your bid deposit made payable to the Commonwealth of Massachusetts**? Bid deposits made payable to any other entity may cause the bid to be rejected.**

☐ d**.** Is your bid deposit five (5%) of the highest possible bid amount, considering all alternates being accepted in order?

☐ 13**.** If you are a General Contractor, have you included your current DCAMM Certificate of Eligibility and a completed, signed DCAMM Update Statement.

~~☐ 14. If you are a Sub-Contractor, have you included your current Certificate of Eligibility and a completed, signed DCAMM Update Statement?~~

☐ 15**.** Are all of your bid materials **uploaded into COMMBUYS** exactly as provided in the Instructions to Bidders?

☐ 16**.** Your bid MUST be **uploaded into COMMBUYS** prior to the deadline!

Rev. December 3, 2020

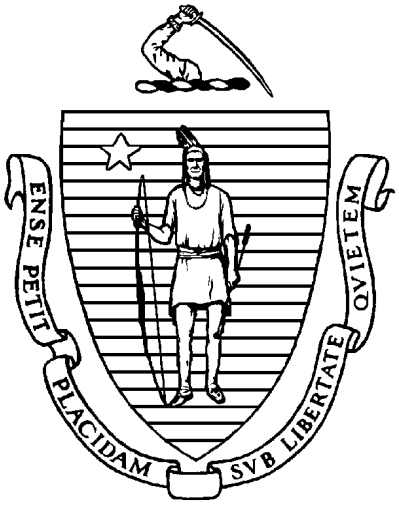
GENERAL BIDDER DOCUMENTS TO UPLOAD TO COMMBUYS CHECKLIST

- ☐ **1. GENERAL BID FORM (PART 1 Attachment B)**
- ☐ **2. WAGE RATES ACKNOWLEDGEMENT (PART 1 ATTACHMENT A)**
  (Complete the bottom of Attachment A in this Part 1 packet.)
- ☐ **3. 5% BID BOND**
- ☐ **4. GENERAL CONTRACTOR - DCAMM UPDATE STATEMENT**
- ☐ **5. GENERAL CONTRACTOR - DCAMM CERTIFICATE OF ELIGIBILITY**
- ☐ 6. ~~GENERAL CONTRACTOR – CHPT. 30 MassDOT PREQUALIFICATION STATEMENT (NOT APPLICABLE)~~

ATTACHMENT C:
Form and Checklists Used For Sub Bids

1) Form for Sub Bid
2) Sub Bid Checklist
3) Sub Bidder Documents to Upload into COMMBUYS Checklist
4) Form for Sub-Bidder Update Statement Form

Executive Office for Health and Human Services
Department of Mental Health
Office of Engineering and Facilities Management
Hadley Building
167 Lyman Street
Westborough, MA 01581
Telephone: (508) 616-2248



COMMONWEALTH OF MASSACHUSETTS
FORM FOR SUB-BID

2022-031A Cooling Towers Replacement
S.C. Fuller Mental Health Center
85 East Newton Street
Boston, Massachusetts 02118

FORM FOR SUB BID

To the Awarding Authority: **DEPARTMENT OF MENTAL HEALTH (DMH)**

A. The undersigned proposes to furnish all labor and materials required for

Section No._____ Sub trade:_____

Project Name: **2022-031A Cooling Towers Replacement at S.C. Fuller Mental Health Center 85 East Newton Street, Boston, Massachusetts 02118**, in accordance with the accompanying plans and specifications prepared by Architectural Engineers, for the contract price specified below, subject to additions and deductions according to the terms of the specifications.

B. The proposed contract price is:

_____

_____

(total bid in words)

dollars ($_____).

For Alternate No. 1: Add $_____ Subtract $_____

For Alternate No. 2: Add $_____ Subtract $_____

For Alternate No. 3: Add $_____ Subtract $_____

C. This sub-bid includes addenda numbered: (please indicate by checking the box of each addenda number):

☐ No. 1 ☐ No. 2 ☐ No. 3 ☐ No. 4 ☐ No. 5 ☐ No. 6

Name of Sub Bidder: _____

D.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 C if no general bidders are excluded.)

E. The undersigned agrees that, if he is selected as a sub-bidder, he will, within five 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 requested so to do in the general bid by such general bidder, who shall pay the premiums therefore, furnish a performance and payment bond of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the awarding authority in the full sum of the subcontract Price.

F. The names of all persons, firms and corporations 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 thereto and the bid price for such class of work or part thereof are:

NAME	CLASS OF WORK	BID PRICE

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

G. 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.

H. The undersigned further agrees to be bound to the general Contractor by the terms of the hereinbefore describe 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 Commonwealth.

I. The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all the requirements of the Plans and specification:

1. Have been in business under present business name _____ years.
2. Ever failed to complete any work awarded? _____.
3. List one or more recent buildings with names of the general Contractor and Designer on which you served as a subcontractor for work of similar character as required for the above named building.

BUILDING	DESIGNER	GENERAL CONTRACTOR	AMOUNT OF CONTRACT

J. 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 and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to M.G.L. c. 149, sec. forty-four F.

The undersigned further certifies under penalties of perjury that his 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 work "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

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 the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the Massachusetts General Laws or any rule or regulation promulgated thereunder. **Please print and /or sign the following requested information.**

Date: _____

By (Name of Sub-Bidder):_____

Signature of Sub-Bidder: _____

Business Name:_____

Business Address: _____

Business Telephone Number:_____

Business FAX Telephone Number:_____

Email Address :_____

SUB BIDDER CHECKLIST

This is not a contract document. It is provided to help bidders avoid common mistakes that can result in the rejection of bids. It does not modify the Contract Documents.

*****Please note that all SUB BID documents must be uploaded into COMMBUYS*****

To ensure that your bids are acceptable to the Department, and are not rejected due to errors or omissions, we are providing this Checklist for your convenience. It does not modify the Contract Documents.

☐ 1. Have you used the Sub Bid form provided in Attachment C to the Instructions to Bidders?

☐ 2. Have you properly identified the project, architect, etc., on your Sub Bid form?

☐ 3. Have you acknowledged receipt of the most current prevailing Wage Rates and/or Truck Rates which have been provided by the Awarding Authority? (Done by completing the bottom of Attachment A in this Part 1 packet.)

☐ 4. Are your bid amounts, as expressed in figures and words, consistent?
The amount expressed in words will control.

☐ 5. Have you acknowledged all addenda issued by placing the number of each addenda on the Sub Bid Form and followed the instructions contained in each one?

☐ 6. ~~If you are a General Bidder, have you responded to every alternate?~~ If you are a sub-bidder, have you responded to all of those alternates identified as applying to the filed sub-bid section you are bidding on?

☐ 7. If you are ~~a general bidder or~~ a Sub-Bidder affected by an alternate and an alternate price is requested and you estimate that there is no change in price, did you indicate by writing "no change", "N/C", or "0" ? Failure to provide a price, no change, N/C or 0 for an alternate by general bidders and sub-bidders when identified as part of a sub-bidders scope of work will result in rejection of your bid.

☐ 8. If you are a Sub-Bidder and the alternate does not affect your category of work, have you left the alternate blank or written "N/A" and only "N/A" ?

☐ 9. If you are a Sub-Bidder and the bid documents request that you supply the name of the firm(s) that will do certain work identified as sub-subcontract paragraph E work, have you completed the Paragraph E section.

☐ 10. Have you added any information not called for, acknowledged an addendum that does not exist, or provided a price for an alternate not identified as part of your scope of work which can result in rejection of your bid?

☐ 11. **Is your Sub Bid Form <u>SIGNED</u> and dated?**

12. **<u>SUB BID DEPOSITS</u>**

☐ a. **Have you uploaded your SUB Bid Deposit onto COMMBUYS and FEDExed your original Sub Bid Bond to arrive prior to the bid opening date?**

☐ b. Is your Sub Bid deposit, if in the form of a Sub Bid bond, issued from a bonding company licensed to do business in the Commonwealth of Massachusetts? **Is it signed by the contractor and the bonding company?**

☐ c. Is your Sub Bid deposit made payable to the Commonwealth of Massachusetts**? Sub Bid deposits made payable to any other entity may cause the Sub Bid to be rejected.**

☐ d**.** Is your Sub Bid deposit five (5%) of the highest possible bid amount, considering all alternates being accepted in order?

~~☐ 13. If you are a General Contractor, have you included your current DCAMM Certificate of Eligibility and a completed, signed DCAMM Update Statement.~~

☐ 14**.** If you are a Sub-Contractor, have you included your current Certificate of Eligibility and a completed, signed DCAMM Update Statement?

☐ 15**.** Are all of your Sub Bid materials **uploaded into COMMBUYS** exactly as provided in the Instructions to Bidders?

☐ 16**.** Your Sub Bid MUST be **uploaded into COMMBUYS** prior to the deadline!

SUB BIDDER DOCUMENTS TO UPLOAD INTO COMMBUYS CHECKLIST

- ☐ **1. SUB BID FORM (PART 1 Attachment C)**
- ☐ **2. WAGE RATES ACKNOWLEDGEMENT (PART 1 ATTACHMENT A)**
  (Complete the bottom of Attachment A in this Part 1 packet.)
- ☐ **3. 5% BID BOND**
- ☐ **4. SUB-BIDDER UPDATE STATEMENT FORM - (DCAMM UPDATE STATEMENT)**
- ☐ **5. SUB CONTRACTOR - DCAMM CERTIFICATE OF ELIGIBILITY**

DIVISION OF
CAPITAL ASSET
MANAGEMENT &
MAINTENANCE

SUB-BIDDERS' UPDATE STATEMENTS ARE NOT PUBLIC RECORDS AND ARE NOT OPEN TO PUBLIC INSPECTION (M.G.L. C.149, §44D)

Sub-Bidder Update Statement

TO ALL SUB-BIDDERS, TRADE CONTRACTORS AND AWARDING AUTHORITIES

A COMPLETED AND SIGNED SUB-BIDDER UPDATE STATEMENT MUST BE SUBMITTED WITH EVERY FILED SUB-BID PURSUANT TO M.G.L. c.149, §44F AND EVERY TRADE SUB-BID PURSUANT TO M.G.L. c. 149A. ANY FILED SUB-BID OR TRADE SUB-BID SUBMITTED WITHOUT AN APPROPRIATE SUB-BIDDER UPDATE STATEMENT IS INVALID AND MUST BE REJECTED.

Caution: This form is to be used for submitting Filed Sub-Bids and Trade Sub-Bids Only

AWARDING AUTHORITIES

If the Awarding Authority determines that the Sub-Bidder is not competent to perform the work as specified on the project, it should reject the bid.

SUB-BIDDER'S AFFIDAVIT

I swear under the pains and penalties of perjury that I am duly authorized by the bidder named below to sign and submit this Sub-Bidder Update Statement on behalf of the bidder named below, that I have read this Sub-Bidder Update Statement, and that all of the information provided by the bidder in this Sub-Bidder Update Statement is true, accurate, and complete as of the bid date.

Bid Date	Print Name of Sub-Bidder or Trade Contractor
Project Number (or name if no number)	Business Address
Awarding Authority	Telephone Number

SIGNATURE⇨

Bidder's Authorized Representative

INSTRUCTIONS

INSTRUCTIONS TO SUB-BIDDERS

- This form must be completed and submitted by all Filed Sub-Bidders bidding on projects and Trade Contractors bidding on projects.
- You must give complete and accurate answers to all questions and provide all of the information requested. MAKING A MATERIALLY FALSE STATEMENT IN THIS SUB-BIDDER UPDATE STATEMENT IS GROUNDS FOR REJECTING YOUR BID AND FOR DEBARRING YOU FROM ALL PUBLIC CONTRACTING.
- This Sub-Bidder Update Statement must include all requested information that was not previously reported on the application used for your company's most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. **The Sub-Bidder Update Statement must cover the entire period since the date of that application, NOT since the date of your Certification.**
- You must use this official form of Sub-Bidder Update Statement. Copies of this form may be obtained from the awarding authority or from the DCAMM Web Site: www.mass.gov/DCAMM/certification.
- If additional space is needed, please copy the appropriate page of this Sub-Bidder Update Statement and attach it as an additional sheet.
- It is acceptable to attach your projects in progress and completed projects spreadsheet for Part 7.

INSTRUCTIONS TO AWARDING AUTHORITIES

Determination of Sub-Bidder Qualifications

- It is the awarding authority's responsibility to determine each responsible bidder. You must consider all of the information in the bidder's Sub-Bidder Update Statement in making this determination. **Remember: this information was not available to the Division of Capital Asset Management and Maintenance at the time of certification.**
- The Sub-Bidder's performance on the projects listed in Parts 1 and 2 must be part of your review.
- Contact the project references.
- AWARDING AUTHORITIES ARE STRONGLY ENCOURAGED TO REVIEW THE LOW BIDDERS CERTIFICATION FILE. WITH THE IMPLEMENTATION OF ELECTRONIC DOCUMENT MANAGEMENT FILE REVIEWS CAN BE PROVIDED ELECTRONICALLY. To discuss your request/options contact DCAMM's Contractor Certification (857) 204-1305.

Correction of Errors and Omissions in Sub-Bidder Update Statements

Matters of Form: An awarding authority shall not reject a Sub-Bidder's bid because there are mistakes or omissions of form in the Sub-Bidder Update Statement submitted with the bid provided the Sub-Bidder promptly corrects those mistakes or omissions upon request of the awarding authority.

Correction of Other Defects: An awarding authority may, in its discretion, give a Sub-Bidder notice of minor defects and omissions as to form in the Sub-Bidder's Update Statement and provide an opportunity to correct its Sub-Bidder Update Statement. However, the Sub-Bidder shall not be allowed to make corrections to a Sub-Bidder Update Statement if material information about the Sub-Bidder was omitted from the Sub-Bidder Update Statement filed with the Sub-Bidder's bid. The Awarding Authority shall advise DCAMM of any material omissions in a Sub-Bidder's Update Statement.

PART 1 - COMPLETED PROJECTS

List All Public And Private Projects Of $20,000 or more your company has completed since the date of application for your most recently issued (not extended or amended) Sub-Bidder Certificate Of Eligibility*.

PROJECT TITLE & LOCATION	WORK CATEGORY	CONTRACT PRICE	START DATE	DATE COMPLETED

Attach additional sheets if necessary

* If your company has been terminated from a project prior to completion of the work or has failed or refused to complete its work under any contract, full details and an explanation must be provided. See Part 3 of this Sub-Bidder Update Statement.

PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH COMPLETED PROJECT LISTED ON THE PREVIOUS PAGE.

PROJECT TITLE		COMPANY NAME	CONTACT PERSON	TELEPHONE	EMAIL ADDRESS
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above, either through a business or family relationship? ☐ YES ☐ NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? ☐ YES ☐ NO

If you have answered YES to either question, explain. _____

PART 2 – PROJECTS IN PROGRESS CONTRACTS

List all public and private projects of $20,000 or more your company has under contract on this date regardless of when or whether the work commenced.

1	2	3	4	5	6	7
PROJECT TITLE & LOCATION	WORK CATEGORY	START AND END DATES (MM/YYYY)	ON SCHEDULE (yes / no)	CONTRACT PRICE	% NOT COMPLETE	$ VALUE OF WORK NOT COMPLETE (col. 5 X col. 6)

PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH INCOMPLETE PROJECT LISTED ON THE PREVIOUS PAGE.

PROJECT TITLE		COMPANY NAME	CONTACT PERSON	TELEPHONE	EMAIL ADDRESS
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				
	OWNER:				
	DESIGNER				
	GC:				

Is your company or any individual who owns, manages or controls your company affiliated with any owner, designer or general contractor named above either through a business or family relationship? ☐ YES ☐ NO

Are any of the contact persons named above affiliated with your company or any individual who owns, manages or control your company, either through a business or family relationship? ☐ YES ☐ NO

If you have answered YES to either question, explain. _____

PART 3 - GENERAL PERFORMANCE (in the prime update it's called Project Performance – can we change it?)

For Parts 3 and 4, if you answer YES to any question, please provide on a separate page a complete explanation. Information you provide herein must supplement the application for your most recently issued (not extended or amended) DCAMM Sub-Bidder Certificate of Eligibility. You must report all requested information not previously reported on that application. Include all details [project name(s) and location(s), names of all parties involved, relevant dates, etc.].

	YES	NO
1. Has your company been terminated on any contract prior to completing a project or has any officer, partner or principal of your company been an officer, partner or principal of another company that was terminated or failed to complete a project?	☐	☐
2. Has your company failed or refused either to perform or complete any of its work under any contract prior to substantial completion?	☐	☐
3. Has your company failed or refused to complete any punch list work under any contract?	☐	☐
4. Has your company filed for bankruptcy, or has any officer, principal or individual with a financial interest in your current company been an officer, principal or individual with a financial interest in another company that filed for bankruptcy?	☐	☐
5. Has your surety taken over or been asked to complete any of your work under any contract?	☐	☐
6. Has a payment or performance bond been invoked against your current company, or has any officer, principal or individual with a financial interest in your current company been an officer, principal or individual with a financial interest in another company that had a payment or performance bond invoked?	☐	☐
7. Has your surety made payment to a materials supplier or other party under your payment bond on any contract?	☐	☐
8. Has any subcontractor filed a demand for direct payment with an awarding authority for a public project on any of your contracts?	☐	☐
9. Have any of your subcontractors or suppliers filed litigation to enforce a mechanic's lien against property in connection with work performed or materials supplied under any of your contracts?	☐	☐
10. Have there been any deaths of an employee or others occurring in connection with any of your projects?	☐	☐
11. Has any employee or other person suffered an injury in connection with any of your projects resulting in their inability to return to work for a period in excess of one year?	☐	☐

PART 4 - Legal or Administrative Proceedings; Compliance with Laws

Please answer the following questions. Information must supplement all judicial and administrative proceedings involving bidder's company, which were instituted or concluded (adversely or otherwise) since your company's Application for your most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. You must report all requested information not previously reported on that DCAMM Application.

The term "administrative proceeding" as used in this Sub-Bidder Update Statement includes (i) any action taken or proceeding brought by a governmental agency, department or officer to enforce any law, regulation, code, legal, or contractual requirement, except for those brought in state or federal courts, or (ii) any action taken by a governmental agency, department or officer imposing penalties, fines or other sanctions for failure to comply with any such legal or contractual requirement.

The term "anyone with a financial interest in your company" as used in this Section "I", shall mean any person and/or entity with a 5% or greater ownership interest in the applicant's company.

If you answer YES to any question, on a separate page provide a complete explanation of each proceeding or action and any judgment, decision, fine or other sanction or result. Include all details (name of court or administrative agency, title of case or proceeding, case number, date action was commenced, date judgment or decision was entered, fines or penalties imposed, etc.).

	YES	NO
1. Have any civil, judicial or administrative proceedings involving your company or a principal or officer or anyone with a financial interest in your company been brought, concluded, or settled relating to the procurement or performance of any construction contract, including but not limited to actions to obtain payment brought by subcontractors, suppliers or others?	☐	☐
2. Have any criminal proceedings involving your company or a principal or officer or anyone with a financial interest in your company been brought, concluded, or settled relating to the procurement or performance of any construction contract including, but not limited to, any of the following offenses: fraud, graft, embezzlement, forgery, bribery, falsification or destruction of records, or receipt of stolen property?	☐	☐
3. Have any judicial or administrative proceedings involving your company or a principal or officer or anyone with a financial interest in your company been brought, concluded, or settled relating to a violation of any state's or federal procurement laws arising out of the submission of bids or proposals?	☐	☐
4. Have any judicial or administrative proceedings involving your company or a principal or officer or anyone with a financial interest in your company been brought, concluded, or settled relating to a violation of M.G.L. Chapter 268A, the State Ethics Law?	☐	☐

PART 4 - Legal or Administrative Proceedings; Compliance with Laws (continued)

	YES	NO
5. Have any judicial or administrative proceedings involving your company or a principal or officer or anyone with a financial interest in your company been brought, concluded, or settled relating to a violation of any state or federal law regulating hours of labor, unemployment compensation, minimum wages, prevailing wages, overtime pay, equal pay, child labor or worker's compensation?	☐	☐
6. Have any judicial or administrative proceedings involving your company or a principal or officer or anyone with a financial interest in your company been brought, concluded, or settled relating to a violation of any state or federal law prohibiting discrimination in employment?	☐	☐
7. Have any judicial or administrative proceedings involving your company or a principal or officer or anyone with a financial interest in your company been brought, concluded, or settled relating to a claim of repeated or aggravated violation of any state or federal law regulating labor relations?	☐	☐
8. Have any proceedings by a municipal, state, or federal agency been brought, concluded, or settled relating to decertification, debarment, or suspension of your company or any principal or officer or anyone with a financial interest in your company from public contracting?	☐	☐
9. Have any judicial or administrative proceedings involving your company or a principal or officer or anyone with a financial interest in your company been brought, concluded, or settled relating to a violation of state or federal law regulating the environment?	☐	☐
10. Has your company been fined by OSHA or any other state or federal agency for violations of any laws or regulations related to occupational health or safety? Note: this information may be obtained from OSHA's Web Site at www.osha.gov	☐	☐
11. Has your company been sanctioned for failure to achieve DBE/MBE/WBE goals, workforce goals, or failure to file certified payrolls on any public projects?	☐	☐
12. Other than previously reported in the above paragraphs of this Section I, have any administrative proceedings or investigations involving your company or a principal or officer or anyone with a financial interest in your company been brought, concluded, or settled by any local, state or federal agency relating to the procurement or performance of any construction contract?	☐	☐
13. Are there any other issues that you are aware which may affect your company's responsibility and integrity as a building contractor?	☐	☐

PART 5 - SUPERVISORY PERSONNEL

List all supervisory personnel who will be assigned to the project if your company is awarded the contract.

Attach the resume of each person listed below.

NAME	TITLE OR FUNCTION

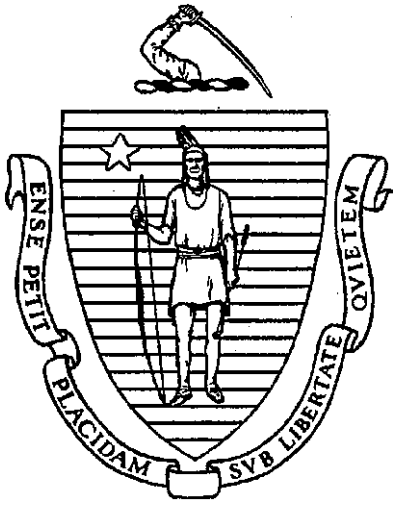
PART 6 - CHANGES IN BUSINESS ORGANIZATION OR FINANCIAL CONDITION

Have there been any changes in your company's business organization, financial condition or bonding capacity since the date your current Contractor Certificate of Eligibility was issued? ☐ Yes ☐ No

If YES, attach a separate page providing complete details.

PART 7 – LIST OF COMPLETED CONSTRUCTION PROJECTS SUBMITTED TO THE DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE ALONG WITH CERTIFICATION SIGNATURE PAGE.

Attach here a copy of the list of completed construction projects which was submitted with your company's application for your most recently issued (not extended or amended) Sub-Bidder Certificate of Eligibility. The Attachment must include a complete copy of the entire Completed Projects spreadsheet and the final page Certification Page of the online application, containing the signature and date the completed projects list was submitted to the Division of Capital Asset Management and Maintenance.



BID PACKAGE

PART II

Forms for Contract Execution

- Form for Subcontract - M.G.L. c.149, s. 44F
- Executive Order 481
- Executive Order 504 (2 pages)
- Owner- Contractor Agreement
- 100 % Payment Bond
- 100 % Performance Bond
- Prompt Payment Discount
- Certificate of Compliance with State Tax Laws and With Unemployment Compensation Contribution Requirements
- Certificate of Compliance with Employment Eligibility Verification Requirements (I-9)
- Request for Taxpayer Identification Number and Certification (W-9) (2 pages)
- Commonwealth of Massachusetts Contractor Authorized Signatory Listing (2 pages)
- Electronic Funds Transfer Sign Up Form
- Insurance Document Required - Proof of Insurance amounts per Part 3 General Conditions of the Contract

Forms are for Reference Only
To be used for contract award and execution

Contract #

COMMONWEALTH OF MASSACHUSETTS
FORM FOR SUBCONTRACT – MGL, c. 149, s. 44F

THIS AGREEMENT made this _____day of_____ 20_____, by and between

_____
a corporation organized and existing under the law of _____

_____
an individual doing business as_____
hereinafter called the "Contractor" and_____

_____
a corporation organized and existing under the laws of _____

_____
a partnership consisting of_____
an individual doing business as_____
hereinafter called a "Subcontractor,"

WITNESSETH that the Contractor and the Subcontractor for the considerations hereafter named, agree as follows:

1. The Subcontractor agrees to furnish all labor and materials required for the completion of all work specified in Section No._____
of the Specifications for_____
(Name of Sub-trade)
and the Plans referred to therein and addenda No. _____, _____, _____ and_____ for the_____

_____
(complete title of project and project no. taken from the title page of the Specifications)
all as prepared by _____
(Name of Architect or Engineer)
for the sum of_____($_____)
and the Contractor agrees to pay the Subcontractor said sum for said work. This price includes the following alternates (and other items set forth in the sub-bid):

Alternate No(s)_____, _____, _____,
_____, _____, _____, _____.

(a) The Subcontractor agrees to be bound to the Contractor by the terms of the hereinbefore described Plans, Specifications (including all general conditions stated therein) and addenda No. _____, and _____, and _____, and to assume to the Contractor all the obligations and responsibilities that the Contractor by those documents assumes to the _____ hereinafter
(Awarding Authority)
called the "Awarding Authority," except to the extent that provisions contained therein by their terms or by law applicable only to the Contractor.

(b) The Contractor agrees to be bound to the Subcontractor by the terms of the hereinbefore described documents and to assume to the Subcontractor all the obligations and responsibilities that the Awarding Authority by the terms of the hereinbefore described documents assumes to the Contractor, except to the extent that provisions contained therein are by their terms or by law applicable only to the Awarding Authority.

2. The Contractor agrees to begin, prosecute and complete the entire work specified by the Awarding Authority in an orderly manner so that the Subcontractor will be able to begin, prosecute and complete the work described in this subcontract; and, in consideration thereof, upon notice from the Contractor, either oral or in writing, the Subcontractor agrees to begin, prosecute and complete the work described in this Subcontract in an orderly manner and with due consideration to the date or time specified by the Awarding Authority for the completion of the entire work.

3. The Subcontractor agrees to furnish to the Contractor within a reasonable time after the execution of this subcontract, evidence of workers' compensation insurance as required by law and evidence of public liability and property damage insurance of the type and in limits required to be furnished to the Awarding Authority by the Contractor.

4. The Contractor agrees that no claim for services rendered or materials furnished by the Contractor to the Subcontractor shall be valid unless written notice thereof is given by the Contractor to the Subcontractor during the first ten (10) days of the calendar month following that in which the claim originated.

5. This agreement is contingent upon the execution of a general Contract between the Contractor and the Awarding Authority for the complete work.

IN WITNESS WHEREOF, the parties hereto have executed this agreement the date and year first above written.

SEAL ATTEST

_____ _____
(Name of Subcontractor)

By: _____

SEAL ATTEST

_____ _____
(Name of Contractor)

By: _____

Issued March 2007

COMMONWEALTH OF MASSACHUSETTS

EXECUTIVE ORDER 481 - CONTRACTOR CERTIFICATION

PROHIBITING THE USE OF UNDOCUMENTED WORKERS ON STATE CONTRACTS

CONTRACTOR LEGAL NAME:
CONTRACTOR VENDOR/CUSTOMER CODE:

INSTRUCTIONS:

Executive Order 481 applies to all state agencies in the Executive Branch, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established. As it is the policy of the Executive Branch to prohibit the use of undocumented workers in connection with the performance of state contracts, all contracts entered into after February 23, 2007 require that contractors, as a condition of receiving Commonwealth funds under any Executive Branch contract, make the following certification:

CONTRACTOR CERTIFICATION:

As evidenced by the signature of the Contractor's Authorized Signatory below, the Contractor certifies under the pains and penalties of perjury that the Contractor shall not knowingly use undocumented workers in connection with the performance of all Executive Branch contracts; that pursuant to federal requirements, the Contractor shall verify the immigration status of all workers assigned to such contracts without engaging in unlawful discrimination; and that the Contractor shall not knowingly or recklessly alter, falsify, or accept altered or falsified documents from any such worker(s). The Contractor understands and agrees that breach of any of these terms during the period of each contract may be regarded as a material breach, subjecting the Contractor to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension or termination.

_____ Date: _____
Contractor Authorizing Signature

_____
Print Name

Title:_____ Telephone: _____

Fax: _____ Email: _____

The Contractor is required to sign this Certification only once and may provide a copy of the signed Certification for any contract executed with an Executive Branch Department. A copy of this signed Certification must be attached to the "record copy" of all contracts with this Contractor that are filed with the contracting Department.

Executive Order 504 Contractor Certification Form

BIDDER/CONTRACTOR LEGAL NAME:

BIDDER/CONTRACTOR VENDOR/CUSTOMER CODE:

Executive Order 504: For all Contracts involving the Contractor's access to personal information, as defined in M.G.L. c. 93H, and personal data, as defined in M.G.L. c. 66A, owned or controlled by Executive Department agencies, or access to agency systems containing such information or data (herein collectively "personal information"), Contractor certifies under the pains and penalties of perjury that the Contractor (1) has read Commonwealth of Massachusetts Executive Order 504 and agrees to protect any and all personal information; and (2) has reviewed all of the Commonwealth of Massachusetts Information Technology Division's Security Policies available at www.mass.gov/ITD under Policies and Standards.

Notwithstanding any contractual provision to the contrary, in connection with the Contractor's performance under this Contract, for all state agencies in the Executive Department, including all executive offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established, the Contractor shall:

(1)obtain a copy, review, and comply with the contracting agency's Information Security Program (ISP) and any pertinent security guidelines, standards and policies; (2) comply with all of the Commonwealth of Massachusetts Information Technology Division's Security Policies ("Security Policies") available at www.mass.gov/ITD under Policies and Standards;

(2) communicate and enforce the contracting agency's ISP and such Security Policies against all employees (whether such employees are direct or contracted) and subcontractors;

(3) implement and maintain any other reasonable appropriate security procedures and practices necessary to protect personal information to which the Contractor is given access by the contracting agency from the unauthorized access, destruction, use, modification, disclosure or loss;

(4) be responsible for the full or partial breach of any of these terms by its employees (whether such employees are direct or contracted) or subcontractors during or after the term of this Contract, and any breach of these terms may be regarded as a material breach of this Contract;

(5) in the event of any unauthorized access, destruction, use, modification, disclosure or loss of the personal information (collectively referred to as the "unauthorized use"): (a) immediately notify the contracting agency if the Contractor becomes aware of the unauthorized use; (b) provide full cooperation and access to information necessary for the contracting agency to determine the scope of the unauthorized use; and (c)

provide full cooperation and access to information necessary for the contracting agency and the Contractor to fulfill any notification requirements.

Breach of these terms may be regarded as a material breach of this Contract, such that the Commonwealth may exercise any and all contractual rights and remedies, including without limitation indemnification under Section 11 of the Commonwealth's Terms and Conditions, withholding of payments, contract suspension, or termination. In addition, the Contractor may be subject to applicable statutory or regulatory penalties, including and without limitation, those imposed pursuant to M.G.L. c. 93H and under M.G.L. c. 214, § 3B for violations under M.G.L. c. 66A.

Bidder/Contractor Name: _____.

Bidder/Contractor Authorized Signature: _____.

Print Name and Title of Authorized Signatory: _____.

Date: _____.

This Certification may be signed once and photocopied to be attached to any Commonwealth Contract that does not already contain this Certification Language and shall be interpreted to be incorporated by reference into any applicable contract subject to Executive Order 504 for this Contractor.

COMMONWEALTH OF MASSACHUSETTS
STANDARD VERTICAL CONSTRUCTION CONTRACT
For Projects Over $150,000 Subject to M.G.L. c. 149, §§ 44A -F

OWNER - CONTRACTOR AGREEMENT

Awarding Authority: **DEPARTMENT OF MENTAL HEALTH (DMH)**
Awarding Authority Address: **167 Lyman Street, Westborough, MA 01581**
Department Code: **DMH**

This Owner-Contractor agreement ("Contract") is made as of the _____ day of _____, 2022, by and between the Commonwealth of Massachusetts acting by and through the awarding authority identified above ("Awarding Authority") and _____, a Contractor with a principal place of business at _____, hereinafter called the "Contractor."

Terms used in this Contract which are defined in the General Conditions of the Contract ("General Conditions") attached hereto shall have the meanings designated therein.

The Awarding Authority and the Contractor agree as follows:

Article 1. Scope of Work. The Work under this Contract is defined as all work required by the Contract Documents for the **Replacement of Cooling Towers at S.C. Fuller Mental Health Center located at 85 East Newton Street Boston, MA 02118 DMH Project No. 2022-031A**, Contract No._____, in accordance with and as described in the Drawings and Specifications dated January 2022, prepared by Architectural Engineers ("Designer"), as modified by Addenda Nos. N/A dated N/A.

Article 2. Time for Completion. The Contractor shall commence the Work under this Contract on the date specified in the written Notice to Proceed and shall, within eighteen (18) months after such date, bring the Work to Substantial Completion and to the point at which a Certificate of Substantial Completion may be issued. The Contractor shall bring the Work to Final Acceptance within 45 days after the date specified for Substantial Completion. Liquidated damages for this Project shall be assessed as set forth Article VI of the General Conditions of the Contract. The agreed liquidated damages amounts shall be $ 500.00 per day for each calendar day of delay in achieving Substantial Completion.

Article 3. Contract Price. The Awarding Authority shall pay the Contractor, in current funds, for the proper performance of the Contract and completion of the Work, subject to additions and deductions by Approved Change Order(s), the Contract Price of _____ dollars ($_____). The unit prices, if any, approved by the Awarding Authority are those included in the Contractor's General Bid. The following alternates have been accepted and their costs are included in the Contract Price:

Alternate No(s): N/A

Article 4. Approved Subcontractors. The filed Subcontractors listed in the General Bid submitted by the Contractor have been approved for the performance of the specified portions of the Work subject to the Commonwealth's verification that they have complied with state corporation and partnership registration laws. No other filed Subcontractors and no non-filed Subcontractors shall be used for these or any other portions of the Work without the prior written Approval of the Awarding Authority.

Article 5. Certifications. Pursuant to M.G.L. c. 62(c), § 49(a), the individual signing this Contract on behalf of the Contractor hereby certifies under the penalties of perjury that to the best of his or her knowledge and belief the Contractor has complied with any and all applicable state and federal tax laws. The individual signing this Contract on behalf of the Contractor further certifies under penalties of perjury that the Contractor is not presently debarred from doing public construction work in the Commonwealth under the provisions of M.G.L. c. 29, § 29F, or any other applicable debarment provisions of any other chapter of the Massachusetts General Laws or any rule or regulation promulgated thereunder and is not presently debarred from doing public construction work by any agency of the United States.

Article 6. The Contract Documents. The following documents form the Contract, are incorporated by reference herein, and are referred to as the "Contract Documents:"

- The instructions to bidders included in the bid documents issued by the Awarding Authority for this Project;
- The General Bid submitted by the Contractor;
- This Contract;
- The General Conditions of the Contract;
- The Drawings and Specifications prepared by the Designer, including addenda thereto identified in Article 1 above; and
- All Approved Change Orders/Contract Modifications issued after execution of this Contract

Article 7. Minority Business Enterprise and Women Business Enterprise Participation Goals and Minority/Women Workforce Utilization Percentages. The applicable goals, if any, for minority business enterprise and woman business enterprise participation established for this Contract are as follows:

The separate Minority Business Enterprise and Women Business Enterprise (MBE & WBE) participation goals for this Contract are 0 % MBE and 0 % WBE of the Contract Price.

The applicable minority workforce utilization percentage is 0%.

The applicable women workforce utilization percentage is 0%.

Article 7A. **Veteran-Owned Business Enterprises Benchmark and Other Participation.** The Commonwealth encourages and monitors the participation of service-disabled veteran-owned business enterprises (SDVOBE) and veteran business enterprises (VBE) on its construction projects. The benchmark for SDVOBE and VBE participation on the project is 0%. The Commonwealth also encourages the participation of Portuguese Business Enterprises (PBE), Lesbian, Gay, Bisexual, and Transgender Business Enterprises (LGBTBE); and Disability-Owned Business Enterprises (DOBE) on its contracts. Please note that only firms SDO certified as MBE or WBEs can be

credited toward meeting project MBE or WBE goals.

Article 8. Additional Insurance Provisions. The insurance requirements set forth in Article XIV of the General Conditions of the Contract are supplemented by the provisions, if any, appearing in Exhibit A attached hereto and incorporated herein.

In witness whereof, the parties hereto have caused this instrument to be executed under seal as of the date set forth above.

CONTRACTOR:

Signed:_____

Name Printed: _____

Title: _____

Date: _____

AWARDING AUTHORITY: DEPARTMENT OF MENTAL HEALTH (DMH)

By executing this Agreement, the undersigned authorized signatory of the Awarding Authority, who incurs no personal liability by reason of the execution hereof or anything herein contained, hereby certifies under penalties of perjury that this Contract is executed in accordance with a prior approval of the Division of Capital Asset Management and Maintenance, and further certifies under the penalties of perjury that all the applicable provisions of M.G.L. c.149, § 44J, have been complied with.

Signed:_____

Name Printed: _____

Title: _____

Date: _____

EXHIBIT A to the Owner-Contractor Agreement

Additional Insurance Provisions

NONE.

EXHIBIT B to the Owner-Contractor Agreement

Forms Used During Contract Award and Execution

- Form for Subcontract – M.G.L. c. 149, s.44F
- Executive Orders 481 & 504 Contractor Certifications
- 100% Payment Bond
- 100% Performance Bond
- Award Letter
- Prompt Payment Discount
- Certificate of Compliance with State Tax Laws and With Unemployment Compensation Contribution Requirements
- Certificate of Compliance with Employment Eligibility Verification Requirements (I-9)
- Request for Taxpayer Identification Number and Certification (W-9) (2 pages)
- Commonwealth of Massachusetts Contractor Authorized Signatory Listing (2 pages)
- Electronic Funds Transfer Sign Up Form
- Notice To Proceed (Letter to Proceed)
- Any other document/form not listed here that DMH needs the Contractor to complete

PAYMENT BOND

Know all men by these presents, that

_____

as principal, and _____
as surety, are held and firmly bound unto the Commonwealth of Massachusetts in the sum of

_____
in lawful money of the United States of America, to be paid to the Commonwealth of Massachusetts, for which payments, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the said principal has made a Contract with the Commonwealth acting through its _____ ("Awarding Authority") bearing date of _____, 20____, for the construction of Project No. _____ Contract No. _____
Project Name _____
_____

Now the condition of this obligation is such that if the principal shall pay for all labor performed or furnished and for all materials used or employed in said Contract and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said Contract that may hereafter be made, notice to the surety of such modifications, alterations, extensions of time, changes or additions being hereby waived, the foregoing to include any other purpose or items set out in, and to be subject to, provisions of Massachusetts General Laws Chapter 30, section 39A, and Chapter 149, section 29, as amended, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

In witness whereof we hereunto set our hand and seals this _____ day of _____, 20__.

_____ (Seal)
(Print Name of General Contractor)

By _____
(Signature - Title)

_____(Seal)
(Print Name of Surety)

_____
(Signature - Title)

Surety Address _____
_____

PERFORMANCE BOND

Know all men by these presents, that

_____

as principal, and _____
as surety, are held and firmly bound unto the Commonwealth of Massachusetts in the sum of

_____
in lawful money of the United States of America, to be paid to the Commonwealth of Massachusetts, for which payments, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the said principal has made a Contract with the Commonwealth, acting through its _____("Awarding Authority"), bearing date of _____, 20____, for the construction of Project No. _____ Contract No. _____
Project Name_____

Now the condition of this obligation is such that if the principal shall well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of said Contract and any extensions thereof that may be granted by the Commonwealth, with or without notice to the surety, and during the life of any guarantee required under the Contract, and shall also well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of any and all duly authorized modifications, alterations, changes or additions to said Contract that may hereafter be made, notice to the surety of such modifications, alterations, changes or additions being hereby waived, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

In the event that the Contract is abandoned by the Contractor, or is terminated by the Commonwealth under the provisions of said Contract, said surety shall, if requested in writing by the Commonwealth, take such action as is necessary to complete the Contract.

In witness whereof we hereunto set our hand and seals this _____ day of _____, 20____.

_____(Seal)
(Print Name of General Contractor

BY_____
(Signature - Title)

_____(Seal)
(Print Name of Surety)

BY_____
(Signature - Title)

Surety Address_____
_____

COMMONWEALTH OF MASSACHUSETTS
Prompt Pay Discount Form
(Invoice discounts for receiving fast payments)

Revised 3/9/07

Bidder Name: _____.
Vendor Code (VCUST): _____ .
Contract/RFR Number(s): _____.

Prompt Payment Discounts (PPD). All contractors/vendors doing business with the Commonwealth must provide a Prompt Payment Discount (PPD) for receiving early payments unless the Contractor/vendor can provide compelling proof that providing a prompt pay discount would be unduly burdensome. Contractors benefit from PPD by increased, usable cash flow as a result of fast and efficient payments for commodities or services rendered. Contractors who agree to accept Electronic Funds Transfer (EFT) increase the prompt pay benefit by ensuring that funds are paid directly to their designated bank accounts, thus eliminating the delay of check clearance policies and traditional mail lead time. Payments processed through the state accounting system (MMARS) can be tracked and verified through the Comptroller's Vendor Web system using the Vendor/Customer Code assigned to you by a Commonwealth department.

The Commonwealth benefits because contractors reduce the cost of products and services through the applied discount. While Bidders/Contractors have flexibility in determining the actual % discount(s) offered to the Commonwealth, the discount(s) must be identified for 10, 15, 20 and/or 30 days for payment issuance in the column entitled "% Discount Off Proposed Price" below. The Commonwealth may use the prompt pay discounts submitted as a basis for selection and may negotiate discounts as deemed in the best interest of the Commonwealth. The requirement to offer PPD discounts may be waived by the Commonwealth on a case-by-case basis if participation in the program would be unduly burdensome, provided the specific reason for the hardship is outlined below.

All discounts offered will be taken in cases where the payment issue date is within the specified number of days listed below and in accordance with the Commonwealth's Bill Paying Policy. Payment days will be measured **from** the date goods are received and accepted / performance was completed OR the date an invoice is received by the Commonwealth, whichever is later **to** the date the payment is issued as an EFT (preferred method) or mailed by the State Treasurer. The date of payment "issue" is the date a payment is considered "paid" not the date a payment is "received" by a Contractor.

If internal Bidder/Contractor systems require an alternate method of measuring payment issue dates, the Bidder/Contractor must note the issues below or on an attached page if necessary to be considered by the PMT. In cases where the Bidder/Contractor considers that offering a Prompt Payment Discount would be a hardship, the Bidder must clearly define the issues and reasons for said hardship. *Providing volume discounts or other discounts on prices is not considered a hardship, since the PPD provides the additional benefit of early cash flow for the Contractor.*

Enter the Prompt Payment Discount percentage (%) off the invoice payment, for each of the payment issue dates listed, if the payment is issued within the specified Payment Issue days. For example:

5% - 10 Days
4% - 15 Days
3% - 20 Days
2% - 30 Days

If no discount is offered enter 0%

Prompt Payment Discount %	Payment Issue Date w/in
%	10 Days
%	15 Days
%	20 Days
%	30 Days

The Contractor is unable to provide a prompt payment discount due to the following hardship:

Contractor/Bidder Authorized Signature _____ Date: _____

Contractor/ Bidder Authorized Signatory Print Name and Title: _____

CERTIFICATE OF COMPLIANCE WITH STATE TAX LAWS AND WITH UNEMPLOYMENT COMPENSATION CONTRIBUTION REQUIREMENTS

Pursuant to M.G.L., Ch. 62C, s. 49A and M.G.L., Ch. 151A, s. 19A, I,

_____ authorized signatory for

_____ whose principal place of business is at

_____ do hereby certify

under penalties of perjury that _____ has filed all state tax returns and paid all taxes as required by law and has complied with all state laws pertaining to contributions to the unemployment compensation fund and to payments in lieu of contributions.

The Business Organization Social Security Number or Federal Identification Number is

_____.

Signed under the penalties of perjury the _____ day of _____

20 ____.

Signature: _____

Name and Title: _____

CERTIFICATE OF COMPLIANCE WITH EMPLOYMENT ELIGIBILITY VERIFICATION REQUIREMENTS (I-9)
Applicable to All DCAM Construction Projects
To Be Executed by GC/CMGC/All Subcontractors

Company Name: _____

I, _____ authorized signatory for
Print Name
Company whose principal place of business is at _____
Address
do hereby certify under penalties of perjury that Company shall comply with Federal Department of Homeland Security Requirements in hiring any and all "Employees" to be employed in the Project who are required to be listed in the certified payroll reports for the Project. Such compliance shall include, but not be limited to the faithful completion of the Federal Department of Homeland Security Form I-9 process by Company for each of its Employees. Company shall require each of its subcontractors to execute and provide to Company a Certificate of Compliance with Employment Eligibility Verification Requirements with the execution of each subcontract. In addition, Company is aware that the certified payroll report form submitted by Company to DCAM contains a statement that the Form I-9 process was faithfully completed for each employee listed on that certified payroll report. Company thus acknowledges that it and all of its subcontractors will be required to certify that the Form I-9 process was faithfully completed for all Employees listed on each certified payroll report.

Project No.: Mass. State Project No. _____

Project Title: _____

The Company Social Security Number or Federal Identification Number is

_____.

Signed under the pains and penalties of perjury the _____ day of _____ 20 ___

Signature: _____

Name and Title: _____

Form **W-9**
(Massachusetts Substitute W-9 Form)
Rev. April 2009

Request for Taxpayer Identification Number and Certification

2022-005 Revised January 14, 2021

Completed form should be given to the department or the department you are currently doing busines with.

Please print or type

Name (List legal name, if joint names, list first & circle the name of the person whose TIN you enter in Part I-**See Specific Instruction** on page 2)

Business name, if different from above. (**See Specific Instruction** on page 2)

Check the appropriate box: ☐ Individual/Sole proprietor ☐ Corporation ☐ Partnership ☐ Other ▶----------

Legal Address: number, street, and apt. or suite no.	**Remittance Address**: if different from legal address number, street, and apt. or suite no.
City, state and ZIP code	**City, state and ZIP code**

Phone # ( ) Fax # ( ) Email address:

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. For individuals, this is your social security number (SSN). **However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instruction on page 2**. For other entities, it is your employer identification number (EIN). If you do not have a number, see **How to get a TIN** on page 2.

Note: *If the account is in more than one name, see the chart on page 2 for guidelines on whose number to enter.*

Vendors:
Dunn and Bradstreet Universal Numbering System (DUNS)

Social security number
☐☐☐-☐☐-☐☐☐☐

OR

Employer identification number
☐☐-☐☐☐☐☐☐☐

DUNS
☐☐☐☐☐☐☐☐☐

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), **and**
2. I am not subject to backup withholding because: **(a)** I am exempt from backup withholding, or **(b)** I have not been notified by the Internal Revenue Services (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or **(c**) the IRS has notified me that I am no longer subject to backup withholding, **and**
3. I am an U.S. person (including an U.S. resident alien).
4. I am currently a Commonwealth of Massachusetts's state employee: (check one): No____ Yes _____ If yes**, in compliance with** the State Ethics Commission **requirements.**

Certification instructions: You must cross out item **2** above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item **2** does not apply.

Sign Here	**Authorized Signature ▶**	**Date ▶**

Purpose of Form

A person who is required to file an information return with the IRS must get your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to give your correct TIN to the person requesting it (the requester) and , when applicable, to:

1. Certify the TIN you are giving is correct (or you are waiting for a number to be issued).
2. Certify you are not subject to backup withholding

If you are a foreign person, use the appropriate Form W-8. See **Pub 515**, Withholding of Tax on Nonresident Aliens and Foreign Corporations.

What is backup withholding? Persons making certain payments to you must withhold a designated percentage, currently 28% and pay to the IRS of such payments under certain conditions. This is called "backup withholding." Payments that may be subject to backup withholding include interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

If you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return, payments you receive will not be subject to backup withholding. **Payments you receive will be subject to backup withholding if:**

1. You do not furnish your TIN to the requester, or
2. You do not certify your TIN when required (see the Part II instructions on page 2 for details), or
3. The IRS tells the requester that you furnished an incorrect TIN, or
4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends only), or
5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See the Part II instructions on page 2.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of Federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Name. If you are an individual, you must generally enter the name shown on your social security card. However, if you have changed your last name, for instance, due to marriage without informing the Social Security Administration of the name change, enter your first name, the last name shown on your social security card, and your new last name.

If the account is in joint names, list first and then circle the name of the person or entity whose number you enter in Part I of the form.

Sole proprietor. Enter your **individual** name as shown on your social security card on the "Name" line. You may enter your business, trade, or "doing business as (DBA)" name on the "Business name" line.

Limited liability company (LLC). If you are a single-member LLC (including a foreign LLC with a domestic owner) that is disregarded as an entity separate from its owner under Treasury regulations section 301.7701-3, **enter the owner's name on the "Name" line**. Enter the LLC's name on the "Business name" line.

Caution: *A disregarded domestic entity that has a foreign owner must use the appropriate Form W-8.*

Other entities. Enter your business name as shown on required Federal tax documents on the "Name" line. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on the "Business name" line.

Part I - Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box.

If you are a **resident alien** and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see **How to get a TIN** below.

If you are a **sole proprietor** and you have an EIN, you may enter either your SSN or EIN. However, the IRS prefers that you use your SSN.

If you are an **LLC** that is **disregarded as an entity** separate from its owner (see ***Limited liability company (LLC)*** above), and are owned by an individual, enter your SSN (or "pre-LLC" EIN, if desired). If the owner of a disregarded LLC is a corporation, partnership, etc., enter the owner's EIN.

Note: *See the chart on this page for further clarification of name and TIN combinations.*

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get **Form SS-5**, Application for a Social Security Card, from your local Social Security Administration office. Get **Form W-7**, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN or **Form SS-4**, Application for Employer Identification Number, to apply for an EIN. You can get Forms W-7 and SS-4 from the IRS by calling 1-800-TAX-FORM (1-800-829-3676) or from the IRS's Internet Web Site **www.irs.gov**.

If you do not have a TIN, write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments.

The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: *Writing "Applied For" means that you have already applied for a TIN* ***or*** *that you intend to apply for one soon.*

Part II - Certification

To establish to the paying agent that your TIN is correct or you are a U.S. person, or resident alien, sign Form W-9.

For a joint account, only the person whole TIN is shown in Part I should sign (when required).

Real estate transactions**.** You must sign the certification. You may cross out item 2 of the certification.

Dunn and Bradstreet Universal Numbering System (DUNS) number requirement –
The United States Office of Management and Budget (OMB) requires all vendors that receive federal grant funds have their DUNS number recorded with and subsequently reported to the granting agency. If a contractor has multiple DUNS numbers the contractor should provide the primary number listed with the Federal government's Central Contractor Registration (CCR) at /www.ccr.gov . Any entity that does not have a DUNS number can apply for one on-line at http://www.dnb.com under the DNB D-U-N Number Tab.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to give your correct TIN to persons who must file information returns with the IRS to report interest, dividends, and certain other income paid to you, mortgage interest you paid, the acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA or MSA. The IRS uses the numbers for identification purposes and to help verify the accuracy of your tax return. The IRS may also provide this information to the Department of Justice for civil and criminal litigation, and to cities, states, and the District of Columbia to carry out their tax laws

You must provide your TIN whether or not you are required to file a tax return. Payers must generally withhold a designated percentage, currently 28% of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to a payer. Certain penalties may also apply.

What Name and Number to Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account)	The actual owner of the account or, if combined funds, the first individual on the account [1]
3. Custodian account of a minor (Uniform Gift to Minors Act)	The minor [2]
4. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee [1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner [1]
5. Sole proprietorship	The owner [3]
For this type of account:	**Give name and EIN of:**
6. Sole proprietorship	The owner [3]
7. A valid trust, estate, or pension trust	Legal entity [4]
8. Corporate	The corporation
9. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
10. Partnership	The partnership
11. A broker or registered nominee	The broker or nominee
12. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name, but you may also enter your business or "DBA" name. You may use either your SSN or EIN (if you have one).

[4]. List first and circle the name of the legal trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.)

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

If you have questions on completing this form, please contact the Office of the State Comptroller. (617) 973-2468.

Upon completion of this form, please send it to the Commonwealth of Massachusetts Department you are doing business with.

Issued May 2004

COMMONWEALTH OF MASSACHUSETTS

CONTRACTOR AUTHORIZED SIGNATORY LISTING

CONTRACTOR LEGAL NAME :
CONTRACTOR VENDOR/CUSTOMER CODE:

INSTRUCTIONS: **The second page of this form must be completed and notarized for each person listed in the table below.** Any Contractor (other than a sole-proprietor or an individual contractor) must provide a listing of individuals who are authorized as legal representatives of the Contractor who can sign contracts and other legally binding documents related to the contract on the Contractor's behalf. In addition to this listing, any state department may require additional proof of authority to sign contracts on behalf of the Contractor, or proof of authenticity of signature (a notarized signature that the Department can use to verify that the signature and date that appear on the Contract or other legal document was actually made by the Contractor's authorized signatory, and not by a representative, designee or other individual.)

NOTICE*: **Acceptance of any payment under a Contract or Grant shall operate as a waiver of any defense by the Contractor challenging the existence of a valid Contract due to an alleged lack of actual authority to execute the document by the signatory.***

For privacy purposes **DO NOT ATTACH** any documentation containing personal information, such as bank account numbers, social security numbers, driver's licenses, home addresses, social security cards or any other personally identifiable information that you do not want released as part of a public record. The Commonwealth reserves the right to publish the names and titles of authorized signatories of contractors.

AUTHORIZED SIGNATORY NAME	TITLE

I certify that I am the President, Chief Executive Officer, Chief Fiscal Officer, Corporate Clerk or Legal Counsel for the Contractor and as an authorized officer of the Contractor I certify that the names of the individuals identified on this listing are current as of the date of execution below and that these individuals are authorized to sign contracts and other legally binding documents related to contracts with the Commonwealth of Massachusetts on behalf of the Contractor. I understand and agree that the Contractor has a duty to ensure that this listing is immediately updated and communicated to any state department with which the Contractor does business whenever the authorized signatories above retire, are otherwise terminated from the Contractor's employ, have their responsibilities changed resulting in their no longer being authorized to sign contracts with the Commonwealth or whenever new signatories are designated.

_____ Date:
Signature

Title: Telephone:

Fax: Email:

[Listing can not be accepted without all of this information completed.]

A copy of this listing must be attached to the "record copy" of a contract filed with the department.

COMMONWEALTH OF MASSACHUSETTS

CONTRACTOR AUTHORIZED SIGNATORY LISTING

CONTRACTOR LEGAL NAME :
CONTRACTOR VENDOR/CUSTOMER CODE:

PROOF OF AUTHENTICATION OF SIGNATURE

This page is optional and is available for a department to authenticate contract signatures. It is recommended that Departments obtain authentication of signature for the signatory who submits the Contractor Authorized Listing.

This Section MUST be completed by the Contractor Authorized Signatory in presence of notary.

Signatory's full legal name (print or type):

Title:

X_____
Signature as it will appear on contract or other document (**Complete only in presence of notary**):

AUTHENTICATED BY NOTARY OR CORPORATE CLERK (PICK ONLY ONE) AS FOLLOWS:

I, _____ (NOTARY) as a notary public certify that I witnessed the signature of the aforementioned signatory above and I verified the individual's identity on this date:

_____, 20 _____.

My commission expires on:

AFFIX NOTARY SEAL

I, _____ (CORPORATE CLERK) certify that I witnessed the signature of the aforementioned signatory above, that I verified the individual's identity and confirm the individual's authority as an authorized signatory for the Contractor on this date:

_____, 20 _____.

AFFIX CORPORATE SEAL

COMMONWEALTH OF MASSACHUSETTS
OFFICE OF THE COMPTROLLER
Electronic Funds Transfer (EFT) Authorization Agreement

Complete this form to enroll, modify, or terminate an existing in electronic funds transfer (EFT) agreement with the Commonwealth of Massachusetts Departments.

PART I: REASON FOR SUBMISSION – See Instructions on Page 2

New Enrollment ☐ Change Enrollment ☐ Cancel Enrollment ☐ **Document Included**: Voided Check ☐ Bank Letter ☐

PART II: ACCOUNT HOLDER INFORMATION- See Instructions on Page 2

Account Holder Legal Name:		DBA Name:	
Street Address:	City:	State:	Zip Code:
Account Holder Tax Identification Number (9 digits EIN or SSN)	EIN:	SSN:	

PART III: FINANCIAL INSTITUTION INFORMATION- See Instructions on Page 2

Financial Institution Name:		
Routing Number (only nine digits):	Account Number:	Account Type (Checking or Saving):

IF YOU ARE MODIFYING BANKING INFORMATION, YOU MUST INCLUDE YOUR OLD BANK INFORMATION OR YOUR REQUEST WILL BE RETURNED

Old Financial Institution Name:		
Old Routing Number (only 9 digits):	Old Account Number:	Old Account Type(Checking or Saving):

PART IV: VENDOR/CUSTOMER CONTACT INFORMATION: This is the person we will contact for any questions regarding this EFT – See Instructions on Page 2

Contact Person's Name:	Contact Person's Title:
Contact Person's Phone:	Contact Person's Email Address:

PART V: AUTHORIZATION- See Instructions on Page 2

By signing below, I hereby certify that the account(s) indicated on this form is under my direct control and access; therefore, I authorize the State Treasurer as fiscal agent for the Commonwealth of Massachusetts to initiate, change, or cancel credit entries to the account(s) as indicated on this form. For ACH debits consistent with the International ACH Transaction (IAT) rules check one:

☐ I affirm that payments authorized by this agreement are not to an account that is subject to being transferred to a foreign bank account.

☐ I affirm that payments authorized by this agreement are to an account that is subject to being transferred to a foreign bank account.

This authority is to remain in full force and effect until the Office of Comptroller (CTR) has received written notification from either me or an authorized officer of the organization of the account's termination in such time and in such a manner as to afford CTR a reasonable opportunity to act upon it.

Account Holder must sign and mail this EFT form and include a confirmation of account information on bank letterhead or a void check and mail to the Commonwealth Department you are doing business with.

Account Holder Authorized Signature:	Print Name: Title	Date:

PART VI: VERIFICATION FROM THE COMMONWEALTH DEPARTMENT – See Instructions on Page 2		
I hereby certify the Vendor/Customer is an authorized signatory and verified by internal records and verbal confirmation initiated by our department.		
VCC/VCM Document ID:	Three letter Department Code:	
Signature:_____ Print Name:_____	Title:_____ Phone #_____	Date:_____

INSTRUCTIONS FOR COMPLETING THE EFT AUTHORIZATION AGREEMENT

All EFT requests are subject to a 5 (five) day pre-certification period in which all accounts are verified by the qualifying financial institution before any direct deposits are made.

PART I: REASON FOR SUBMISSION

Indicate your reason for completing this form by checking the appropriate box: New EFT enrollment, a change to your EFT enrollment account information, or cancellation of your EFT enrollment.

PART II: ACCOUNT HOLDER INFORMATION

- Account Holder Name: Enter the accounts holder legal name (individual or business name), as reported
- to the Internal Revenue Service (IRS).
- DBA Name: Enter the DBA name if applicable.
- Street Address: Enter the account holder's street address.
- Enter the account holder's city, state, and zip code.
- Account Holder Tax Identification Number: Enter the tax identification number as reported to the IRS. If the business is a group, organization or corporation, provide the Federal employer identification number (EIN). If enrolling as an individual provide your Social Security Number.

PART III: FINANCIAL INSTITUTION INFORMATION

- Financial Institution Name: Enter your Financial Institution's name (this is the name of the bank or qualifying depository
- that will receive the funds).
  - **NOTE**: The account name to which EFT payments will be paid is to the name submitted on Part II of this form.
- Routing Number: Enter the bank or financial institutional nine-digit routing number, including applicable leading zeros.
- Account Number: Enter the account holder's account number with the financial institution, including applicable leading zeros.
- Account Type: Enter the account type (Checking or Saving).
- If account holder is changing the banking information, you must provide OLD banking information.
- Old Financial Institution Name: Enter your Financial Institution's name (this is the name of the bank or qualifying depository that will receive the funds).
- Old Routing Number: Enter the Old bank or financial institutional nine-digit routing number, including applicable leading zeros.
- Old Account Number: Enter the Old account holder's account number with the financial institution, including applicable leading zeros.
- Account Type: Enter the Old account type (Checking or Saving).
  - **NOTE**: Supporting bank documents must be in the account holder legal name only.
- If you do not submit this information, your EFT authorization agreement will be returned without further processing.

PART IV: CONTACT INFORMATION

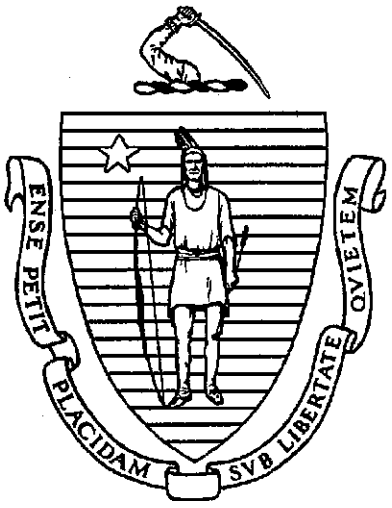
- Enter the name and title of a contact person who can answer questions about the information submitted on this EFT form.
- Enter the contact person's telephone number. Enter the contact person's e-mail address.

PART V: AUTHORIZATION

- By your signature on this form, you are certifying that the account is drawn in the Name of an Individual, or the Legal Business Name of the person or entity who has sole control of the account to which EFT deposits are made.
- The EFT authorization form must be signed and dated by the same account holder name in Part II and include a title and telephone number.
- Mail this form with the original signature in black or blue ink (no facsimile signatures can be accepted) to the Commonwealth Department that you doing business with.

PART VI: VERIFICATION FROM THE COMMONWEALTH DEPARTMENT

By your signature on this form, you are certifying that authentication of the vendor/customer's authorized signatory was conducted by review of the Contractor Signatory Authorization Form (CASL) or by another internal verification process, and additional verification was conducted to confirm banking or address change request. Departments should have multiple known vendor contacts to confirm any registration change.



BID PACKAGE

PART III

GENERAL CONDITIONS OF THE CONTRACT

CHAPTER 149

COMMONWEALTH OF MASSACHUSETTS
STANDARD VERTICAL CONSTRUCTION CONTRACT
For Projects over $150,000 Subject to M.G.L. c. 149, §§ 44A-F

GENERAL CONDITIONS OF THE CONTRACT
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- Payment Requisition Transmittal (3 pages)
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- ~~Weekly Site Meeting Template (1 Page)~~
- Certificate of Substantial Completion -E-1
- Certificate of Final Inspection, Release and Acceptance - E-2
- Certificate of Payment MBE, WBE, Veteran, Etc.
- Certificate of Payment to Subcontractors, Sub-Bidders, suppliers

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ARTICLE I
DEFINITION OF TERMS

Other terms, abbreviations and references are defined as they appear herein. Words and abbreviations that are not defined in the Contract Documents but which have recognized technical or trade meanings are used in accordance with those meanings.

The following words shall have the following meanings as used in this Contract:

Approval (or Approved): An approval in writing signed by the authorized signatory of the Awarding Authority.

Awarding Authority: The public agency awarding and administering this Contract identified as the Awarding Authority in the Contract. Where the Awarding Authority is an agency of the Commonwealth, references to the Awarding Authority shall also include the Commonwealth and its agencies.

Building Code: All applicable rules and regulations to which the Awarding Authority is subject and which are contained or referenced in the code authorized by M.G.L. c. 143, § 93 et seq., including all amendments thereto.

Certificate of Substantial Completion: A certificate signed by the Designer and the Awarding Authority pursuant to the requirements of Article VI of these General Conditions, indicating that the Awarding Authority has determined that (1) the Work has been completed in accordance with the Contract Documents, except for Punch List items, (2) certificates of inspection, testing and/or approval (including a certificate of occupancy under the Building Code), operating permits for any mechanical apparatus which may be required to permit full use and occupancy of the Work by its intended users (which in a Subcontractor's case may include the Contractor) have been delivered to the Awarding Authority, (3) any applicable written warranties, operating instructions and related materials have been delivered to the Awarding Authority, and (4) the Work may be used for its intended purpose without substantial inconvenience or interference.

Change Order: (1) A written order not requiring the consent of the Contractor, signed by an authorized representative of the Awarding Authority and designated as a Change Order, directing the Contractor to make changes in the Work within the general scope of the Contract, or (2) any written order from an authorized representative of the Awarding Authority that causes any change in the Work, provided that the Contractor has given the Awarding Authority written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a Change Order.

Change Order Request: Contractor's written request for a Change Order submitted in accordance with the requirements of Article VII of these General Conditions.

Contract: The Owner - Contractor Agreement executed between the Awarding Authority and the Contractor.

Contract Documents: The documents listed in Article 6 of the Contract.

Contract Modification: Any alteration of the Contract Documents accomplished by a written agreement properly executed by the parties to this Contract.

Contract Price: The Contract Price stated in Article 3 of the Contract which constitutes full compensation to the Contractor for everything to be performed and furnished in connection with the Work and for all damages arising out of the performance of the Work for which the Contractor is responsible, and constitutes the maximum compensation regardless of any difficulty incurred by the Contractor in connection with the Work or in consequence of any suspension or discontinuance of the Work.

Contractor: The person, corporation or other entity identified in the first page of the Contract as the "Contractor".

DCAMM: The Division of Capital Asset Management and Maintenance of the Commonwealth of Massachusetts. Where DCAMM is an agency of the Commonwealth, references to DCAMM shall also include the Commonwealth and its agencies.

Designer: The architect or engineer identified as the Designer in Article 1 of the Contract.

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

Final Acceptance: The written determination by the Awarding Authority that the Work has been 100% completed, except for the Contractor's indemnification obligations, warranty obligations, obligations to continue to maintain insurance coverage for the time periods provided in the Contract Documents, and any other obligations which are intended to survive Final Acceptance and/or the termination of the Contract.

General Bid: The completed bid form submitted by the Contractor in accordance with the requirements of M.G.L. c. 149.

Laws: All applicable statutes, regulations, ordinances, codes, laws, orders, decrees, approvals, certificates and requirements of governmental and quasi-governmental authorities.

Notice to Proceed: The written notice provided by the Awarding Authority to the Contractor which authorizes the Contractor to commence the Work as of a date specified therein, from which date the time of completion specified in Article 2 of the Contract is measured.

Or equal (or words of like import): Equal in the opinion of the Awarding Authority determined pursuant to the provisions of M.G.L. c.30, § 39M and the provisions of these General Conditions.

Owner: The Commonwealth of Massachusetts or political subdivision thereof, authority, or other instrumentality that will own the Work.

Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor or its Subcontractors and suppliers to illustrate materials or equipment for some portion of the Work. Product data also include any such information or instructions produced by the manufacturer or distributor of such materials or equipment and made readily available by said manufacturer or distributor.

Progress Schedule: The progress schedule submitted by the Contractor Approved by the Awarding Authority in accordance with the Contract Documents.

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

Punch List: A list of items determined by the Awarding Authority to be minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work for its intended purpose.

Resident Engineer: The on-Site representative of the Awarding Authority.

Samples: Physical examples, that illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

Schedule of Values: The schedule Approved by the Awarding Authority pursuant to Article VIII of these General Conditions which allocates the Contract Price to the various portions of the Work and is used as a basis for payments to the Contractor.

Shop Drawings: Drawings, diagrams, details, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, sub-Subcontractor, manufacturer, supplier, or distributor to illustrate a portion of the Work.

Site: The land and, if any, building(s) or space within any such building(s) on which or in which the Contractor is to perform the Work.

Specifications: The portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards, and workmanship for the Work and performance of related services, including, without limitation, supplementary general conditions.

Subcontractor: Person or entity with whom the Contractor contracts in accordance with this Contract in order to perform the Work, except as otherwise specifically provided or required herein or by Law.

Substantial Completion: For work subject to M.G.L. c. 30, § 39K, "substantial completion" means that the value of the Work remaining to be done is, in the estimate of the Awarding Authority, less than one percent of the adjusted contract price and shall occur when (1) the Contractor fully completes the Work or substantially completes the Work, or (2) the Contractor substantially completes the work and the Awarding Authority takes possession for occupancy, whichever occurs first. For work subject to M.G.L. c. 30, § 39G "substantial completion" shall mean that the work required by the Contract has been fully completed, completed except for work having a Contract Price of less than one percent of the then adjusted total Contract Price, or substantially all of the Work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work.

Superintendent: The licensed construction supervisor who is an employee of the Contractor designated to be in full-time attendance at the Site throughout the prosecution and progress of the Work and who shall have complete authority to act for the Contractor.

User Agency: The department, county, commission, board, agency or other instrumentality of the Commonwealth of Massachusetts or political subdivision thereof which operates, or

which will operate, the facility at which the Work is undertaken or which comprises the completed Work.

Work: The Work consists of all the work identified in the Contract Documents, including, without limitation, as defined in Article 1 of the Contract and Article II, Section 2 of these General Conditions. The Work comprises the completed construction required by the Contract Documents and includes all labor, tools, materials supplies, equipment, permits and approvals, paperwork, calculations, submittals, and certificates necessary to develop, construct, and complete the Work in accordance with all Laws and all construction and other services required to be supervised, overseen, performed, or furnished by the Contractor or that the Contract Documents require the Contractor to cause to be supervised, overseen, performed or furnished.

ARTICLE II
EXECUTION OF THE CONTRACT, SCOPE OF WORK, INTERPRETATION OF CONTRACT DOCUMENTS

1. Execution.

The execution of the Contract by the Contractor is a representation that the Contractor has visited the Site, has become familiar with local conditions under which the Work is to be performed and has correlated personal observations at the Site with requirements of the Contract Documents.

2. Scope of Work.

The Work comprises the completed construction required by the Contract Documents and includes all labor, tools, materials, supplies, equipment, permits, approvals, paperwork, calculations, submittals, and certificates necessary to develop, construct and complete the Work in accordance with all Laws, and all construction and other services required to be supervised, overseen, performed or furnished by Contractor or that the Contract Documents require the Contractor to cause to be supervised, overseen, performed or furnished. The Contractor shall provide and perform for the Contract Price all of the duties and obligations set forth in the Contract Documents.

3. Interpretation.

A. The Drawings and Specifications and other Contract Documents are to be considered together and are intended to be mutually complementary, so that any work shown on the Drawings though not specified in the Specifications, and any work specified in the Specifications though not shown on the Drawings, is to be executed by the Contractor as a part of this Contract. Should a conflict occur in or between or among any parts of the Contract Documents that are entitled to equal preference, the better quality or greater quantity shall govern, unless the Awarding Authority directs otherwise. Figured dimensions shall take precedence over scaled dimensions.

B. All things that in the opinion of the Designer may be reasonably inferred from the Drawings, Specifications and other Contract Documents are to be executed by the Contractor. The Designer shall determine whether the detail Drawings conform to the general Drawings and Contract Documents, except as may be otherwise determined by the Awarding Authority.

C. The tables of contents, titles, headings and marginal notes or sub-scripts contained herein are solely to facilitate references, are not intended to be construed as provisions of the Contract, and in no way affect the interpretation of the provisions to which they refer.

D. Where reference is made in the Contract Documents to publications, standards, or codes issued by associations or societies, such reference shall be interpreted to mean the current edition of such publications, standards, or codes, including revisions in effect on the date of the issuance of the public notice inviting bids or proposals for the Work, notwithstanding any reference to a particular date. The foregoing sentence shall not apply to the dates, if any, specified with respect to insurance policy endorsement forms.

E. In case of any conflict among the Contract Documents, unless the context clearly otherwise requires, the Contract Documents shall be construed according to the following priorities:

First Priority:	Contract Modifications and Change Orders
Second Priority:	Contract, as amended
Third Priority:	General Conditions of the Contract, as amended
Fourth Priority:	Drawings, as amended -- schedules take precedence over enlarged detail Drawings, and enlarged detail Drawings take precedence over reduced scale Drawings; figured dimensions shall prevail over scale.
Fifth Priority:	Specifications, as amended

F. 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. Neither the Awarding Authority nor the Designer assumes any liability arising out of jurisdictional issues raised or claims advanced by Subcontractors, trade organizations or other interested parties based on the arrangement or manner of subdivision of the content of the Specifications and Drawings. In the event of any claim arising out of any duplication, conflict, inconsistency or discrepancy within the Specifications or on the Drawings as to the allocation of the Work among the Subcontractors the Contractor shall be solely responsible for resolving the claim and shall be responsible for ensuring that all of the Work is completed, regardless of where it appears in the Specifications or on the Drawings.

4. Distribution of Work.

The distribution of the Work is intended to be described under the appropriate trades and, except for filed sub-bid work, may be redistributed, except as directed herein or as required by any applicable Laws, provided that such redistribution shall cause no controversy among the trades and no delay in the progress of the Work and is in the best interests of the Project.

ARTICLE III
CONTROL OF WORK / ADMINISTRATION OF THE CONTRACT

1. Designer.

Notwithstanding anything to the contrary expressed or implied in this Contract, any of the powers, rights, and duties of the Designer may be exercised by the Awarding Authority, provided that the Awarding Authority shall be under no obligation to do so. The Awarding Authority may rely on the Designer for the performance and exercise of its rights and obligations hereunder and shall be presumed to so rely on the Designer in the absence of an

explicit written assumption by the Awarding Authority of any such rights and obligations, except that any Approval required to be obtained from the Awarding Authority hereunder shall not be valid without the signature of the Awarding Authority. The Awarding Authority may explicitly overrule in writing any action, determination or decision of the Designer should the Awarding Authority choose to do so, except to the extent that the same would violate applicable Law. Subject to the foregoing, the Designer shall be responsible for the general administration of the Contract and shall perform the duties and exercise the rights herein conferred on the Designer. Except as otherwise specifically provided herein, the Designer shall decide all questions which may arise as to the conduct, quantity, quality, equality, acceptability, fitness, and rate of progress of the several kinds of work and materials to be performed and furnished under this Contract, and shall decide all questions which may arise as to the interpretation of the Drawings and Specifications and as to the fulfillment of this Contract on the part of the Contractor. In the case of the death, resignation, inability or refusal of the Designer to act, or the termination of his or her or its employment, the Awarding Authority may appoint another person to act as Designer for the purposes of this Contract. The Awarding Authority shall give written notice to the Contractor of any such appointment.

2. Right of Access to Work.

The Awarding Authority, the User Agency and the Designer (and persons designated by them) may for any purpose enter upon the Work, the Site, and premises used by the Contractor, and the Contractor shall provide safe facilities therefor. Other contractors of the Awarding Authority may also enter upon the same for the purposes which may be required by their contracts or work. Any differences or conflicts which may arise between the Contractor and other contractors of the Awarding Authority with respect to their work shall be initially resolved by the Designer.

3. Inspection No Waiver.

No inspection by the Awarding Authority or the Designer or employees or agents of either of them, and no order, measurement, certificate, approval, payment order, payment, acceptance or any other action or inaction of any of them, shall operate as a waiver by the Awarding Authority of any provision of this Contract.

ARTICLE IV
GENERAL PERFORMANCE OBLIGATIONS OF THE CONTRACTOR

The Contractor shall complete for the Contract Price all Work in a proper, thorough, and workmanlike manner in accordance with the Contract Documents. Without limiting the foregoing and without limiting the Contractor's obligations under any other provision of the Contract Documents, the Contractor shall for the Contract Price perform the following general obligations:

1. Review of Contract Documents and Field Conditions.

A. Before commencing the Work, the Contractor shall carefully study the Contract Documents and carefully compare all Specifications, Drawings, figures, dimensions, lines, marks, scales, directions of the Designer and Awarding Authority, and any other

information provided by the Awarding Authority and shall at once report to the Designer and Awarding Authority any questions, errors, inconsistencies, or omissions.

B. Before commencing the Work, the Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents and shall at once report to the Designer and Awarding Authority any questions, errors, inconsistencies, or omissions.

2. <u>Supervision and Construction Procedures; Coordination; Cutting, and Patching.</u>

A. The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and shall have control over, construction means, methods, techniques, sequences and procedures, and shall be responsible for coordinating all portions of the Work under the Contract.

B. The Contractor shall be responsible for the proper fitting of all Work and the coordination of the operations of all trades, Subcontractors, and materialmen engaged in the Work. The Contractor shall guarantee to each of its Subcontractors all dimensions which they may require for the fitting of their Work to all surrounding Work.

C. All necessary cutting, coring, drilling, grouting, and patching required to fit together the several parts of the Work shall be done by the Contractor, except as may be specifically noted otherwise under any particular filed sub-bid section of the Specifications.

D. The Contractor shall be responsible to the Awarding Authority for the acts and omissions of the Contractor's employees, agents and Subcontractors, and their agents and respective contractors' employees, and other persons performing portions of the Work or supplying materials therefor.

E. The Contractor shall be responsible for the inspection of portions of the Work already performed under this Contract to determine that such portions are completed in accordance with industry standards of good workmanship and the Contract Documents and in proper condition to receive subsequent Work.

F. The Contractor shall employ a registered land surveyor to perform any engineering required for establishing grades, lines, levels, dimensions, layouts, and reference points for the trades. The Contractor shall be responsible for maintaining benchmarks and other survey marks and shall replace any benchmarks or survey marks that may have become disturbed or destroyed. The Contractor shall verify the materials shown on the Drawings before laying out the Work and shall be responsible for any error resulting from its failure to exercise this precaution.

G. Unless otherwise required by the Contract Documents, or directed in writing by the Designer or the Awarding Authority, Work shall be performed during regular working hours, which, unless prescribed otherwise by applicable Law, shall be 7:00 a.m. to 5:00 p.m.. If the Contractor desires to carry on the Work outside of regular working hours or on Saturdays, Sundays, or Massachusetts or federal holidays, then the Contractor shall provide at least forty-eight (48) hours' notice to the Awarding Authority and Designer to allow satisfactory arrangements to be made for inspecting Work in progress and shall bear the costs of such inspection. The Awarding Authority at its election shall be entitled either to issue a credit Change Order to cover such cost or to withhold such cost from any further payments due the Contractor and/or to receive a payment from the Contractor of the amount of such cost.

H. Work performed outside of regular working hours set forth above without the consent or knowledge of the Designer and/or the Awarding Authority shall be subject to additional inspection and testing as directed by the Designer. The cost of this inspection and testing shall be borne by the Contractor whether the Work is found to be acceptable or not. The Awarding Authority at its election shall be entitled either to issue a credit Change Order to cover such cost or to withhold such cost from any further payments due the Contractor and/or to receive a payment from the Contractor of the amount of such cost.

3. Superintendent.

A. The Contractor shall employ a Superintendent whose appointment shall be subject to the Approval of the Awarding Authority. The Superintendent shall be in attendance at the Site full-time during the performance of the Work. The Superintendent shall represent the Contractor. Communications given to and from the Superintendent shall be deemed given to and from the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed upon written request in each case. The Superintendent shall attend each job meeting. The Superintendent shall be responsible for coordinating all of the Work of the Contractor and the Subcontractors.

B. The Superintendent shall be a competent employee regularly employed by the Contractor. The Superintendent shall be licensed in accordance with the Building Code and shall have satisfactorily performed similar duties on previous construction projects similar in type, complexity and scale to the Project. The Superintendent's resume shall be submitted to the Awarding Authority prior to commencement of construction together with such other information as the Awarding Authority may reasonably require in order to determine whether or not to Approve of his or her appointment. Any change in the Superintendent shall require the prior written consent of the Awarding Authority. The Contractor shall establish an emergency telephone line by which the Awarding Authority, the Designer, or their respective agents may contact the Superintendent during non-working hours.

4. Labor.

A. The Contractor shall employ only competent workers on the Project. The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall certify and ensure that all employees to be employed at the Site will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least ten (10) hours in duration at the time the employee begins work and the Contractor and each of its Subcontractors and others working on the Project shall furnish documentation of successful completion of said course by employees working with the first certified payroll report for each employee. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. Whenever the Designer shall notify the Contractor in writing that any worker is, in the Designer's opinion, incompetent, unfaithful, disorderly, or otherwise unsatisfactory, such employee shall be discharged from the Work and shall not again be employed on the Project except with the written consent of the Designer.

B. The Contractor shall employ a sufficient number of workers and shall ensure that all its Subcontractors employ a sufficient number of workers to carry on the Work with all

proper speed in accordance with Laws, the requirements of the Contract Documents, and the Progress Schedule.

C. The Contractor shall procure materials from such sources and shall manage its own forces and the forces of its Subcontractors and any sub-Subcontractors in such a manner as will result in harmonious labor relations on the Site. If union and nonunion workers are employed to perform any part of the Work, the Contractor shall establish and maintain separate entrances to the Site for the use of union and nonunion workers. The Contractor shall cause persons to be employed in the Work who will work in harmony with others so employed. Should the Work be stopped or materially delayed in the Awarding Authority's reasonable judgment due to a labor dispute, the Awarding Authority shall have the right to require the Contractor to employ substitutes acceptable to the Awarding Authority.

5. Notices and Permits.

A. The Contractor at its sole cost shall take out and pay for all approvals, permits, certificates and licenses required by Laws, pay all charges and fees, and pay for (or cause the appropriate Subcontractor to pay for) all utilities required for the proper execution of the Work.

B. The Contractor shall comply with all Laws and shall give all notices required thereby.

C. Except as otherwise specified in this Contract, it is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable Laws. However, if the Contractor observes that portions of the Contract Documents are at variance with the requirements of Laws, the Contractor shall promptly notify the Designer and Awarding Authority in writing, and necessary changes shall be accomplished by an appropriate Contract Modification.

D. If the Contractor performs Work knowing it to be contrary to Laws without giving such notice to the Designer and Awarding Authority, the Contractor shall bear full

responsibility for such Work and all costs attributable thereto, including, without limitation, corrections to the Work.

6. Lines, Marks etc.

The Contractor shall furnish batter boards and stakes and shall cause to be placed and maintained thereon so as to be easily read, such lines, marks and directions relating to the Work as the Designer shall from time to time direct. The Designer shall establish base lines and benchmarks on the Drawings for the locations of the Work but all other lines and grades shall be determined by the Contractor.

7. Excavation.

The Contractor shall prevent by sheeting and shoring or bracing, if necessary, any caving or bulging of the sides of any excavation made by the Contractor, leaving sheeting and shoring in place, or if any is removed, filling solid the spaces left thereby.

8. Dewatering/Hoisting/Staging.

The Contractor shall provide pumping, drainage, and disposal of all water and other flows so that no puddle, nuisance, or damage will be caused by water or flooding. The Contractor shall provide all hoisting equipment and machinery required for the proper execution of the Work. The Contractor shall provide all exterior and interior staging required to be over eight feet in height, except as may be otherwise provided in the Contract Documents.

9. Corrections to the Work; Inspection No Bar to Subsequent Corrections.

The inspection of the Work by the Designer, the Awarding Authority or their respective consultants shall not relieve the Contractor of its responsibilities to fulfill the Contract obligations. Defective work may be rejected by the Designer, the Awarding Authority, or their respective designated consultants, whether or not such work and/or materials have been previously overlooked or misjudged by the Designer, the Awarding Authority, or their respective consultants and accepted for payment. If the Work or any part thereof shall be found defective at any time before the Final Acceptance of the whole Work, the Contractor shall forthwith cease the performance of any defective work in progress and, whether or not such work is still in progress, shall forthwith correct such defect in a manner satisfactory to the Designer, the Awarding Authority, or their respective designated consultants. If any material brought upon the Site for use in the Work, or selected for the same, is rejected by the Designer, the Awarding Authority, or their respective consultants as unsuitable or not in conformity with the Contract Documents, or as damaged by casualty or deteriorated due to improper storage at the Site or to any other factor, the Contractor shall forthwith remove such materials from the Site. The Contractor shall pay for the cost of making good all work or property of other contractors or of the Owner destroyed or damaged by such removal or replacement; repair, finish and immediately make good any injury, defect, omission or mistake in the Work as soon as it is discovered; and complete and leave the Work in perfect condition.

10. Sanitary Facilities.

A. The Contractor shall provide and maintain sanitary facilities for all persons employed on the Work, beginning with the first worker at the Site. Said facilities shall meet the following requirements unless otherwise specified in the Specifications.

B. There shall be no fewer facilities than the number required by applicable Laws.

C. Facilities shall be kept in a clean sanitary condition at all times and shall be adequately screened to be inaccessible to flies.

(**Note:** If existing sanitary facilities at the Site are to be used by the Contractor, this requirement will be modified accordingly in the Specifications.)

11. Temporary Offices.

A. Except as otherwise specified in the Contract Documents, the Contractor shall erect the following temporary offices near the Site as directed by the Designer and adequately furnish and maintain them in a clean, orderly condition:

(1) A Contractor's field office at which Contractor's authorized representative shall be present at all times while work is in progress. Instructions, notices, and other communications delivered there by the Designer or the Awarding Authority shall be deemed delivered to the Contractor.

(2) The Contractor shall provide a separate conference room space with a conference table and chairs sufficient to accommodate 12 persons at one time.

B. The Contractor shall relocate the Resident Engineer's trailer, as well as services connected with said trailer, at no additional cost to the Owner if the need for relocation arises as determined by the Designer.

12. Contract Documents and Samples at the Site.

A reasonable number of sets of Contract Documents will be furnished to the Contractor by the Awarding Authority immediately after signing of the Contract, one of which shall be maintained at the Site for reference by authorized representatives of the Awarding Authority. The Contractor shall maintain at the Site for the use and information of the Awarding Authority one record copy of the Drawings, Specifications, addenda, Change Orders, Approved Shop Drawings, Product Data, Samples, updated Progress Schedule, and all other submittals, all in good order and marked currently to record changes and selections made during construction. These shall be available to the Designer and the Awarding Authority and shall be delivered to the Designer for submittal to the Awarding Authority upon completion of the Work. The Drawings, Specifications, and other documents prepared by the Designer and copies thereof furnished to the Contractor are for use solely with respect to this Project. The Contractor shall not permit their release to other parties except as may be necessary in dealing with governmental authorities in the ordinary course of permitting and constructing the Project. Further, they are not to be used by the Contractor or any Subcontractor or supplier on other projects without the specific written consent of the Awarding Authority and the Designer.

13. Telephones, Data Lines, and Wi-Fi.

The Contractor shall provide and maintain separate individual telephone, data and wi-fi service and pay for all calls, data service, and wi-fi service relating to the Work. Service and equipment shall meet the requirements, if any, of the Contract Documents and shall include provisions for incoming and outgoing calls and continually available wi-fi: (1) in the Contractor's field office for the use of its authorized agents and (2) in the Resident Engineer's office for the use of the Designer and authorized agents of the Owner.

14. <u>Health, Safety, and Accident Prevention</u>

A. In performing the Work, the Contractor shall:

(1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the U.S. Secretary of Labor by regulation;

(2) Protect the lives, health, and safety of other persons; and

(3) Prevent damage to property, materials, supplies, and equipment.

B. For these purposes, the Contractor shall:

(1) Comply with 84 Stat. 1590, the "Occupational Safety and Health Act of 1970" (OSHA) and with regulations and standards issued by the U.S. Secretary of Labor at 29 CFR Part 1926; and

(2) Comply with the trench safety law set forth in M.G.L. c. 82A and regulations promulgated by the Departments of Public Safety and Occupational Safety in 520 CMR 14.00 et. seq., which require at a minimum that: 1) all excavators obtain a permit for all trenches as defined; 2) all excavators must provide protections when trenches are unattended; and 3) authorizes fines for violations; the Contractor shall execute a “Trench Application and Permit” form included in Appendix C with the execution of this Contract.

(3) Include the terms of this Article IV.14 in every Subcontractor contract so that such terms will be binding on each Subcontractor.

(4) Designate by written notice to the Awarding Authority a responsible member of its organization at the Site whose duties shall include ensuring safety, implementation of Contractor’s safety plan referenced below and preventing accidents.

C. The Contractor shall maintain an accurate record of exposure data on all accidents incident to the Work resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 CFR Part 1904. Without limiting the foregoing, the Contractor shall submit to the Awarding Authority without delay verbal and written reports of all accidents involving bodily injury or property damage arising in connection with the Work.

D. In any emergency affecting the safety of persons or property the Contractor shall immediately act in the exercise of reasonable judgment to prevent threatened damage, injury, or loss. The Contractor shall immediately notify the Awarding Authority of such emergency.

E. The Contractor shall be responsible for its Subcontractors’ compliance with the provisions of this Article IV.14.

F. Before commencing any portion of the Work on Site, the Contractor shall submit a written Project-specific plan for implementing this Article IV.14. The plan shall include an analysis of the significant hazards to life, limb and property inherent in the performance of the Work and a plan for controlling these hazards.

G. Without limiting the foregoing provisions of this Article IV.14, the Contractor shall comply with all health and safety Laws applicable to the Work. Without limitation:

(1) If the Contractor uses, stores or encounters toxic or hazardous substances it shall comply with M.G.L. c. 111F, § 2, the "Right to Know" law and regulations promulgated by the Department of Public Health, 105 CMR 670, the Department of Environmental Protection, 310 CMR 33, and the Department of Labor and Workforce Development, 441 CMR 21; and shall post a “workplace notice” obtainable from the Department of Labor and Workforce Development.

(2) The Contractor shall comply with the Federal Resource Conservation and Recovery Act, the Federal Comprehensive Environmental Response, Compensation and Liability Act, M.G.L. c. 21C, M.G. L. c. 21E, and any other Laws affecting toxic or hazardous materials, solid, special or hazardous waste. Should the Contractor discover unforeseen materials subject to the aforementioned hazardous materials laws at the Site, the Contractor shall immediately comply with any and all requirements for dealing with such materials and notify all required governmental authorities and the Awarding Authority of such discovery.

(3) The Contractor shall be responsible for the location of all utilities in connection with the Work. Without limiting the foregoing, the Contractor shall comply with Dig-Safe Laws. Dig-Safe is the Utility Underground Plant Damage Prevention System, 331 Montvale Road, Woburn, MA, 01801, 1-888-344-7233. The Contractor shall notify Dig-Safe of contemplated excavation, demolition, or explosive work in public or private ways, and in any utility company right of way or easement, by certified mail, with a copy to Department of Environmental Protection . This notice shall be given at least 72 hours prior to the work, but not more than sixty days before the work is to be done. Such notice shall state the name of the street or the route number of the way and shall include an accurate description of the location and nature of the proposed work. Dig-Safe is required to respond to the notice within 72 hours of receipt by designating the location of pipes, mains, wires or conduits at the Site. The Contractor shall not commence work until Dig-Safe has responded. The work shall be performed in such manner and with reasonable precautions taken to avoid damage to utilities under the surface at the work location. The Contractor shall provide the Superintendent with current Dig-Safe regulations, and a copy of M.G.L. c. 82, § 40. Any costs related to the services performed by Dig-Safe shall be borne by the Contractor.

(4) The Contractor shall comply with M.G.L. c. 149, § 129A, relative to shoring and bracing of trenches.

H. Without limiting the Contractor’s responsibilities described above, the Contractor shall take all reasonable precautions for the safety of, and the prevention of injury or damage to (i) all agents and employees and contractors on the Work and all other persons who may be affected thereby including the general public, (ii) all the Work and all materials and equipment to be incorporated therein, whether in storage on or off the Site, under the care custody or control of the Contractor or any of its Subcontractors or any contractors directly or indirectly contracting through any of them, and (iii) other property at the Site

or adjacent thereto, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of the Work. The Contractor shall promptly remedy all damage or loss to any such property caused in whole or in part by the Contractor, any Subcontractor, or anyone directly or indirectly contracted or employed by any of them or by anyone for whose acts any of them may be liable. Without limiting the foregoing, the Contractor shall:

(1) post and maintain adequate danger signs and other warnings against hazards;

(2) promulgate safety regulations and give appropriate notices to the Awarding Authority and users of adjacent utilities and property;

(3) ensure the adequate strength and safety of all scaffolding, staging and hoisting equipment, temporary shoring, bracing and tying;

(4) protect adjoining private or public property;

(5) provide barricades, temporary fences, and covered walkways required by prudent construction practices, Laws and/or the Contract Documents;

(6) furnish approved hard hats and other personal protective equipment, furnish approved first aid supplies, furnish the name of the first aid attendant, and maintain a posted list of emergency facilities;

(7) provide proper means of access to property where the existing access is cut off by the Contractor;

(8) maintain from the beginning of any darkness or twilight through the whole of every night sufficient lights on or near any obstruction so as to guard and protect travelers from injury from such obstruction;

(9) maintain adequate security at the Site so as not to expose the Work and surrounding property to vandalism or malicious mischief;

(10) provide adequate fire protection procedures during the use of cutting torches, welding equipment, plumbers' torches and other flame and spark producing apparatus;

(11) take prompt action to correct any dangerous or hazardous conditions.

I. The Contractor shall not use or store explosives in the performance of the Work unless the Contractor first obtains the Awarding Authority's prior written specific Approval. If the Awarding Authority Approves the use or storage of explosives during the performance of the Work, the Contractor shall first comply with all Laws and obtain all permits, approvals, and certificates required in connection with the same and shall exercise best efforts, including but not limited to the employment and supervision of properly qualified personnel, to prevent damage, injuries, and accidents involving said explosives.

J. The Contractor shall not permit cutting or welding in or immediately adjacent to existing property of the Owner, Awarding Authority or of anyone else without the Awarding Authority's prior Approval in each instance.

15. <u>Debris and Chemical Waste.</u>

A. The Contractor shall not permit the accumulation of interior or exterior debris. The Contractor shall keep the Work area clean at all times. Without limitation, garbage shall be removed daily.

B. The Contractor shall properly classify and remove debris and waste from the Site and transport and dispose of it, all in accordance with Laws, employing a qualified and properly licensed transporter, at any landfill, disposal or recycling facility licensed under applicable Laws, including without limitation, hazardous materials Laws. The Contractor shall make all arrangements and give and obtain all notices, communications, documentation, permits, certificates, and approvals necessary for said disposal from the owner or officials in charge of such landfills, disposal or recycling facilities. The Contractor shall bear all fees and costs in connection with such classification, removal, transportation, disposal and storage. The Contractor shall not permit any storage of debris or waste except in accordance with Laws.

C. The Contractor shall not permit any open fire on the Site.

D. Chemical waste shall be stored in corrosion resistant containers, removed from the Site, and disposed of not less frequently than monthly unless more frequently required by Laws, including without limitation hazardous materials laws, or by the Contract Documents. Disposal of chemical waste shall be performed in accordance with requirements of the U.S. Environmental Protection Agency and the Massachusetts Department of Environmental Protection. Fueling and lubricating of vehicles and equipment shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants shall be disposed of in accordance with procedures meeting all applicable Laws. The Contractor shall immediately notify the Designer and Awarding Authority of any hazardous materials release large enough to require reporting under applicable Laws. The Contractor shall be responsible for immediately cleaning up in accordance with Laws any oil or hazardous materials releases resulting from its operations. Any costs incurred in cleaning up any such releases shall be borne by the Contractor.

16. Weather Protection (M.G.L. c. 149, §§ 44F(1) and 44G).

The Contractor shall furnish and install "weather protection," which means temporary protection of that Work adversely affected by moisture, wind and cold. Weather protection shall be achieved in accordance with the Specifications, and at a minimum shall include covering, enclosing and/or heating working areas such that a minimum temperature of 40 degrees Fahrenheit (or higher temperature, if so stated in the Specifications) is maintained at the working surface during the months of November through March in order to permit construction to be carried on during such period in accordance with the Progress Schedule. After the building or portion thereof is completely enclosed by either permanent construction or substantial temporary materials having a resistance comparable to the specified permanent construction, the Contractor shall provide heat in accordance with the Specifications; if the Specifications do not specify a temperature range for this phase, the Contractor shall provide heat of not less than 55 degrees F. nor more than 75 degrees F. The foregoing provisions do not supersede any specific requirements for methods of construction, curing of materials and the like. Such weather protection shall be consistent with the Progress Schedule, shall permit the continuous progress of the Work necessary to maintain an orderly and efficient sequence of construction operations, shall include one thermometer for every two-thousand (2,000) square feet of floor space or fraction thereof (or as otherwise stated in the Specifications), shall be subject to the Approval of the Awarding Authority, and shall meet such additional requirements as may be specified by the Awarding Authority and by the Contract Documents.

17. Furnishings and Equipment.

When, in the opinion of the Designer, any portion of the Work is in a reasonable condition to receive fittings, furniture, or other property of the Owner not covered by this Contract, the Contractor shall allow the Awarding Authority to bring such fittings, furniture, and/or other property into such portions of the Work and shall provide all reasonable facilities and protection thereof. No such occupancy shall be construed as interfering with the provisions relating to time of completion, or as constituting an acceptance of the whole or any part of the Work. Any furniture or fittings so installed shall be placed in the Work at the risk of the Awarding Authority except that the Contractor shall be liable for damages or losses to such furniture or fittings to the extent such damages or losses arise in whole or in part from the negligence or intentional misconduct of Contractor, Subcontractors, their agents and/or employees, or anyone for whose acts Contractor is responsible.

18. Form for Subcontract.

The Contractor when subcontracting with sub-bidders filed pursuant to M.G.L. c. 149, § 44F shall use the form for subcontract in M.G.L. c. 149, § 44F(4)(c). The Contractor shall not interpret paragraph 3 of the statutory form of subcontract to require such sub-bidders to provide insurance with limits higher than the limits that are required by Article XIV of these General Conditions, assuming that the term "Contractor" therein refers to the sub-bidder and that the term "Contract Price" refers to the sub-bidder's price stated in paragraph 1 of the statutory form of subcontract.

19. Sales Tax Exemption and Other Taxes.

All building materials and supplies as well as the rental charges for construction vehicles, equipment and machinery rented exclusively for use on the Site, or while being used exclusively for the transportation of materials for the Work are entitled to an exemption from sales taxes under M.G.L. c. 64H, § 6(f). The Contractor shall take all action required to obtain the benefit of such sales tax exemption. The Contractor shall bear the cost of any sales taxes that Contractor incurs in connection with the Work and the Awarding Authority shall not reimburse the Contractor for any such taxes. The exemption number assigned to the Contractor as an exempt purchaser shall be provided to the Contractor by the Awarding Authority upon the written request of the Contractor.

20. Final Cleaning.

At the completion of the Work, the Contractor shall remove all waste materials, rubbish, tools, equipment, machinery and surplus materials, and professionally clean all sight-exposed surfaces so that the Work is clean and ready for occupancy. Subsequent to installation of User Agency furniture, telephones, and equipment, the Contractor shall provide such additional cleaning as may be necessary to remove any soil resulting from installation of such furniture, telephones and equipment. The Contractor shall comply with the detailed final cleaning requirements of the Specifications; in the event of any conflict

between the Specifications and this Section specifically with respect to cleaning at or after the completion of the Work, the Specifications shall apply.

21. Maintenance Data.

Subject to such additional requirements as may be provided in the Contract Documents, the Contractor shall compile four complete and identical binders of operating and maintenance

data for the entire Work, which shall include, at a minimum for all equipment and systems installed, complete operation and maintenance programs, including but not limited to operation and maintenance (O&M) manuals, records of any and all maintenance performed (whether by the Contractor or Subcontractors) between equipment installation and Final Acceptance, all as may be further detailed in the Specifications. The Contractor shall submit record maintenance data to the Designer for approval, shall submit approved maintenance data to the Awarding Authority, and shall instruct and train the User Agency's personnel in proper inspection and maintenance procedures in accordance with the training plan developed and Approved in accordance with the Specifications. If requested by the Awarding Authority, the Contractor shall also submit information on equipment and systems installed as the Work is performed in a format acceptable to the Awarding Authority, which shall be compatible for entry in the Capital Asset Management Information System (CAMIS), as may be further detailed in the Specifications.

22. Closeout Procedures.

The Contractor shall take all actions and submit all items required for the issuance of the Certificate of Substantial Completion and Final Acceptance as specified in the Contract Documents.

23. Risk of Loss.

The Contractor shall bear all risk of loss to the Work during the term of the Contract except for any portion of the Work as to which the Certificate of Substantial Completion has been issued pursuant to Article VI of these General Conditions of the Contract. Nothing herein shall limit the Contractor's responsibilities under Article IX or XV of these General Conditions of the Contract.

24. LEED Requirements.

Contractor understands that, pursuant to Executive Order No. 484, all new construction and renovation projects over 20,000 square feet must, at a minimum, meet a Massachusetts LEED Plus building standard, and that smaller projects must meet the minimum energy performance standards for advanced buildings established by the Commonwealth of Massachusetts Sustainable Design Roundtable. Furthermore, Contractor understands that the Massachusetts LEED Plus standard or a higher LEED standard applies to all projects overseen by DCAMM, as well as all projects built on state land for use by state agencies. Contractor must document compliance with this executive order and Project LEED certification standards as described in the Specifications.

25. Electronic Project Management System.

If so requested by the Awarding Authority, the Contractor and Subcontractors shall be required to use the Awarding Authority’s electronic web-based project management information system as a repository for Project correspondence, documentation, budgeting, and scheduling, and all submittals and processes under this Contract, as directed by the Awarding Authority.

26. Drugs/Alcohol.

The Contractor shall direct that all persons coming onto the Site are free of drugs and alcohol. The Contractor shall dismiss from the Project any individual employed by the Contractor or any Subcontractor or suppliers who is found by the Contractor, the Awarding Authority, or the User Agency to be in violation of this provision or in any other way incompetent, guilty of misconduct, or detrimental to the Project.

ARTICLE V
MATERIALS AND EQUIPMENT

1. Materials Generally.

A. Unless otherwise specifically provided in the Contract Documents, the Contractor shall provide and pay for 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.

B. Materials and equipment to be installed as part of the Work (both or either of which are hereinafter referred to as "materials") shall be new, unused, of recent manufacture, assembled, and used in accordance with the best construction practices. The Contractor shall inform himself as to, and shall comply with, the provisions of M.G.L. c. 7, § 23A, as amended, and shall abide by the same and all applicable rules, regulations and orders made thereunder in relation to the purchase of supplies and materials in the execution of the Work, including the provisions of M.G.L. c.7, § 22, paragraph 17 which provides that there be *"a preference in the purchase of supplies and materials, other considerations being equal, in favor, first, of supplies and materials manufactured and sold within the Commonwealth, and, second, of supplies and materials manufactured and sold elsewhere within the United States."*

2. Shop Drawings, Product Data, and Samples.

A. The Contractor shall furnish to the Designer all Samples of the materials to be used in the execution of the Work as required by the Contract Documents. The Contractor shall furnish to the Designer in a timely manner all coordination Drawings, shop details, Shop Drawings, and setting diagrams which may be necessary for acquiring and installing materials. These shall be reviewed as required by the Designer. Unless otherwise specified by the Awarding Authority, the Contractor shall provide a minimum of four (4) copies when submitting for final approval by the Designer, one of which shall be returned to the Contractor, one to the Resident Engineer, one to the Awarding Authority and one filed with the Designer. The inspection and approval by the Designer of Shop Drawings and setting diagrams shall be general and shall in no way relieve the Contractor from responsibility for proper fitting, coordinating, construction, and construction sequencing. The Contractor shall furnish to the Designer such information and vouchers relative to the Work, the materials therefor, and the persons employed thereon, as the Designer shall from time to time request.

B. Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. The purpose of their submission is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents.

C. The Contractor shall review, approve, and submit to the Designer, Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Awarding Authority or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents or which do not comply with the Contract Documents may be returned without action. The Contractor's attention is directed to the provisions of Section 4 of this Article V and to the Specifications.

D. The Contractor shall prepare and keep current for the Designer's approval a schedule of submittals which is coordinated with the Progress Schedule and allows the Designer reasonable time to review submittals.

E. The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Designer. Such Work shall be in accordance with approved submittals.

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

G. The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Designer's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Designer in writing of such deviation at the time of submittal and the Awarding Authority has given explicit written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals by the Designer's or the Awarding Authority's actions.

H. 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 Designer on previous submittals.

I. Informational submittals upon which the Designer is not expected to take responsive action may be so identified in the Contract Documents.

J. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, such certification must be stamped by a registered Massachusetts professional in the discipline required. The Designer shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

K. Materials furnished or used or employed under the Contract must be equal in quality to the Samples furnished and be satisfactory to the Designer.

3. <u>Tests.</u>

A. Any material to be used in the Work may be tested or inspected at any time by the Designer with the prior Approval of the Awarding Authority and may be rejected if it fails to comply with specified tests. The Awarding Authority shall pay for all testing of specified material, except as provided herein. If the Contractor requests permission to use a material that was not specified, then the Contractor shall pay for such testing. The cost of testing of materials that fail the testing criteria shall be borne by the Contractor

B. The Contractor shall notify the Designer and the Awarding Authority of the proposed sources of materials in time to permit all required testing and inspection before the material is needed for incorporation into the Work. The Contractor shall have no claim arising from Contractor's failure to designate the proposed source or to order the material in time for adequate testing and inspection. Necessary arrangements shall be made to permit the Designer to make factory, shop or other inspection of materials or equipment ordered for the Work in process of manufacture or fabrication, or in storage elsewhere than the Site.

4. <u>"Or Equal" Submissions.</u>

A. Where products or materials are prescribed 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 Awarding Authority (a) it is at least equal in quality, durability, appearance, strength and design, (b) it performs at least equally the function imposed in 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. Any changes in the Work made necessary to accommodate products or materials substituted as an "or equal" shall be at the expense of the Contractor. "Approved equal" shall mean an item with respect to which the Awarding Authority shall have issued a written statement to the Contractor to the effect that the item is, in the Awarding Authority's opinion, equal within the meaning of this paragraph to that prescribed in the Contract Documents.

B. The Contractor shall be responsible for providing the Designer with any information and test results that the Designer reasonably requires to determine whether or not a material is equal to a material named or described in the Contract Documents.

C. Whenever the Contractor submits a material for Approval as a substitute for a material named or described in the Contract Documents, such submission shall be made at least one hundred twenty (120) days prior to the date the materials will be used in the Work. In no event shall the Contractor maintain a claim for delays based upon the Designer's review of such substituted materials if the Contractor has failed to comply with the one hundred twenty (120) day submission requirement.

D. The Contractor shall save the written calculations, pricing information, and other data that the Contractor used to calculate the General Bid (the "Bid Pricing Materials") for at least six years after the Awarding Authority makes final payment under this Contract. No increase in the Contract Price shall be allowed for any material later found to have been improperly rejected as not being equal unless the Contractor can show persuasive evidence that the rejection increased the Contractor's costs over those provided for in the Bid Pricing Materials, net of all savings the Contractor obtained by substituting other "or-equal" items. Without limiting the foregoing, if the Awarding Authority rejects a proposed substitution on the basis that the item is not equal and if after the Contractor complies with the appeal procedures required by law, DCAMM regulation, and by the Contract Documents, the appropriate authority finds that the proposed substitution was equal, the Contract Price may be increased only to the extent that:

(1) the item that the Contract Documents specifically require costs more than the item later approved as equal;

(2) the Bid Pricing Materials prove that the Contractor calculated its bid using the cost of the item later found as equal;

(3) any increase is reduced by any cost that the Contractor would have incurred for structural or mechanical changes necessary to accommodate the substitute item;

(4) the Contractor shall not be entitled to any adjustment for overhead and profit;

(5) any increase must exceed the aggregate amount that the Contractor saved using products or materials that the Awarding Authority approved as equal under this Contract.

In calculating the Contractor's aggregate saving under the preceding clause (5), the Contractor shall provide the Awarding Authority with the Bid Pricing Materials and a calculation based on the Bid Pricing Materials that compare the price (stated in the Bid Pricing Materials) of each item replaced with an "or equal" item, with the cost of the approved equal item, specifically describes all costs that Contractor would have incurred making structural or mechanical changes to include within the Work the item later found to have been improperly rejected and copies of all plans, specifications, shop drawings, and other design documents that the Awarding Authority deems necessary or desirable.

5. Delivery and Storage of Materials; Inspection.

A. Materials and equipment shall be progressively delivered to the Site so that there will be neither delay in the progress of the Work nor an undue accumulation of materials that are not to be used within a reasonable time and so that their security, quality, and fitness of the materials for the Work is preserved.

B. Materials stored off Site shall be insured and stored at the expense of the Contractor so as to guarantee the preservation of their security, quality and fitness for the Work. Without derogating from the Contractor's responsibilities in the previous sentence, when necessary to avoid deterioration or damage, material (on or off Site) shall be placed on wooden platforms or other hard clean surfaces and not on the ground and shall be properly protected.

C. The Contractor shall obtain prior written Approval for permission to store materials or equipment to be incorporated into the Work for which progress payments will be requested at off-Site locations. Any and all charges for storage, inspection, and verification by the Designer and Awarding Authority, including insurance, shall be borne solely by the Contractor. Before Approval, the Awarding Authority may require, without limitation

(1) evidence that the off-Site location is properly secure;

(2) proper proof of insurance and proof of satisfactory contractual arrangement for transportation to the Site; and

(3) a certificate from the Contractor stating: (i) the name of the member of the Contractor or Subcontractor that leases or owns the warehouse or other storage facility; (ii) the location of such storage facility, including the storage space (i.e. the entire premises or certain areas of a warehouse giving the number of floors or portions thereof) and a certification that the Contractor has visited such location, verified the storage of such materials or equipment therein or thereon (including confirmation that the materials or equipment are marked and segregated as provided below) and verified payment of all current storage charges; (iii) the date(s) on which the materials or equipment is first stored at such facility; and (iv) a description of the materials or equipment stored, including quantities, types, manufacturers and other identification information, such as serial numbers.

The Contractor shall furnish to DCAMM, not less often than once per month, a current inventory of all materials or equipment being stored at any off-Site location. The Contractor shall mark each sealed carton or other item with the name of the Project and the Awarding Authority, and all materials or equipment stored off-Site shall be segregated to the extent required by the Awarding Authority or the Designer. Payment for materials or equipment stored off-Site shall be at the reasonable discretion of the Awarding Authority, taking into account the schedule requirements of the Work. Title to materials or equipment stored off-Site shall be transferred at the time at which the Awarding Authority pays for them, free of any lien or other interest of the supplier or any other lien or encumbrance. Notwithstanding such transfer of title, the Contractor shall retain sole care, custody and control of, and shall have complete responsibility for the security and protection of, all materials or equipment included in any application for payment which are stored at locations other than the Site, and the Contractor assumes all risk of loss or damage to such materials or equipment, and the Contractor shall hold harmless the Awarding Authority from and against all liabilities arising out of or resulting from loss or damage, from any cause, to such materials or equipment for which payment is requested, including liens, security interests or other claims of any kind by suppliers or other third parties relating to such materials or equipment.

D. Expenses for inspection of material by the Designer and/or the Awarding Authority personnel including travel, quarters, and subsistence shall be borne by the Contractor requesting the inspection of material stored outside the Commonwealth of Massachusetts as part of the Contract Price. The policy of the Awarding Authority precludes the payment for material stored outside the boundaries of Massachusetts except in extremely limited circumstances with the express written consent of the Awarding Authority. If the Contractor requests an inspection of material stored outside the Commonwealth of Massachusetts, the Awarding Authority will initially pay for all expenses of inspecting the material incurred by the Designer and/or Awarding Authority's personnel including travel, quarters, and subsistence. The Awarding Authority will then give Contractor an invoice for those costs and the Contractor shall submit a credit Change Order in the amount of those expenses.

E. Stored materials either at the Site or at some other location agreed upon in writing shall be so located as to facilitate prompt inspection and even though approved before storage, may again be inspected prior to their use in the Work.

F. All storage sites shall be restored to their original condition by the Contractor at the Contractor's expense.

G. The Contractor shall take charge of and be liable for any loss of or injury to the materials for his use delivered to or in the vicinity of the place where the Work is being done, whether furnished by the Owner or otherwise; the Contractor shall notify the Designer as soon as any such materials are so delivered, allow them to be examined by the Designer, and furnish workers to assist therewith.

6. Defective, Damaged, or Deteriorated Materials and Rejection Thereof.

The Designer may reject materials if the Designer reasonably determines that such materials do not conform to the Contract Documents in any manner, including but not limited to materials that have become damaged or deteriorated from improper storage whether or not such materials have previously been accepted. The Contractor at its own expense shall remove rejected materials from the Work. No rejected material, the defects of which have been

subsequently corrected, shall be used except with the written permission of the Designer. Should the Contractor fail to remove rejected material within a reasonable time, the Designer and/or Awarding Authority may, in addition to any other available remedies, remove and/or replace the rejected material, and deduct the cost of such removal and/or replacement from any moneys due or to become due the Contractor. No extra time shall be allowed for completion of Work by reason of such rejection. The inspection of the Work shall not relieve the Contractor of any of its obligations herein prescribed, and any defective Work shall be corrected. Work not conforming to the Contract Documents may be rejected notwithstanding that such Work and materials have been previously overlooked or misjudged by the Designer and accepted for payment. If the Work or any part thereof shall be found defective at any time before Final Acceptance of the whole Work, the Contractor shall forthwith make good such defect in a manner satisfactory to the Designer. Nothing in the Contract shall be construed as vesting in the Contractor any property rights in the materials used after they have been attached or affixed to the Work or the Site; but all such materials shall upon being so attached or affixed become a property of the Owner.

ARTICLE VI
PROSECUTION AND PROGRESS

1. Beginning, Progress Schedule, and Completion of Work.

A. The Contract time shall commence upon the date specified in the Notice to Proceed. The Contractor shall begin Work at the Site within ten days of said date unless otherwise ordered in writing by the Awarding Authority.

B. Prior to the submission of the first progress payment, the Contractor shall submit to the Designer and to the Awarding Authority, a progress schedule for the term of the Contract as required by the Contract Documents, showing in detail his proposed progress for the construction of the various parts of the Work and the proposed times for receiving required materials. Upon Approval by the Awarding Authority, said schedule shall constitute the Progress Schedule. The Contractor shall at the end of each month, or more often if required, furnish to the Designer and to the Awarding Authority a schedule meeting the requirements of the Specifications showing the actual progress of the parts of the Work in comparison with the Progress Schedule.

C. Time is of the essence of this Contract. The Work shall be completed within the time specified in Article 2 of the Contract. Should the Contractor require additional time to complete the Work, the Contractor shall document the reasons therefor and submit a written request for an extension of time within 20 days of the occurrence of the event alleged to be the cause of the delay, as provided in this Article and in Article VII of these General Conditions. Failure to submit said written request within the time required by the preceding sentence shall preclude the Contractor from subsequently claiming any time extension due to said delay.

D. If, in the opinion of the Designer or the Awarding Authority, the Contractor fails to comply with the Progress Schedule, the Awarding Authority may give the Contractor a written notice to that effect whereupon (1) the Contractor shall, if the notice requires, discontinue all or any portion of the Work (which discontinuance shall neither terminate the Contract nor give the Contractor any claim for an increase in the Contract Price, damages, or an extension of any completion deadlines); or (2) at Contractor's sole cost increase the work force, equipment and plant, or any of them, employed on the whole or any part of the Work, to the extent required by such notice, and employ the same from

day to day until the completion of the Work or such part thereof, or until the failure regarding the rate of progress, in the opinion of the Designer or the Awarding Authority, shall have been sufficiently corrected.

E. If, in the opinion of the Awarding Authority, the Contractor fails to comply with the Progress Schedule, and whether or not the Awarding Authority shall have given the Contractor a notice described in D above, the Awarding Authority may (but shall not be required to) give the Contractor notice of such failure and five days to cure the same. Unless the Contractor shall within that five days take all necessary steps to do so (including, if the Awarding Authority requires, increasing its forces, equipment and plant) and continue to do so until in the opinion of the Awarding Authority the failure is corrected, the Awarding Authority may at the Contractor's expense and without terminating this Contract take exclusive or joint possession of all or a portion of the Site and employ and direct the labors of existing or such additional forces, equipment and plant as may in the Designer's or Awarding Authority's opinion be necessary to ensure the completion of the Work or such part thereof within the time specified in the Contract Documents or at the earliest possible date thereafter. The Awarding Authority may exercise its rights under this Article at any time and from time to time without waiving any of its rights under this Contract, at law or in equity, including, without limitation, the right to deem this Contract terminated or to order the Contractor to discontinue the Work at any time thereafter. The Contractor shall continue to perform the remaining Work under this Contract even if the Awarding Authority elects to have another contractor perform a portion of the Work under this Article.

F. The Awarding Authority shall deduct the cost of any actions the Awarding Authority takes under this Article from any amount then due or which might have become due to the Contractor under this Contract had the Contractor performed as required. On demand, the Contractor shall pay the Awarding Authority any amount by which the cost of completing all or any portion of the Work exceeds the amount attributable to that Work under the Contract Documents. The Awarding Authority's sole goal will be to complete the Work that it elects to complete within the time limits stated in the Contract or at the earliest possible date thereafter. Consequently, the Awarding Authority shall have no obligation to obtain competitive bids or the lowest cost for completing the Work or any part thereof, except when it is required by Law. The Awarding Authority's election to complete all or part of the Work shall not release the Contractor from any liability for failure to complete the Work as the Contract Documents require, and shall not entitle the Contractor to a claim for an increase in the Contract Price or an extension of the time for completing the Work. If the cost that the Awarding Authority incurs in completing all or any portion of the Work is less than the amount that the Contract Documents attribute to that Work, the Awarding Authority will pay or credit the difference to the Contractor, less any other costs and expenses that the Awarding Authority incurs, including the cost of supervision, and the Designer’s and attorneys' fees and costs.

2. <u>Failure to Complete Work on Time - Liquidated Damages.</u>

A. If the Contractor shall neglect, fail or refuse to achieve the Substantial Completion Date, the Contractor and the Contractor’s surety agree, as a part of the consideration for the execution of this Contract by the Awarding Authority, to pay the Awarding Authority the amounts set forth in Article 2 of the Contract, not as a penalty, but as liquidated damages to cover certain losses, expenses, and damages of the Awarding Authority for such breach of this Contract as herein set forth. The Contractor acknowledges that delay of the

Substantial Completion Date will cause disruption of the Awarding Authority's operations and those of the User Agency. Such disruptions include without limitation, loss of productivity and efficiency and duplication of effort of the User Agency and of employees and contractors engaged by the User Agency and the Awarding Authority for operation of the completed facility. The Awarding Authority and the User Agency will incur other direct administrative, professional, rental, storage, moving, transportation, and other costs in the event of such delay. Delay of the Substantial Completion Date will also require the Awarding Authority to incur additional costs for compensation to the Designer and other consultants or contractors for extended or additional services on the Project. In light of the costs, damages, losses, risks and liabilities described above, the parties agree upon the liquidated damages stated below. Such damages have been fixed and agreed upon because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Awarding Authority and the Commonwealth would, in such event, sustain. Said amounts may be retained by the Awarding Authority on or after the scheduled Substantial Completion Date from current progress payments or any other amounts owing to the Contractor.

B. Similarly, if the Contract states that by a specified date a designated portion of the Work shall be prosecuted to the point at which it qualifies for the issuance of a Certificate of Substantial Completion, and if such portion has not been prosecuted to such point by said date, the Contractor shall pay to the Awarding Authority the sum designated in the Contract for each calendar day that the Contractor is in default in completing such portion of the Work to such point. Such moneys shall also be paid as liquidated damages not as a penalty, to cover losses and expenses to the Owner resulting solely from the fact that the Work is not completed on time.

C. The Awarding Authority may recover such liquidated damages by deducting the amount thereof from any moneys due or that might become due the Contractor, and if such moneys shall be insufficient to cover the liquidated damages, then the Contractor or the Surety shall pay to the Awarding Authority the amount due.

D. Except as otherwise expressly provided, none of the following shall constitute a waiver of the Contractor's or its surety's obligations to pay liquidated damages or any portion thereof or of any of the Owner's rights hereunder at law or in equity:

(1) Acceptance of any portion of the Work or payment to the Contractor or its surety therefor;

(2) Completion of a portion of the Work or the use and occupancy thereof by the Awarding Authority or others; or

(3) The Awarding Authority's requiring or allowing the Contractor or its surety to complete the Work.

E. Liquidated damages or a portion thereof may be waived by the Awarding Authority if the Contractor submits evidence satisfactory to the Awarding Authority that the delay was caused solely by conditions beyond the control of the Contractor and that the Awarding Authority has not suffered any damages as a result of said delay.

F. Failure by the Awarding Authority to specify a sum as liquidated damages in the Contract, or the insertion of "N/A" or "none" in the space provided therein for liquidated damages, shall not be deemed a waiver of the Awarding Authority's right to recover actual damages arising from the Contractor's failure to complete the Work on time.

3. <u>Delays; Statutory Provisions (M.G.L. c. 30, § 39O).</u>

A. Notwithstanding any provision of this Contract to the contrary, except as otherwise provided by Law as set forth in paragraph B below, the Contractor shall not be entitled to increase the Contract Price or to receive damages on account of any hindrances or delays, avoidable or unavoidable, including damages for compression or acceleration of Work, or loss of productivity; but if any delay is caused, in the opinion of Awarding Authority, by the Awarding Authority, the Contractor shall be entitled to an extension of time. The length of the extension shall be sufficient in the opinion of the Awarding Authority or the Contractor to complete the Work. Although no delay shall increase the Contract Price, the Awarding Authority may require that any change in the date by which the Contractor must complete all or any part of the Work be processed on a standard Change Order form.

B. If 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 with respect to such increase as the Contractor shall have against the Awarding Authority by virtue of (a) and (b) of M.G.L. c. 30, § 39O set forth below, but nothing in provisions (a) and (b) shall alter any other rights which the Contractor or the subcontractor may have against each other. As used in the statutory language of (a) and (b) below, "contract" means this Contract, "general contractor" means the Contractor and "awarding authority" means the Awarding Authority:

"*(a) The awarding authority may order the general 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 price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision 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 general 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 general contractor notified the awarding authority in writing of the act or failure to act involved in the claim."

4. <u>Use and Occupancy Prior to Final Acceptance.</u>

A. The Contractor agrees to the use and occupancy of the Project or any portion thereof before Final Acceptance of the Work by the Awarding Authority.

B. The Awarding Authority and the User Agency will cooperate with the Contractor with respect to the completion of the Work by taking such reasonable steps as may be possible to avoid interference with the Contractor's Work provided that they do not interfere with the proper functioning of the facility.

C. The Contractor shall not be responsible for wear and tear or damage resulting solely from temporary occupancy.

D. Use and occupancy of any part of the Work prior to Final Acceptance by the Awarding Authority shall not relieve the Contractor from maintaining the required payment and performance bonds and insurance (to the extent that insurance is required to be maintained after Substantial Completion) required by this Contract.

5. <u>Certificate of Substantial Completion.</u>

A. When the Work, or portion thereof which the Awarding Authority agrees to accept separately has reached the state of Substantial Completion as shown on Approved payment request, the Contractor shall develop, with the participation of the Designer and the Awarding Authority, the Punch List identifying those items of unfinished or unacceptable Work that remain to be performed or corrected under the Contract.

B. Before the Work shall be deemed completed to the point where it is ready for the issuance of a Certificate of Substantial Completion, the Contractor shall:

(1) Provide Contractor's proposed Punch List containing a statement of the reason for each item listed thereon;

(2) Advise the Awarding Authority of proposed changes in insurance in accordance with the provisions of this Contract, and provide to the Awarding Authority evidence of Contractor's completed operations insurance coverage to the extent required by the Contract Documents;

(3) Execute and submit a notarized warranty on a form provided by the Awarding Authority or otherwise acceptable to the Awarding Authority meeting the requirements of Article IX of these General Conditions, to commence upon the date of the issuance of the Certificate of Substantial Completion for the Work or the designated portion thereof, unless otherwise provided in the Certificate of Substantial Completion;

(4) Submit signed special warranties and warranties of longer than one year as required by the Contract Documents;

(5) Submit signed maintenance agreements for all portions of the Work specified to receive maintenance after the issuance of the Certificate of Substantial Completion;

(6) Submit all preliminary record Drawings and documents and framed data in the forms required by the Contract Documents;

(7) Complete all items required to be completed by the Department of Public Safety and obtain a Certificate of Occupancy from the Department of Public Safety (or, if the Awarding Authority is a municipality, the building department having jurisdiction) and similar releases which permit the User Agency and the Awarding Authority full and unrestricted use of the areas claimed to be ready for occupancy;

(8) Deliver specified maintenance stocks of materials, required spare parts, and all special tools furnished by manufacturers to persons designated by the Awarding Authority and obtain written receipts for same;

(9) Make final changes of lock cylinders or cores and advise the Awarding Authority of the change of project security responsibility;

(10) Complete start-up of systems and instruct User Agency personnel on proper operation and routine maintenance of all systems and equipment; obtain and submit to User Agency personnel that start-up and instruction have been completed;

(11) Remove all remaining temporary facilities that are no longer needed, surplus materials, and debris (provided, however, that the Contractor shall not remove construction offices and trailers without the prior Approval of the Awarding Authority);

(12) Submit final utility meter readings and similar information and advise the User Agency and the Awarding Authority of the change of responsibility for utility charges and payments upon the issuance of the Certificate of Substantial Completion;

(13) Complete final clean-up of all Work, restoration of damaged finishes, and replacement of all damaged and broken glass not listed on the Contractor's Punch List.

(14) Complete such other items as may be called for in the Contract Documents, if any, including without limitation the Specifications.

C. After completing the items specified in subsections A and B above, the Contractor shall make a written request for the Designer's inspection for a Certificate of Substantial Completion in accordance with the Contract Documents. The Designer shall review the submittals and the Work and shall either 1) sign a Certificate of Substantial Completion or 2) notify the Contractor of incomplete and/or incorrect Work that must be completed and corrected prior to the issuance of the Certificate of Substantial Completion. The Designer shall notify the Contractor of any additions to the Punch List. In connection with the execution of the Certificate of Substantial Completion the Designer shall assign dollar values to each item on the Punch List. Failure to include any incomplete or defective item on the Punch List shall not relieve the Contractor of the obligation to complete all Work in accordance with the Contract Documents.

6. <u>Final Acceptance of the Work.</u>

A. Prerequisites for Final Acceptance. After the issuance of a Certificate of Substantial Completion for the entire Work, and after the Contractor has completed all of the Work required by this Contract, including Change Orders and Punch List items, the Contractor shall submit the following completed items to the Awarding Authority together with such additional items as may be specified in the Contract Documents:

(1) A completed final application for payment showing a final accounting of all changes in the Work, on the form provided by the Awarding Authority.

(2) Certification and satisfactory evidence that all taxes, fees, and similar obligations have been paid.

(3) Consent of the Contractor’s surety to final payment executed by applicable bonding companies.

(4) Certified copy of the Punch List stating that the Contractor has completed or corrected every item listed.

(5) Evidence of Contractor's continuing completed operations insurance coverage to the extent required by the Contract Documents.

(6) All final record Drawings and documents in the forms specified by the Contract Documents.

(7) A notarized certification that all purchases made under the tax exemption certificate were legitimate and entitled to exemption.

(8) Written certifications from the Department of Public Safety (or if the Awarding Authority is a municipality, the building department having jurisdiction) and the Designer to the effect that: a) the Work has been inspected for compliance with the Contract Documents and has satisfied the Department of Public Safety; b) all equipment and systems included in the Work have been tested in the presence of the Designer and are operational and satisfactory; c) the Work is completed and ready for final inspection.

(9) Such other items as may be required by the Contract Documents.

B. Reinspection; Final Acceptance. After notification from the Contractor that all remaining Contract exceptions, omissions and incompletions have been completed (with the exception of Contractor's continuing warranty, insurance, indemnification, and such other obligations as are intended by the terms of the Contract Documents to extend beyond the date of Final Acceptance), the Awarding Authority and the Designer shall inspect the Work to verify the completion of the same. If the Work is satisfactory, the Awarding Authority shall prepare a Certificate of Final Acceptance or shall notify Contractor in writing of items which remain to be completed prior to Final Acceptance.

7. <u>One-Year Warranty Repair List and Inspection.</u>

Approximately 30 days prior to the expiration of the comprehensive one-year warranty period, the Contractor shall schedule an appointment with the Awarding Authority for a re-inspection of the Work with the Awarding Authority, and shall thereafter inspect the work at the time scheduled. Based on this inspection and on prior inspections, the Awarding Authority shall issue a "Warranty Repair List" of items to be corrected by the Contractor. The Contractor shall make the repairs and/or replacements listed within 30 days of the issuance of the “Warranty Repair List” unless otherwise agreed by the Awarding Authority in writing.

<u>ARTICLE VII</u>
CHANGES IN THE WORK

1. <u>Change Orders Generally.</u>

A. No changes in the Work, the Contract Price, the Substantial Completion date, the Final Acceptance date, or any other provision of an Approval by the Awarding Authority of the Contract Documents shall be made in absence of a Change Order as defined in Article I of these General Conditions, directing the Contractor to perform such changes. Any request for a change in the provisions of this Contract submitted by the Contractor must be made in writing and in accordance with the provisions of this Contract, including the procedures of the Awarding Authority.

B. A request for a change in the provisions of this Contract may be submitted to the Awarding Authority by the Contractor, Designer, Resident Engineer or User Agency. The request must be made in writing and in accordance with the provisions of this Contract, Laws, and the procedures of the Awarding Authority. When the Contractor believes that

an event or circumstance gives rise to an adjustment in the Contract Price and/or the Contract time it shall submit a Change Order Request in accordance with the forms and procedures required by the Awarding Authority.

C. A written directive may be issued by the Awarding Authority instructing the Contractor to make changes in the Work within the general scope of the Contract, including but not limited to, changes in: (1) the Drawings and Specifications; (2) the method or manner of performance of the Work; (3) the Owner-furnished facilities, equipment, materials, services or Site; (4) the schedule for performance of the Work.

D. Whenever a Change Order or written directive will cause a change in the Contractor's cost, the Contractor or the Awarding Authority may request an adjustment in the Contract Price. Such request shall be in writing and shall be submitted by the party making such claim to the other party before commencement of the pertinent work.

E. The Awarding Authority and the Contractor shall negotiate in good faith an agreement on an equitable adjustment in the Contract Price, and/or time if appropriate, before commencement of the pertinent Work. In the absence of an agreement for an equitable adjustment, the Awarding Authority shall unilaterally determine the costs attributable to the change and provide the Contractor with a written notice to that effect. The Contractor may appeal the decision of the Awarding Authority within thirty days of receipt of said notice, to the chief executive official of the Awarding Authority (in the case of DCAMM, the DCAMM commissioner) or the chief executive's designee, and the Contractor shall have the right to such further appeal as is provided in M.G.L. c.30, § 39Q set forth in Article VII4.D. However, if the Contractor shall exercise its rights to appeal the decision of the Awarding Authority as aforesaid, the Contractor shall be required to engage in the mandatory mediation procedures set forth in Article VII.5.

F. During the negotiation of an equitable adjustment in the Contract Price, the Contractor shall provide the Awarding Authority with all cost, pricing data and any other information or documentation used by the Contractor in computing the amount of the equitable adjustment, and the Contractor shall certify that the pricing data used was accurate, complete, and current. If the Awarding Authority subsequently determines that the data submitted by the Contractor was inaccurate, incomplete, or not current, the Awarding Authority may exclude such data from consideration under the equitable adjustment request.

G. Whenever the Contractor is entitled or believes it is entitled to a Change Order adjusting the Contract Price, the Contractor shall maintain separate accounts (by job order or other suitable accounting procedure) of all costs incurred and attributable to such work and schedule. The Contractor shall maintain a computerized accounting system, acceptable to the Awarding Authority, in which current information as to the status of all such Work and schedule is maintained. The Contractor shall maintain such contemporaneous records as are necessary to provide a clear distinction between the costs of all Change Order Work and proposed Change Order Work, and the costs of other Work and schedule.

H. Notwithstanding any provisions in the Contract Documents to the contrary, no additional general conditions cost shall be due for any Change Order or portion of a Change Order resulting from or attributable to:

(1) Increases in the cost of allowance items;

(2) Substitutions of equipment or materials which are functionally similar to equipment or materials specified in the Contract Documents; or

(3) Sales and use taxes.

I. The Contractor shall reasonably investigate the validity of Subcontractor and supplier change order requests before agreeing to pass them through to the Awarding Authority. For all Change Order Requests submitted, the Contractor shall certify that: the Change Order Request is made in good faith; the validity of the Contractor's and any Subcontractor and supplier Change Order Requests have been verified; the supporting data is accurate and complete to the best of the Contractor's knowledge and belief; and the Contractor believes the Awarding Authority to be liable for the add amount, or entitled to the deduct amount of the Change Order Request, whichever is applicable.

2. <u>Methods of Computing Equitable Adjustments.</u>

A. Equitable adjustments in the Contract Price shall be determined according to one of the following methods, or a combination thereof, as determined by the Awarding Authority:

(1) fixed price basis, provided that the fixed price shall be inclusive of items (a) through (g) below and shall be computed in accordance with those provisions and as detailed in the Awarding Authority's instructions and procedures regarding Change Order Request submissions, Contract Modifications and equitable adjustments (For DCAMM Projects, DCAMM Form 13 included in Appendix C to these General Conditions);

(2) estimated lump sum basis to be adjusted in accordance with Contract unit prices or other agreed upon unit prices provided that the unit prices shall be inclusive of all costs related to such equitable adjustment;

(3) time and materials basis to be subsequently adjusted based upon of actual costs (but subject to a predetermined "not to exceed limit") calculated as follows:

(a) the direct cost (or credit) for labor at the minimum wage rates established for this Contract pursuant to M.G.L. c. 149, §§ 26-27H;

(b) plus (or minus) the cost of workmen's compensation insurance, liability insurance, federal social security and Massachusetts unemployment compensation, which are to be calculated using an allowance equal to 40% applied to said rate. The rate of 40 percent is inclusive of all insurances, taxes, general conditions, overhead, superintendence, fee, and profit. No other expenses are allowed; for example, sick time, vacation time, etc. are included in the all-inclusive rate. Documentation must be provided if a higher percentage is requested and will only be accepted for workmen's compensation over 12.5%.

(c) plus (or minus) the actual direct additional premium costs and expenses incurred as a result of collective bargaining agreements or other agreements between organized labor. No allowance for markups is allowed on these costs.

(d) plus the direct cost of materials and use of equipment; an allowance equal to 15% of the amount of materials and equipment for general conditions, overhead, superintendence, fee, and profit can be applied.

(e) plus certain miscellaneous services Approved in advance by the Awarding Authority (e.g. police details, utilities, etc.) and provided, which may be subject to a 5% markup.

(f) plus (or minus) the actual direct premium cost of payment and performance bonds required of the Contractor and certain Subcontractors for this Contract.

(g) the Contractor shall receive an allowance equal to 5% of the sum of items (a) through (e) above for overhead, superintendence, fee, and profit when the work is performed by Subcontractors. Subcontractors can also apply an allowance equal to 5% of the sum of items (a) through (e) above for overhead, superintendence, fee, and profit when the work is performed by sub-Subcontractors.

(4) The Contractor and its Subcontractors are required to anticipate annual updated minimum wage schedules in accordance with M.G.L. c. 149, § 27 and shall not be entitled to claim additional compensation for base bid contract Work due to updated minimum wage schedules.

B. If the net change is an increase to the Contract Price, it shall include the value of the Contractor's overhead, superintendence, fee and profit. On any change that involves a net credit, the amount of the credit shall include the hard cost of the work being credited and the value of the overhead, superintendence, fee and profit applicable thereto (calculated as an agreed upon percentage multiplied by such hard cost of the work). Charges for small tools known as "tools of the trade" are not to be computed in the amount of any change in the Contract Price.

C. Substitutions in Subcontractors made in accordance with the provisions of M.G.L. c. 149, § 44F shall not be considered Change Orders and shall not entitle the Prime Contractor to any adjustments for overhead, profit, and superintendence, although the Awarding Authority may require that such Contract adjustments be processed on standard Change Order and equitable adjustment forms.

D. For DCAMM Projects, refer to Appendix C (Commonly Used Forms) to these General Conditions for instructions regarding Change Orders, Contract Modifications, and equitable adjustments (DCAMM Form 13), form for request for Approval of wages and rates for Change Order pricing (DCAMM Form 14) and format for submission of Change Order (DCAMM Form 15). Section 2 (Directions for Computing Costs for Changes in the Work) of DCAMM Form 13 contains specific information for computing the cost of changes. DCAMM Form 14 and DCAMM Form 15 are available electronically and will be provided to the Contractor prior to the start of construction. The Contractor, all Subcontractors, and sub-Subcontractors shall utilize DCAMM Form 15 when submitting Change Order Requests.

3. <u>Work Performed under Protest.</u>

The Contractor agrees to perform all Work as directed by the Awarding Authority, and if the Awarding Authority determines that certain Work that the Contractor believes to be or to warrant a Change Order under this Article does not represent a change in the Work, the Contractor shall perform said Work. The Contractor shall be deemed to have concurred with the Awarding Authority 's determination as aforesaid unless the Contractor shall perform Work under protest in compliance with the following sub-paragraphs (1) and (2) below. Any disputed order, decision or action by the Awarding Authority or its authorized representative shall be fully performed or complied with pending resolution of the dispute.

(1) If the Contractor claims compensation for a change in the Work that is not deemed by the Awarding Authority to be a change or to warrant additional compensation as claimed by the Contractor, the Contractor shall on or before the first working day following the commencement of any such Work or the sustaining of any such damage submit to the Awarding Authority a written statement of the nature of such Work or

claim. The Contractor shall not be entitled to additional compensation for any Work performed or damage sustained for which written notice is not given within the time limit specified in the preceding sentence, even though similar in character to work or damage with respect to which notice is timely given.

(2) On or before the second working day after the commencement of such Work or the sustaining of such damage, for each day upon which work occurs or damage is sustained, the Contractor shall file to the extent possible with the Resident Engineer, the Designer, and the Awarding Authority, itemized statements of the details and costs of such Work performed or damage sustained. Unless otherwise indicated by the Awarding Authority in writing, the Contractor shall use the Awarding Authority's "Daily Time and Materials Report" form found in Appendix C to these General Conditions to record all labor and material used. If the Contractor shall fail to make such statements, then the Contractor shall not be entitled to additional compensation for any such work or damages.

4. <u>False Claims, Statutory Provisions Regarding Changes.</u>

A. Criminal Penalties. The Contractor's attention is directed to M.G.L. c. 30, § 39I which provides criminal penalties for unauthorized deviations from the Drawings and Specifications, and to M.G.L. c. 30, § 39J and M.G.L. c. 7C, §§ 17-21. The Contractor's attention is also directed to M.G.L. c. 266, § 67B which provides criminal penalties for false claims by Contractor under this Contract:

"Whoever makes or presents to any employee, department, agency or public instrumentality of the commonwealth, or of any political subdivision thereof, any claim upon or against any department, agency, or public instrumentality of the commonwealth, or any political subdivision thereof, knowing such claim to be false, fictitious, or fraudulent, shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than five years, or in the house of correction for not more than two and one-half years, or both."

B. Differing Site Conditions (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 contracting 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 contracting 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 contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly."

C. Timely Decision By the Awarding Authority (M.G.L. c. 30, § 39P).

"Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which 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, shall require that the decision 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."

D. Change Order / Contract Interpretation Appeal Procedure (M.G.L. c. 30, § 39Q).

The following provisions apply to every contract awarded by any state agency as defined by M.G.L. c. 7C, § 1 for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section 39A:

"(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.

"(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefore, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his/her designee shall be final and conclusive unless an appeal is taken as provided below.

"(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and

twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, s/he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one hundred and twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.

"(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subparagraph shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subparagraph. The hearing officer's decision shall be final and conclusive, and shall not be set aside except in cases of fraud."

5. Mandatory Mediation.

In the case of every dispute where the dollar amount in dispute (or the estimated dollar value of the extension of time in dispute) is $50,000 or more and the Contractor appeals the decision of the chief executive official of the Awarding Authority or his/her designee as required by M.G.L. c.30, § 39Q, quoted in Article VII.4.D.(b) above, the Awarding Authority and the Contractor shall engage in good faith in a non-binding mediation process, which process shall be concluded within sixty days from the date that the Contractor files an appeal from said decision as provided in M.G.L. c.30, § 39Q. In the case of such disputes where the dollar amount in dispute (or the estimated dollar value of the extension of time in dispute) is $500,000 or more, if the mediation process fails, the Awarding Authority may, in its sole discretion, elect to submit the dispute to an impartial third party, not having an interest in the Owner, the Designer, the Program Manager, the Contractor, or the Project, which shall within sixty (60) days render a non-binding advisory opinion. Unless the parties have previously agreed in writing to a process for submitting disputes to mediation, the Awarding Authority shall determine in its reasonable discretion the procedures to be followed and shall give the Contractor notice of the same in writing within seven (7) days of the date that the Awarding Authority receives notice of the Contractor's appeal from the decision of the chief executive officer of the Awarding Authority or his designee. The cost of the services of any mediator selected by one party to this Contract shall be borne by the party making the selection. The cost of the services of any mediator selected jointly by the parties to this Contract or jointly by mediators selected by the parties to this Contract shall be borne equally by the Contractor and the Awarding Authority.

ARTICLE VIII
PAYMENT PROVISIONS

1. Schedule of Values.

Before the first application for payment the Contractor shall submit to the Designer and the Awarding Authority for its Approval, a schedule of values in a form acceptable to the Awarding Authority and allocated to various portions of the Work in sufficient detail to reflect the various major components of each trade (with filed Subcontractors as well as MBE/WBE

noted), including quantities when requested, aggregating the total Contract Price and divided so as to facilitate payments for work under each section of the Specifications. The schedule shall be prepared in such form and supported by such data to substantiate its accuracy as the Awarding Authority may require. Each item in the schedule shall include its proper share of overhead and profit. When Approved by the Awarding Authority, it shall constitute the Schedule of Values and shall be used only as a basis for the Contractor's requests for payments and credits, the first of which payments shall not be made until such Schedule of Values is Approved by the Awarding Authority.

2. Payment Liabilities of Contractor.

A. The Contractor shall pay to the Owner all expenses, losses and damages, as determined by the Awarding Authority or the Designer, incurred in consequence of any default, defect, omission or mistake of the Contractor or the Contractor's employees or Subcontractors or the making good thereof.

B. If the Work (or a portion thereof) is not completed to Substantial Completion and the Contractor has not satisfied the requirements for the issuance of a Certificate of Substantial Completion in accordance with Article VI.5 of these General Conditions, by the date specified in Article 2 of the Contract, the Contractor shall pay to the Owner liquidated damages as provided in Article VI.2 of these General Conditions.

3. Retention of Moneys by Awarding Authority.

A. The Awarding Authority may keep any moneys which would otherwise be payable at any time hereunder and apply the same, or so much as may be necessary therefor, to (1) the Owner 's expenditures for the Contractor's account, (2) to secure the Awarding Authority's remedies against the Contractor for the Contractor's breach of its obligations under this Contract or the breach of any person performing any part of the Work and (3) the payment of any expenses, losses or damages incurred by the Awarding Authority or any agency of the Commonwealth as a result of the failure of the Contractor to perform its obligations hereunder. The Awarding Authority may retain, until all claims are settled, such moneys as the Awarding Authority estimates to be the fair value of the Awarding Authority's claims against the Contractor, and of all claims for labor performed or furnished and for materials used or employed in or in connection with the Work and for the rental of vehicles, appliances and equipment employed and for the employment of substitute contractors and labor in connection with the Work filed in accordance with M.G.L. c. 30, § 39A and § 39F. The Awarding Authority may make such settlements and apply thereto any moneys retained under this Contract.

B. The Contractor shall each week examine all claims so filed, and if the same are in any respect incorrect or do not correctly show the amount due from the Contractor to the claimant for such labor and materials, the Contractor shall forthwith file with the Awarding Authority a separate written statement of all inaccuracies in each claim and of the correct amount due from the Contractor to each claimant therefor, and shall immediately file a statement of all payments thereafter made to such claimants. Each such statement shall be sworn to and contain a detailed breakdown required by M.G.L. c. 30, § 39F (d) and (e). Unless such statements are so filed by the Contractor the amount shown by the claims filed shall, at the option of the Awarding Authority, be conclusively deemed to be the accurate amount due from the Contractor therefor in all accounting with the Awarding Authority. If the moneys retained under this Contract are insufficient to pay

the sums found by the Awarding Authority to be due under the claims for labor and materials filed as aforesaid, the Awarding Authority may, at its discretion, pay the same, and the Contractor shall repay to the Awarding Authority all sums paid out. The Awarding Authority may also at its discretion use any moneys retained, due or to become due under this Contract for the purpose of paying for both labor and materials used or employed in the Work for which claims have not been filed with the Awarding Authority.

C. No moneys retained under the provisions of this Article shall be held to be statutory security for the payment of claims filed in accordance with the provisions of M.G.L. c. 149, § 29, as amended, for which security is provided by bond.

4. Applications for Payment.

A. The Contractor shall, once in each month on the day of the month corresponding to the day of the month specified in the Notice to Proceed, unless otherwise directed by the Awarding Authority in writing, on forms provided and in the manner prescribed by the Awarding Authority, submit to the Awarding Authority a statement showing the total amount of Work done to the time of such estimate and the value thereof as approved by the Resident Engineer and the Designer. It shall be the sole responsibility of the Contractor to deliver or cause to be delivered to the "designee" as provided by M.G.L. c. 30, § 39K indicated by the Awarding Authority in writing, said periodic estimate in proper form, approved as provided above and arithmetically correct. For DCAMM projects, the “designee” as provided by M.G.L. c. 30, § 39K shall be the DCAMM Office of Finance Payment Unit, and requests for payment shall be submitted thereto in accordance with the “DCAMM Instructions and Procedures for Payment for Construction Contracts” included in Appendix C to these General Conditions. For other projects, unless otherwise indicated by the Awarding Authority in writing, said “designee” shall be the Resident Engineer, or, if there is no Resident Engineer, the Designer; if there is neither a Resident Engineer nor a Designer the designee shall be a person designated by the Awarding Authority at the project field office or alternatively the home office of the Awarding Authority. All periodic estimates shall contain such certifications and other evidence supporting the Contractor's right to payment as the Awarding Authority may require, including without limitation, lien waivers and other evidence, on such forms as the Awarding Authority may require, establishing that title to the equipment or materials is unencumbered and has been transferred to the Owner.. The Contractor shall include in such periodic estimate only such materials as are incorporated in the Work, except as provided in Article VIII.4.C below. The Awarding Authority shall retain five (5) percent of such estimated value as security for the completion of the Work and while the Contractor continues to carry on the Work, will pay to the Contractor the Approved balance, net of the five (5) percent, all previous payments, and all sums which may be otherwise retained under the provisions of this Contract.

B. Each periodic estimate shall constitute the Contractor's representation that:

(1) the payment then requested to be disbursed has been incurred by the Contractor on account of the Work and is justly due to Subcontractors or, to the Contractor in the case of other Work performed by the Contractor on account thereof (if the Contractor’s self-performance has been previously Approved in accordance with the Contract);

(2) the materials, supplies and equipment for which application for payment is being submitted have been installed or incorporated into the Work or have been stored at the

Site or at such off Site storage locations as the Awarding Authority shall have Approved;

(3) the materials, supplies and equipment are insured in accordance with the provisions of this Contract;

(4) the materials, supplies and equipment are owned by the Owner and are not subject to any liens or encumbrances;

(5) the Work which is the subject of such periodic estimate has been performed in accordance with the Contract Documents; and

(6) that all due and payable bills with respect to the Work have been paid to date or shall be paid from the proceeds of such periodic estimate.

The Contractor's attention is directed to the criminal penalties for false claims referenced in Article VII above.

C. The Contractor may include in a periodic estimate the value of materials or equipment delivered at the Site (or at some location agreed to in writing by the Awarding Authority) only upon delivery to the Awarding Authority of:

(1) an acceptable transfer of title on the form provided by the Awarding Authority;

(2) written certification by the Contractor (or applicable Subcontractor) on the form provided by the Awarding Authority that the Contractor (or the Subcontractor which executed the transfer of title) is the lawful owner and that the materials or equipment are free from all encumbrances, accompanied by receipted invoices or other acceptable proof of prior payment for such materials;

(3) a stored materials insurance binder that covers the materials for which payment is requested, that names the Owner as an insured party should the stored materials be subjected to any casualty, loss, or theft prior to their inclusion in the Work. The material(s) or equipment must, in the judgment of the Designer, (a) meet the requirements of the Contract, including prior Shop Drawing, Product Data, and Sample Approval, (b) be ready for use, and (c) be properly stored by the Contractor and be adequately protected until incorporated into the Work. See also Article V.5.D of these General Conditions concerning the cost of inspections.

D. The Awarding Authority may make changes in any periodic estimate submitted by the Contractor in accordance with M.G.L. c.30, §39K (see below) and the payment due shall be computed in accordance with the changes so made. The provisions of said section 39K shall govern payments on which the Awarding Authority has made changes.

E. No certificate for payment and no progress payment shall constitute acceptance of Work that is not in accordance with the Contract Documents.

5. Periodic Payments (M.G. L. c. 30, § 39K).

The Awarding Authority shall make payment to the Contractor in accordance with M.G.L. c. 30, § 39K, which provides as follows (for the purposes of the below language, the Awarding Authority shall be considered the “awarding authority”, the Designer shall be considered the “architect” or “engineer”, the Contractor shall be considered the “contractor” and Subcontractors shall be considered “subcontractors”):

"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 at 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, 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, 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. 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 period 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.

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 change 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. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies.

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 column listing the amount paid to each filed subcontractor as of the date of 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 of receipt marked on the estimate.

A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section.

Notwithstanding the provisions of this section, 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 general 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 general 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 general 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 general 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 general 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."

6. Payment of Subcontractors (M.G.L. c. 30, § 39F).

The Contractor shall make payments to Subcontractors in accordance with M.G.L c.30, § 39F which is quoted in this section below. For the purposes of this Contract, the word "forthwith" appearing in paragraph (1)(a) of the quoted provision shall be deemed to mean "within five (5) business days."

"1(a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general 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 general 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 general contractor. The general 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 general contractor.

(c) Each payment made by the awarding authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the awarding authority shall take reasonable steps to compel the general 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 general contractor or which is to be included in a payment to the general contractor for payment to the subcontractor as provided in subparagraphs (1) and (2) the awarding authority shall act upon the demand as provided in this section.

(d) If, within seventy days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the general 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 general contractor at the same time. The reply 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 general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement 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 contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of the amount due for each claim made by the general 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 general 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 general 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 subparagraph (d). The awarding authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deduction from direct payments made as provided in parts (i) and (ii) of this subparagraph.

(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (5) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the general contractor and the subcontractor and shall notify the general 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 general 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 subparagraph (6) shall be made out of amounts payable to the general 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 general 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 general contractor to the extent of such payment.

(h) The awarding authority shall deduct from payments to a general contractor amounts which, together with the deposits in interest bearing accounts pursuant to subparagraph (6) 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 general contractor.

(i) If the subcontractor does not receive payment as provided in subparagraph (1) or if the general 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 subparagraph (1), the subcontractor may demand direct payment by following the procedure in subparagraph (4) and the general contractor may file a sworn reply as provided in that same subparagraph. 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 general contractor. Thereafter the awarding authority shall proceed as provided in subparagraph (e), (f), (g) and (h)."

(2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of section twenty-nine of chapter one hundred forty-nine 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 subparagraph (6) 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.

(3) "subcontractor" as used in this section (I) for contracts awarded as provided in sections forty-four A to forty-four L, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and received a subcontract as a result of that filed sub-bid 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 general contractor, (ii) for contracts awarded as provided in paragraph (1) of section thirty-nine M of chapter thirty shall mean a person 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 general contractor, and (iii) for contracts with the commonwealth not awarded as provided in sections forty-four A to forty-four L, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the general contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.

(4) A general contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposit as provided in subparagraph (6) 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 subparagraph (6) by a petition in equity in the superior court against the awarding authority and the general 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 paragraph. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one 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 fifty-nine and fifty-nine B 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 general contractor are available for direct payment shall have a right to file a petition in 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 subparagraph (5) and in subparagraph (6).

(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 general contractor, reduce by the amount of any deposit of a disputed amount by the awarding authority as provided in part (iii) of subparagraph (5) and in subparagraph (6) any amount held under a trustee writ or pursuant to a restraining order or injunction."

7. Contracts for Public Works Governed by M.G.L. c. 30, § 39G.

The following statutory provision applies only to contracts for public works governed by M.G.L. c. 30, § 39G:

"Upon substantial completion of the work required by a Contract with the Owner, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges, and other highway structures, sewers and water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such a list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as

aforesaid, to the contractor's certification within the twenty-one day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

Within sixty-five days after the effective date of a declaration of a substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one percent retainage of that undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payments filed by subcontractors and not yet paid to subcontractors or deposit d in joint accounts pursuant to section thirty-nine F, but no Contract subject to said section thirty-nine F shall contain any other provision authorizing the awarding authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate than charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date or payment therefore, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid

hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the Site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and 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. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on the estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.

Substantial completion, for the purposes of this section, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one percent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract"

8. Final Payment; Release of Claims by Contractor.

Upon Final Acceptance of the Work the Contractor shall be entitled to payment of the balance of the Contract Price. Final payment shall be as provided in this Article above and in accordance with any process set forth in the Contract Documents. The Contractor agrees to execute a Certificate of Final Inspection, Release and Acceptance in the form provided in Appendix C to these General Conditions to the Contract (with Contractor's own exceptions listed thereon) as a condition precedent to final payment. The acceptance by the Contractor of the final payment made as aforesaid, or the execution of the "Certificate of Final Inspection, Release and Acceptance" (included in Appendix C to these General Conditions) by the Contractor, shall constitute a release of the Owner, the Awarding Authority, the Designer, and every member, officer, employee and agent of any of them, from all claims of

and liability to the Contractor for anything done or furnished for or relating to the Work, or for any act or neglect of the Owner, the Designer, or of any person relating to or affecting the Work, except the claim against the Owner or the Designer for the remainder, if any, of the amounts set forth by the Contractor in the "Certificate of Final Inspection, Release and Acceptance". Final Acceptance shall not relieve Contractor of the requirements of Articles IX, XIV, and XV of these General Conditions, or of other provisions of this Contract, to the extent that the same are intended to survive Final Acceptance.

ARTICLE IX
GUARANTEES AND WARRANTIES

1. General Warranty.

If at any time during the period of one (1) year from the date of the issuance of the Certificate of Substantial Completion by the Awarding Authority or the date of Final Acceptance, whichever occurs first, any part of such Work shall in the reasonable opinion of the Awarding Authority be defective or require replacing or repairing, or damage to other property of the Owner is caused by any defect in the Work, the Awarding Authority shall notify the Contractor in writing to make the required repairs or replacements and repair such damage. If the Contractor shall neglect to commence such repairs or replacements to the satisfaction to the Awarding Authority within ten (10) days from the date of the giving of such notice, then the Awarding Authority may employ other persons to make the same. The Contractor agrees, upon demand, to pay to the Awarding Authority all amounts which it expends for such repairs, replacements, and/or damages. During this one-year guarantee period, any corrective work shall be performed under all the applicable terms of this Contract,. This one-year guarantee shall not limit any express guaranty or warranty provided elsewhere in the Contract.

2. Special Guarantees and Warrantees.

A. The Contractor's obligation to correct Work as set forth in Article IX above is in addition to, and not in substitution of, such guarantees or warranties as may be required in the various sections of the Specifications.

B. Guarantees and warranties required in the various sections of the Specifications must be delivered to the Designer or, if directed by the Awarding Authority, to the Awarding Authority before final payment to the Contractor may be made, or in the case of guarantees and warranties which originate with a Subcontractor's section of the Work, before final payment for the amount of that subtrade or for the phase of Work to which the guarantee or warranty relates.

C. The failure to deliver a required guarantee or warranty shall constitute a failure to fully complete the Work in accordance with the Contract Documents.

ARTICLE X
MISCELLANEOUS LEGAL REQUIREMENTS.

1. Contractor to be Informed.

The Contractor shall inform itself of all existing and future Laws in any manner affecting those engaged or employed in the Work, or the materials used or employed in the Work, or in a any way affecting the conduct of the Work, and of all orders and decrees of bodies or tribunals having any applicable jurisdiction or authority over the Work.

2. Compliance with all Laws.

The Contractor shall cause all persons employed in the performance of the Work to comply with, all existing and future Laws, including but not limited to those set forth below:

A. Corporate Disclosures. The Contractor, if a foreign corporation, shall comply with M.G.L. c. 181, § 3 and § 5, and M.G.L. c. 30, § 39L.

B. Workforce Certification: Certification of Compliance with Workforce Related Legal Requirements. The Contractor shall comply with the following legal requirements for any and all employees to be employed in the Project who are required to be listed in the certified payroll reports for the Project:1) Federal Department of Homeland Security Requirements in hiring such employees including, but not limited to, the faithful completion of the Federal Department of Homeland Security Form I-9 process by the Contractor; 2) proper classification of individuals employed on the Project; 3) all Laws concerning workers' compensation insurance coverage, unemployment insurance, social security taxes, and income taxes; and 4) all Laws concerning hospitalization and medical benefits that meet the minimum requirements of the connector board established in M.G.L. c. 176Q. The Contractor shall execute a "Workforce Certification" form provided in Exhibit B to the Contract with the execution of this Contract. The Contractor shall require each Subcontractor and sub-Subcontractor working on the Project to execute and provide to Contractor such "Workforce Certification" form in the form provided in Exhibit B to the Contract with the execution of each subcontract, and Contractor shall immediately provide a copy to the Awarding Authority. The Contractor shall require each of its Subcontractors and sub-Subcontractors to execute and provide to Contractor such "Workforce Certification" form in the form provided in Exhibit B to the Contract with the execution of each subcontract, and the Contractor shall immediately provide a copy to the Awarding Authority. Contractor acknowledges that with the weekly workforce reports it must submit on a weekly basis, in the form and format required by the Awarding Authority, including, but not limited to, by electronic reporting through the requested means. Contractor and all Subcontractors must also report on gender, race/ethnicity of its workforce through the requested means, including the Awarding Authority's online workforce reporting system. Contractor and all Subcontractors on the Project are required to certify that the Form I-9 process was faithfully completed and that all other legal requirements related to its workforce referenced above were followed for all employees listed on each certified payroll report when submitted. The Contractor and all Subcontractors must: comply with the legal requirements of this section; must not knowingly use undocumented workers in connection with the performance of this Contract; pursuant to federal requirements must verify the immigration status of all workers assigned to the Contract without engaging in unlawful discrimination; and must not knowingly or recklessly alter, falsify, or accept altered or falsified documents from any such worker. Breach of any of the terms of the workforce certification legal requirements during the period of the Contract may be regarded as a material breach,

subjecting the Contractor and Subcontractors to sanctions, including but not limited to monetary penalties, withholding of payments, contract suspension or termination.

C. Veterans and Other Preference. In the employment of mechanics and apprentices, teamsters, chauffeurs, and laborers in the performance of Work in the Commonwealth, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six (6) months at the commencement of their employment and who are veterans as defined in M.G.L. c. 4,§ 7(34), and who are qualified to perform the work to which the employment relates and, within such preference, preference shall be given to service-disabled veterans; and secondly, to citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six (6) months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States.

The Awarding Authority encourages and monitors the participation of veteran business enterprises ("VBE") and service-disabled veteran-owned business enterprises ("SDVOBE") in its construction and design projects pursuant to Chapter 108 of the Acts of 2012 and Executive Order 565. The benchmark for combined SDVOBE and VBE participation on the Project is 3% of the Contract Price. For the Commonwealth's VBE and SDVOBE program purposes, a VBE or SDVOBE is a firm so certified directly by the Massachusetts Supplier Diversity Office ("SDO") www.mass.gov/sdo or is: 1) certified by a certifying agency that's certification is accepted by the SDO; 2) the firm has submitted its existing certification credentials directly to the SDO by submitting an application for verification of certification to the SDO; 3) the SDO has reviewed and granted the application for verification; and 4) the SDO has certified the firm as a VBE or SDVOBE for purposes of the Commonwealth's program as evidenced by a letter issued by the SDO to the firm. VBEs and SDVOBEs shall be provided opportunities to participate in the Project and Contractor shall within 30 days of Contract execution submit its "Anticipated Veteran Owned Business and Service-Disabled Veteran-Owned Business Enterprise Participation" plan to the Awarding Authority's Compliance Office. Contractor shall report on the amount of VBE and SDVOBE participation on the Project on a regular basis, in the form, format and frequency requested by the Awarding Authority, including, for DCAMM projects, through the requested means including the Awarding Authority's online compliance reporting system. The Commonwealth also encourages the participation of Portuguese Business Enterprises (PBE), Lesbian, Gay, Bisexual, and Transgender Business Enterprises (LGBTBE); and Disability-Owned Business Enterprises (DOBE) on its contracts.

D. Prevailing Wages. The Contractor shall comply with M.G.L. c. 149, §§ 26-27H. The prevailing wage schedule is found in Exhibit A to the "Instructions to Bidders" included in the public solicitation of bids for this Project, listing the prevailing minimum wage rates that must be paid to all workers employed in the Work. The Awarding Authority is not responsible for any errors, omissions, or misprints in said schedule. Such prevailing wage schedule shall continue to be the minimum rate wages payable to workers employed in the Work throughout the term of this Contract, subject to the exceptions provided in M.G.L c.149, §§ 26-27H. The Contractor shall not have any claim for extra compensation from the Owner if the actual wages paid to workers employed in the Work exceeds the rates listed on the schedule or as otherwise provided by Law. The Contractor shall cause a copy of said schedule to be kept in a conspicuous place at the Site during the term of the Contract. If reserve police officers are employed by the Contractor, they shall be paid the prevailing wage of regular police officers. (See M.G.L c.149, § 34B). In accordance with M. G. L. c. 149, §27the Contractor shall obtain from the Awarding Authority annual updates to prevailing wage schedules for all public construction projects lasting longer than one year. The Contractor is required to obtain the

wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The Contractor and all Subcontractors are required to anticipate such annual updated prevailing wage schedules and neither the Contractor nor any Subcontractors shall be entitled to claim additional compensation for base contract work due to updated prevailing wage schedules.

E. Payroll Records and Statement of Compliance. The Contractor shall comply and shall cause its Subcontractors to comply with M.G.L. c. 149, § 27B, which requires that a true and accurate record be kept of all persons employed on the Project for which the prevailing wage rates have been provided. The Contractor and all Subcontractors shall keep these records and preserve them for a period of three years from the date of completion of the Contract. Such records shall be open to inspection by any authorized representative of the Owner at any reasonable time, and as often as may be necessary. The Contractor shall, and shall cause its Subcontractors to, submit weekly certified copies of their weekly payroll records to the Awarding Authority at no additional expense to the Awarding Authority. The Awarding Authority may at all reasonable times audit such reports. DCAMM requires submission of weekly payroll reports and related information through DCAMM's online compliance reporting system. In addition, the Contractor and each Subcontractor shall furnish to the Executive Department of Labor within fifteen (15) days after completion of its portion of the Work a signed statement in the form required by the Awarding Authority.

F. Vehicle operators. If the Director of the Department of Labor and Workforce Development has established a schedule of wage rates to be paid to the operators of trucks, vehicles or equipment for the Work, the Contractor shall be obligated to pay such operators at least the minimum wage rate contained on such schedule. (See M.G.L. c.149, §§ 26-27H).

G. Eight Hour Day. The Contractor shall comply with M.G.L. c. 149, §§ 30, 34 and 34A which provide that no laborer, workman, mechanic, foreman or inspector working within the Commonwealth in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the Work shall be required or permitted to work more than eight (8) hours in any one day or more than forty-eight (48) hours in any one week, or more than six (6) days in any one week, except in cases of extraordinary emergency.

H. Timely Payment of Wages. The Contractor shall comply with, and shall cause its Subcontractors to comply with M.G.L. c. 149, § 148 which requires the weekly or biweekly payment of employees within six (6) days of the end of the pay period during which wages were earned if employed for five or six days of a calendar week, and within other periods of time under certain circumstances as set forth therein.

I. Lodging, etc. The Contractor shall comply with, and shall cause its Subcontractors to comply with, M.G.L. c. 149, § 25 which provides that 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.

J. Truck Rates. The use by the Contractor of trucks or other motor vehicles hired from either common or contract motor carriers in the course of performance of this Contract is subject to such minimum rates and charges, and rules and regulations as may from time to time be promulgated by the Department of Public Utilities of the Commonwealth of Massachusetts or other agency of the State or Federal government which may be

authorized by Law to set rates or otherwise regulate the use of such vehicles. The Contractor expressly assumes the risk of any additional expense that may arise by reason of any change in such minimum rates and charges, and rules and regulations, and shall be entitled to no additional compensation or reimbursement by reason thereof.

K. Anti-Boycott Covenant (Executive Order 130). The Contractor warrants, represents and agrees that during the time this Contract is in effect, neither it or any affiliated company, as hereafter defined, participates in or cooperates with an international boycott, as defined in Section 999(b) (3) and (4) of the Internal Revenue Code of 1954, as amended, or engages in conduct declared to be unlawful by M.G.L. c. 151E, § 2. If there shall be a breach in the warranty, representation or agreement contained in this paragraph, then without limiting such other rights as it may have the Awarding Authority shall be entitled to rescind this Contract. As used herein, an affiliated company shall be any business entity of which at least 51% of the ownership interests are directly or indirectly owned by the Contractor or by a person or persons or business entity or entities directly or indirectly owning at least 51% of the ownership interests of the Contractor; or which directly or indirectly owns at least 51% of the Ownership interests of the Contractor.

L. Contractor's Agreements with Suppliers--Anti-Boycott Provisions.

(1) The Contractor shall not purchase or rent any materials, equipment, machinery, vehicles, or supplies for or in connection with the Work from any person or entity who does not sign, under pains and penalties of perjury, a certificate that recites: "The undersigned warrants, represents and agrees that during the time its agreement with {insert contractor's name} is in effect for materials, supplies or equipment to be used in connection with the {insert the name of the Awarding Authority} Project No. {insert project number}, neither the undersigned or any affiliated company, as hereafter defined, participates in or cooperates with an international boycott, as defined in Section 999(b)(3) and (4) of the Internal Revenue Code of 1954, as amended, or engages in conduct declared to be unlawful by M.G.L. c.151E, § 2. As used herein, an affiliated company shall be any business entity of which at least 51% of the ownership interests are directly or indirectly owned by the undersigned or by a person or persons or business entity or entities directly or indirectly owning at least 51% of the ownership interests of the undersigned; or which directly or indirectly owns at least 51% of the ownership interests of the undersigned."

(2) The Awarding Authority shall not be obligated to pay the Contractor for the cost of any materials, supplies, or equipment purchased or rented from any individual or entity from whom the Contractor has not previously obtained and delivered to the Awarding Authority the certificate that the previous paragraph requires. The Contractor will immediately terminate its contract with any supplier who breaches the warranty, representation and agreement contained in the previous paragraph.

(3) The Contractor shall include in the Contractor's agreement with any person or entity from whom the Contractor intends to purchase or rent any materials, equipment, machinery, vehicles or supplies for or in connection with the Work: (a) a notice that this Contract obligates the Contractor to terminate the supply contract upon discovery of such breach of the sworn certificate delivered under subparagraph (1) above and such termination shall be without liability to the Contractor or the Awarding Authority; and (b) a provision which states: "The Governor or his designee, the secretary of administration and finance, and the state auditor or his designee shall have the right at reasonable times and upon reasonable notice to examine the books,

records and other compilations of the undersigned vendor which pertain to the performance and requirements of this agreement to provide materials of any nature to the undersigned contractor in connection with State Project No. (insert project number)."

M. Access to Contractor's Records (Executive Order 195). The Governor of the Commonwealth or his/her designee, the secretary of administration and finance, and the state auditor or his/her designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and other compilations of data of the Contractor which pertain to the performance and requirements of this Contract.

N. Northern Ireland (M.G.L. c. 7, § 22C). Pursuant to M.G.L. c. 7, § 22C for state agencies, state authorities, the House of Representatives or the state Senate, the Contractor certifies that it does not employ ten (10) or more employees in an office or other facility in Northern Ireland and if the Contractor employs ten (10) or more employees in an office or other facility located in Northern Ireland the Contractor certifies that it does not discriminate in employment, compensation, or the terms, conditions and privileges of employment on account of religious or political belief; and it promotes religious tolerance within the work place, and the eradication of any manifestations of religious and other illegal discrimination; and the Contractor is not engaged in the manufacture, distribution or sale of firearms, munitions, including rubber or plastic bullets, tear gas, armored vehicles or military aircraft for use or deployment in any activity in Northern Ireland.

O. Data Security Certifications. For all contracts involving the Contractor's access to personal information, as defined in M.G.L. c. 93H, and personal data, as defined in M.G.L. c. 66A or access to agency systems containing such information or data, the Contractor certifies under the pains and penalties of perjury that the Contractor (a) has read M.G.L. c. 93H and c. 66A and agrees to protect any and all personal information and personal data; and (b) has reviewed all of the "Enterprise Information Security Policies and Standards" published by the Executive Office for Technology Services and Security ("TSS")), or stricter standards prescribed by Owner. Notwithstanding any contractual provision to the contrary, in connection with the Contractor's performance under this Contract, for all state agencies in the Executive Department, including all offices, boards, commissions, agencies, departments, divisions, councils, bureaus, and offices, now existing and hereafter established, the Contractor shall:

(1) obtain a copy, review, and comply with the pertinent security guidelines, standards and policies;

(2) comply with the "Enterprise Information Security Policies and Standards" published by TSS, or a comparable set of policies and standards ("Information Security Policy") as prescribed by the Owner;

(3) communicate and enforce such security guidelines, standards, policies and the applicable Information Security Policy among all employees (whether such employees are direct or contracted) and Subcontractors;

(4) implement and maintain any other reasonable appropriate security procedures and practices necessary to protect personal information and data to which the Contractor is given access by the Awarding Authority from the unauthorized access, destruction, use, modification, disclosure or loss;

(5) be responsible for the full or partial breach of any of these terms by its employees (whether such employees are direct or contracted) or Subcontractors during or after

the term of this Contract, and any breach of these terms may be regarded as a material breach of this Contract;

(6) in the event of any unauthorized access, destruction, use, modification, disclosure or loss of the personal information or personal data (collectively referred to as the "unauthorized use"): (a) immediately notify the Awarding Authority if the Contractor becomes aware of the unauthorized use; (b) provide full cooperation and access to information necessary for the Awarding Authority to determine the scope of the unauthorized use; and (c) provide full cooperation and access to information necessary for the Awarding Authority and the Contractor to fulfill any notification requirements.

Breach of these terms may be regarded as a material breach of this Contract, such that the Commonwealth may exercise any and all contractual rights and remedies, including without limitation indemnification, withholding of payments, Contract suspension, or termination. In addition, the Contractor may be subject to applicable statutory or regulatory penalties, including and without limitation, those imposed pursuant to M.G.L. c. 93H and under M.G.L. c. 214, § 3B for violations under M.G.L. c. 66A.

ARTICLE XI
CONTRACTOR'S ACCOUNTING METHOD REQUIREMENTS
(M.G.L. c. 30, § 39R)

1. Definitions.

The words defined herein shall have the meaning stated below whenever they appear in this Article XI:

"***Independent Certified Public Account***" means a person duly registered in good standing and entitled to practice as a certified public accountant under the Laws of the place of his/her 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.

"***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.

"***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 or other person or persons primarily responsible for the financial and operational policies and practices of the Contractor.

Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

2. Record Keeping.

A. The Contractor shall make, and keep for at least six (6) years after final payment, books, records, and accounts that in reasonable detail accurately and fairly reflect the transactions and dispositions of the Contractor.

B. Until the expiration of six (6) years after final payment, the Inspector General, DCAMM, and the Awarding Authority shall have the right to examine any books, documents, papers or records of the Contractor and Subcontractors that directly pertain to, and involve transactions relating to the Contractor and Subcontractors.

C. The Contractor shall describe any change in the method of maintaining records or recording transactions which materially affects any statements filed with the Awarding Authority including 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.

D. The Contractor represents that it has, prior to the execution of the Contract, filed a statement of management on internal accounting controls as set forth in Article XI.3 below.

E. The Contractor represents that it has, prior to the execution of the Contract, filed an audited financial statement for the most recent completed fiscal year as set forth in Article XI.4 below and will continue to file such statement annually during the term of the Contract.

3. Statement of Management Controls.

A. The Contractor 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 to: (a) to permit preparation of financial statements in conformity with generally accepted accounting principles, and (b) 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.

B. The Contractor shall file with the Awarding Authority a statement prepared and signed by an independent certified public accountant, stating that the accountant 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 Article XI.3 above are consistent with the results of management's evaluation of the system of internal accounting controls; and

(2) whether such representations of management are reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statement.

4. Annual Financial Statement.

A. The Contractor shall annually file with DCAMM during the term of the Contract a financial statement prepared by an independent certified public accountant based on 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.

B. The office of Inspector General and DCAMM shall have the right to enforce the provisions of this Article. A Contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to M.G.L. c. 149, § 44C.

5. Bid Pricing Materials.

The Contractor shall save the written calculations, pricing information, and other data that the Contractor used to calculate the bid that induced the Awarding Authority to enter into this Contract (the "Bid Pricing Materials") for at least six (6) years after the Awarding Authority makes final payment under this Contract.

ARTICLE XII
EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM.

[EXECUTIVE ORDERS 524 & 565] (See Appendix A)

This Contract includes the provisions of the Awarding Authority's "Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program" attached as Appendix A to these General Conditions and incorporated herein by reference.

ARTICLE XIII
GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES

[M.G.L. c. 7C, § 6 & EXECUTIVE ORDERS 524 & 565]

This Contract includes the provisions of the Awarding Authority's program relating to “Goals for Participation by Minority Business Enterprises and Women Business Enterprises” attached as Appendix B to these General Conditions and incorporated herein by reference.

ARTICLE XIV
INSURANCE REQUIREMENTS

1. Insurance Generally.

A. The Contractor shall purchase and maintain insurance of the type and limits listed in this Article with respect to the operations as well as the completed operations of this Contract. This insurance shall be provided at the Contractor's expense and shall be in full force and effect for the full term of the Contract or for such longer period as this Article requires.

B. All policies shall be written on an occurrence basis and be issued by companies lawfully authorized to write that type of insurance under the laws of the Commonwealth with a financial strength rating of “A-” or better as assigned by AM Best Company, or an equivalent rating assigned by a similar rating agency acceptable to the Awarding Authority, or otherwise acceptable to the Awarding Authority.

C. Contractor shall submit each certificate of insurance, acceptable to the Awarding Authority, simultaneously with the execution of this Contract. Certificates shall show each type of insurance, insurance company, policy number, amount of insurance, deductibles and/or

self-insured retentions, and policy effective and expiration dates. Certificates shall show the Awarding Authority, the Owner and anyone else the Awarding Authority requests as an additional insured as to all policies of liability insurance. Certificates shall specifically note the following:

(1) that the general liability policy includes contractual liability.

(2) that the general liability policy includes the Owner and Awarding Authority as additional insureds for ongoing operations (CG 20 10) and for completed operations (CG 37 10) or equivalent endorsements.

(3) that the automobile liability, umbrella liability and pollution liability policies include the Owner and Awarding Authority as an additional insured;

(4) that the general liability policy includes endorsement CG 24 04 or equivalents, a waiver of subrogation in favor of the Owner and Awarding Authority.

(5) that the builders' risk or installation floater is on an all risk basis including earthquake and flood, and includes the Awarding Authority, Owner, Contractor, Subcontractors and suppliers of any tier as a named insured or loss payee as their interests may appear; and

(6) that none of the coverages shall be cancelled, terminated, or materially modified unless and until thirty (30) days prior notice is given in writing to the Awarding Authority.

Contractor shall submit updated certificates prior to the expiration of any of the policies referenced in the certificates so that the Awarding Authority shall at all times possess certificates indicating current coverage.

D. The Contractor shall file one certified complete copy of all policies and endorsements with the Awarding Authority within sixty (60) days after Contract award. If the Awarding Authority is damaged by the Contractor's failure to maintain such insurance and to comply with the terms of this Article, then the Contractor shall be responsible for all costs and damages to the Awarding Authority attributable thereto.

E. Termination, cancellation, or material modification of any insurance required by this Contract, whether by the insurer or the insured, shall not be valid unless written notice thereof is given to the Awarding Authority at least thirty(30) days prior to the effective date thereof, which shall be expressed in said notice.

F. The Contractor is responsible for the payment of any and all deductibles under all of the insurance required below. The Awarding Authority shall not in any instance be responsible for the payment of deductibles, self-insured retentions, or any portion thereof.

2. <u>Contractor's Commercial General Liability.</u>

A. The Contractor shall purchase and maintain general liability coverage on the ISO form CG 00 01 or equivalent, including products and completed operations, on an occurrence basis. The form must be amended to state that the aggregate limit applies on a per location/project basis. The policy shall provide the following minimum coverage to protect the Contractor from claims with respect to the operations performed by Contractor and any employee, Subcontractor, or supplier, or by anyone for whose acts they may be liable unless a higher coverage is specified in Exhibit A to the Contract, in which case the Contractor shall provide the additional coverage:

Bodily Injury &	$1,000,000 each occurrence
Property Damage	$2,000,000 general aggregate per project
Products & Completed Operations	$1,000,000 annual aggregate
Personal & Advertising Injury	$1,000,000 each occurrence
Medical Expenses	$10,000

B. This policy shall include coverage relating to explosion, collapse, and underground property damage.

C. This policy shall include contractual liability coverage.

D. The completed operations coverage shall be maintained for a period of three (3) years after Substantial Completion and acceptance by the Awarding Authority. The Contractor shall provide renewal certificates of insurance to the Awarding Authority as evidence that this coverage is being maintained.

E. If the Work includes work to be performed within 50 feet of a railroad, any exclusion for liability assumed under contract for work within 50 feet of a railroad shall be deleted.

F. This policy shall include the Awarding Authority, the Owner and anyone else requested by the Awarding Authority as an additional insured via endorsements CG 20 10 for ongoing operations and CG 20 37 for completed operations This policy shall be primary and non-contributory with respect to any other insurance available to additional insureds.

G. The policy shall include endorsement CG 24 04, a waiver of subrogation in favor of the Awarding Authority and Owner.

3. <u>Automobile Liability.</u>

A. The Contractor shall purchase and maintain the following minimum coverage with respect to the operations of any owned, non-owned, and hired vehicles including trailers used in the performance of the work, unless a higher coverage is specified in Exhibit A to the Contract, in which case the Contractor shall provide the additional coverage:

Bodily Injury & Property Damage	$1,000,000 combined single limit

B. The policy shall include a CA 99 48 Broadened Pollution Endorsement. If specified in Exhibit A to the Contract, the Contractor, if hauling contaminants and/or pollutants, must adhere to Sections 29 and 30 of the Motor Carrier Act of 1980, which shall include coverage Form MCS-90.

C. The policy shall name the Awarding Authority and Owner as additional insureds.

D. The policy shall contain a waiver of subrogation in favor of the Awarding Authority and Owner.

4. <u>Contractor's Pollution Liability.</u>

The Contractor shall purchase and maintain coverage for bodily injury and property damage resulting from liability arising out of pollution related exposures such as asbestos abatement, lead paint abatement, tank removal, removal of contaminated soil, etc. The insurance policy shall cover the liability of the Contractor during the process of removal, storage, transport and disposal of hazardous waste and contaminated soil and/or asbestos abatement. The policy shall include coverage for on-Site and off-Site bodily injury and loss of, damage to, or loss of use of

property, directly or indirectly arising out of the discharge, dispersal, release or escape of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, liquids or gas, waste materials or other irritants, contaminants or pollutants into or upon the land, the atmosphere or any water course or body of water, whether it be gradual or sudden and accidental. The policy shall also include defense and clean-up costs. The Awarding Authority and Owner shall be named as an additional insureds and coverage must be on an occurrence basis. The amount of coverage shall be as follows unless a higher amount is specified in Exhibit A to the Contract, in which case the Contractor shall provide the additional coverage:

Limit of liability	$1,000,000 per occurrence $3,000,000 aggregate

5. <u>Worker's Compensation.</u>

A. The Contractor shall provide the following coverage in accordance with M.G.L. c.149, § 34A and c. 152, as amended, unless a higher coverage is specified in Exhibit A to the Contract, in which case the Contractor shall provide the higher coverage:

Worker's Compensation	Statutory limits
Employer's Liability	$ 500,000 each accident $ 500,000 disease per employee $ 500,000 disease policy aggregate

B. If specified in Exhibit A to the Contract the policy must be endorsed to cover United States Longshoremen & Harborworkers Act (USLHW), Maritime Liability for $1,000,000/$1,000,000 or Federal Employer's Liability Act liability.

C. The policy shall contain a waiver of subrogation in favor of the Awarding Authority and Owner.

6. <u>Builder's Risk/ Installation Floater/Stored Materials.</u>

A. The Contractor shall purchase and maintain coverage against loss or damage on all Work included in this Contract in an amount equal to the Contract Price. Such coverage shall be written on an all risks basis or equivalent form and shall include, without limitation, insurance against perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, terrorism ("certified" and "non-certified"), collapse, earthquake, flood (if the project is not in an "A" or a "V" flood zone), 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 Designer's and Contractor's services and expenses required as a result of such insured loss. Unless otherwise specified in this Contract, the limits for earthquake and flood shall be the lesser of the Contract Price or $10,000,000. This policy and/or installation floater shall include transportation and stored materials coverage in an amount equal to the value of the stored materials as required in Article XIV.6.C. below.

B. When Work will be completed on existing buildings owned by the Owner, the Contractor shall provide an installation floater, in the full amount of the Contract Price. Such coverage shall be written on an all risks basis or equivalent form and shall include, without limitation, insurance against perils of fire (with extended coverage) and physical loss or

damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood (if the project is not in an "A" or a "V" flood zone), 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 Designer's and Contractor's services and expenses required as a result of such insured loss. Unless otherwise specified in this Contract, the limits for earthquake and flood shall be the lesser of the Contract Price or $10,000,000. This policy and/or installation floater shall include transportation and Stored Materials coverage in an amount equal to the value of the stored materials as required in Article XIV.6.C. below.

C. The Contractor shall maintain insurance on delivered and/or stored material designated to be incorporated in the Work against fire, theft or other hazards. Any loss or damage of whatever nature to such material while stored at an off -Site location shall be forthwith replaced by the Contractor at no expense to the Awarding Authority.

D. The policy or policies shall specifically state that they are for the benefit of and payable to the Awarding Authority, the Owner, the Contractor, Subcontractors, and all persons furnishing labor or labor and materials for the Work, as their interests may appear. The policy or policies shall list the Awarding Authority, the Owner, the Contractor, and Subcontractors of any tier as named insureds.

E. Coverage shall include any costs for work performed by the Designer or any consultant as the result of a loss experienced during the term of this Contract.

F. Coverage shall include permission for temporary occupancy and a waiver of subrogation in favor of the Awarding Authority and Owner

G. Coverage shall be maintained until Final Acceptance by the Awarding Authority and Owner of the Contract and final payment has been made.

H. A loss under the property insurance shall be adjusted by the Contractor as fiduciary and made payable to the Contractor as fiduciary for the insureds. The Contractor shall pay the Subcontractors their just shares of insurance proceeds received by the Contractor and shall require Subcontractors to make payments to their sub-Subcontractors in similar manner.

7. Umbrella Coverage.

The Contractor shall provide umbrella coverage in a form at least as broad as primary coverages required by subparagraphs 2, 3 and 5 of this Article in the following amount unless a higher amount is specified in Exhibit A to the Contract, in which case the Contractor shall provide the higher amount:

Contract Price:	Limit of Liability:
Under $1,000,000	$2,000,000 per occurrence
$1,000,001 -- $5,000,000	$5,000,000 per occurrence
$5,000,001-- $10,000,000	$10,000,000 per occurrence
$10,000,001 and over	$25,000,000 per occurrence

8. Additional Types of Insurance.

The Contractor shall provide such other types of insurance as may be required by Exhibit A to the Contract.

ARTICLE XV
INDEMNIFICATION

1. Generally.

To the fullest extent permitted by law, the Contractor shall indemnify, defend (with counsel appointed as a Special Assistant Attorney General and subject to the supervision of the Attorney General of the Commonwealth of Massachusetts as required by M.G.L. c. 12, § 3) and hold harmless the Owner, Awarding Authority and Designer and their officers, agents, divisions, agencies, employees, representatives, successors and assigns from and against all claims, damages, losses and expenses, including but not limited to court costs and attorneys' fees, arising out of or resulting from the performance of the Work, including but not limited to those arising or resulting from: labor performed or furnished and/or materials used or employed in the performance of the Work; violations by Contractor, any Subcontractor, or by any person directly or indirectly employed or used by any of them in the performance of the Work (including, without limitation, suppliers) or anyone for whose acts any of them may be liable (Contractor, Subcontractor and all such persons herein collectively called "Contractor's Personnel") of any Laws; violations of any provision of this Contract by any of Contractor's Personnel; injuries to any persons or damage to any property in connection with the Work; any act, omission, or neglect of Contractor's Personnel.

The Contractor shall be obligated as provided above, regardless of whether or not such claims, damages, losses and/or expenses, are caused in whole or in part by the actions or inactions of a party indemnified hereunder. In any and all claims by Contractor's Personnel against parties indemnified hereunder, the Contractor's indemnification obligation set forth above shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Article XV.

2. Designer's Actions.

The obligations of the Contractor under Section 1 above shall not extend to the liability of the Designer, its agents or employees, arising out of (i) the preparation or approval of maps, Drawings, opinions, reports, surveys Change Orders, designs, or Specifications, or (ii) the giving of or the failure to give directions or instructions by the Designer, its agents to employees provided such giving or failure to give is the primary cause of the injury or damage.

3. Survival.

The provisions of this Article XV are intended to survive Final Acceptance and/or any termination of this Contract.

ARTICLE XVI
PERFORMANCE AND PAYMENT BONDS

1. Contractor Bonds.

A. The Contractor shall provide performance and payment (labor and materials) bonds in the form provided by the Awarding Authority, executed by a surety licensed by the Commonwealth of Massachusetts Division of Insurance and whose name appears on United States Treasury Department Circular 570. Each such bond shall be in the amount of the Contract Price.

B. If at any time prior to final payment to the Contractor, the Contractor's surety:

(1) is adjudged bankrupt or has made a general assignment for the benefit of its creditors;

(2) has liquidated all assets and/or has made a general assignment for the benefit of its creditors;

(3) is placed in receivership;

(4) otherwise petitions a state or federal court for protection from its creditors; or

(5) allows its license to do business in Massachusetts to lapse or be revoked;

then the Contractor shall, within twenty-one (21) days of any such action listed above, provide the Awarding Authority with new performance and payment bonds as described in Article XVI.1.A above. Such bonds shall be provided solely at the Contractor's expense.

2. Subcontractor Bonds.

A. If the Contractor provided in its General Bid that any or all filed Subcontractors shall provide the Contractor with payment and performance bonds for the full amount of their respective Subcontracts, then the costs for said bonds shall be the responsibility of the Contractor. Irrespective of whether the Contractor requests payment and performance bonds from their respective Subcontractors, the Contractor understands that if the Subcontractor defaults or is terminated, the Contractor shall have full responsibility for all costs and expenses related to said default or termination.

B. If the Contractor provided in its General Bid that filed Subcontractors shall provide bonds, and subsequently waives the requirement, the Contractor shall give the Awarding Authority a written certification that the Contractor understands that if the filed Subcontractor defaults or is terminated, the Contractor shall have full responsibility for all costs and expenses related to said default or termination and the Awarding Authority shall be entitled to a credit adjustment to the Contract Price in an amount equal to the bond premium Contractor would have paid had Contractor required the filed Subcontractor to provide such bonds. The Awarding Authority may, at its election, either issue a credit Change Order, withhold such amount from any payments due the Contractor and/or receive a payment from the Contractor for such amount.

ARTICLE XVII
TERMINATION OF CONTRACT

1. <u>Termination for Cause.</u>

A. The Awarding Authority may without prejudice to any other right or remedy deem this Contract terminated for cause if any of the following defaults shall occur and not be cured within three (3) days after the giving of notice thereof by the Awarding Authority to the Contractor and any surety that has given bonds in connection with this Contract:

(1) The Contractor has filed a petition, or a petition has been filed against the Contractor with its consent, under any federal or state law concerning bankruptcy, reorganization, insolvency or relief from creditors, or if such a petition is filed against the Contractor without its consent and is not dismissed within sixty (60) days; or if the Contractor is generally not paying its debts as they become due; or if the Contractor becomes insolvent; or if the Contractor consents to the appointment of a receiver, trustee, liquidate, custodian or the like of the Contractor or of all or any substantial portion of its assets and such appointment or possession is not terminated within sixty (60) days; or if the Contractor makes an assignment for the benefit of creditors;

(2) The Contractor refuses or fails, except in cases for which extension of time is provided under this Contract's express terms, to supply enough properly skilled workers or proper materials to perform its obligations under this Contract, or the Awarding Authority as determined that the rate of progress required for the timely completion of the Work is not being met;

(3) The Contractor fails to make prompt payment to Subcontractors or for materials, equipment, or labor;

(4) All or a part of the Work has been abandoned;

(5) The Contractor has sublet or assigned all or any portion of the Work, the Contract, or claims thereunder, without the prior written consent of the Owner, except as expressly permitted in this Contract;

(6) The Contractor has failed to comply with Laws;

(7) The Contractor fails to maintain or provide to the Awarding Authority evidence of the insurance or bonds required by this Contract, or

(8) The Contractor has failed to prosecute the Work or any portion thereof as required under this Contract or has otherwise breached any material provision of this Contract.

B. The Awarding Authority shall give the Contractor and any surety notice of such termination for cause, but the giving of notice of such termination shall not be a condition precedent or subsequent to the termination's effectiveness. In the event of such termination, and without limiting any other available remedies, the Awarding Authority may, at its option:

(1) hold the Contractor and its sureties liable in damages for a breach of Contract;

(2) notify the Contractor to discontinue all work, or any part thereof, and the Contractor shall discontinue all work, or any part thereof, as the Owner may designate;

(3) complete the Work, or any part thereof, and charge the expense of completing the Work or part thereof, to the Contractor;

(4) require the surety or sureties to complete the Work and perform all of the Contractor's obligations under this Contract;

(5) take such other lawful action as is deemed by the Awarding Authority to be in the best interest of the Owner.

If the Awarding Authority elects to complete all or any portion of the Work as specified in Article XVII.1.B.(3) above, it may take possession of all materials, equipment, tools, machinery, implements at or near the Site owned by the Contractor and finish the Work at the Contractor's expense by whatever means the Awarding Authority may deem expedient; and the Contractor shall cooperate at its expense in the orderly transfer of the same to a new contractor or to the Awarding Authority as directed by the Awarding Authority. In such case, the Awarding Authority shall not make any further payments to the Contractor until the Work is completely finished. The Owner shall not be liable for any depreciation, loss or damage to said materials, machinery, implements or tools during said use and the Contractor shall be solely responsible for their removal from the Site after the Owner has no further use for them. Unless so removed within fifteen days after notice to the Contractor to do so, they may be sold at public auction, after publication of notice thereof at least twice in any newspaper published in the county where the Work is being performed, and the proceeds credited to the Contractor's account; or they may, at the option of the Awarding Authority, be stored at the Contractor's expense subject to a lien for the storage charges.

C. Damages and expenses incurred under Article XVII.1.B above shall include, but not be limited to, costs for the Designer's extra services required, in the opinion of the Awarding Authority, to successfully inspect and administer the construction contract through Final Acceptance of the Work.

D. Expenses charged under Article XVII.1.B above may be deducted and paid by the Awarding Authority out of any moneys then due or to become due the Contractor under this Contract.

E. All sums damages, and expenses incurred by the Owner to complete the Work shall be charged to the Contractor. In case the damages and expenses charged are less than the sum that would have been payable under this Contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference. In case such expenses shall exceed the said sum, the Contractor shall pay the amount of the excess to the Owner.

2. <u>Termination For Convenience.</u>

A. The Awarding Authority may terminate this Contract for convenience even though the Contractor is not in default by giving notice to the Contractor specifying in said notice the date of termination.

B. In case of such termination without cause, the Contractor shall be paid:

(1) all sums due and owing under this Contract through the date of termination, including any retainage withheld to the date of termination, less any amount which the Awarding Authority determines is necessary to correct or complete the Work performed to the date of termination; plus

(2) a reasonable sum to cover the expenses which Contractor would not have incurred but for the early termination of the Contract, such as demobilization of the work force, restocking charges, termination fees payable to Subcontractors.

C. Lost profits shall not be payable. The payment provided in Article XVII.2.B above shall be considered to fully compensate the Contractor for all claims and expenses and those of

any consultants, Subcontractors, and suppliers, directly or indirectly attributable to the termination.

3. Contractor's Duties Upon Termination For Convenience.

Upon termination of this Contract for convenience as provided above in Article XVII.2, the Contractor shall: (1) stop the Work; (2) stop placing orders and subcontracts in connection with this Contract; (3) cancel all existing orders and subcontracts; (4) surrender the Site to the Awarding Authority in a safe condition; (5) transfer to the Awarding Authority all materials, supplies, work in process, appliances, facilities, equipment and machinery of this Contract, and all plans, Drawings, Specifications and other information and documents used in connection
with this Contract.

ARTICLE XVIII
MISCELLANEOUS PROVISIONS

1. No Assignment by Contractor.

The Contractor shall not assign by power of attorney or otherwise, or sublet or subcontract, the Work or any part thereof, without the previous written consent of the Awarding Authority and shall not, either legally or equitably, assign any of the moneys payable under this Contract, or Contractor's claims hereunder, unless with the like consent of the Awarding Authority, whether said assignment is made before, at the time of, or after the execution of the Contract. The Contractor shall remain responsible for satisfactory performance of all Work sublet or assigned. Consent of the Awarding Authority shall not be deemed to constitute a representation or waiver of any right hereunder by the Awarding Authority as to the qualifications or the responsibility of the Contractor or Subcontractor(s).

2. Non-Appropriation.

The Awarding Authority certifies that at the time of the execution of this Contract, sufficient appropriations exist and shall be encumbered to fund the Contract Price. Payments are subject to appropriation and shall be made only for work performed in accordance with the terms of this Contract. The Contractor shall not be obligated to perform and shall not perform work outside the scope of this Contract without an appropriate amendment to this Contract, and a sufficient appropriation(s) to support such additional work. The Awarding Authority may immediately terminate or suspend this Contract in the event that the appropriation(s) funding this Contract is eliminated or reduced to an amount which will be insufficient to support anticipated future obligations under this Contract. Such termination shall be deemed a termination for convenience subject to the provisions of Article XVII.2 of these General Conditions.

3. Claims by Others Not Valid.

No person other than the Contractor shall acquire any interest in this Contract or claim against the Awarding Authority or Owner hereunder, and no claim by any other person shall be valid except as provided in M.G.L. c. 30, § 39F.

4. No Personal Liability of Public Officials.

No public official, employee, or agent of the Awarding Authority or Owner shall have any personal liability for the obligations of the Awarding Authority or Owner set forth in this Contract.

5. Severability.

The provisions of this Contract are severable, and if any of these provisions shall be held unconstitutional or unenforceable by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the other provisions of this Contract.

6. Choice of Laws.

This Contract shall be governed by the Laws of the Commonwealth of Massachusetts for all purposes, without regard to its Laws on choice of law. All proceedings under this Contract or related to the Project shall be brought in the courts of the Commonwealth of Massachusetts.

7. Standard Forms.

Unless directed otherwise in writing by the Awarding Authority, Contractor shall use the standard forms in use by Awarding Authority appearing in Appendix C to these General Conditions.

8. No Waiver of Subsequent Breach.

No waiver of any breach or obligation of this Contract shall constitute a waiver of any other or subsequent breach or obligation.

9. Remedies Cumulative.

All remedies of the Awarding Authority provided in this Contract shall be construed as cumulative and may be exercised simultaneously or in any order as determined by the Awarding Authority in its sole discretion. The Awarding Authority shall also be entitled as of right to specific performance and equitable relief including the right to an injunction against any breach of any of the provisions of this Contract.

10. Notices.

Notices to the Contractor shall be deemed given when hand delivered to the Contractor's temporary field office at or near the Site, or when deposited in the U.S. mail addressed to the Contractor at the Contractor's address specified in the Contract, or when delivered by courier to either location. Unless otherwise specified in writing by the Awarding Authority, notices and deliveries to the Awarding Authority shall be effective only when delivered to the Awarding Authority at the address specified in the Contract and date-stamped at the reception desk or for which a receipt has been signed by the agent or employee designated by the Awarding Authority to receive official notices.

11. Additional Information.

Recognizing that the Awarding Authority may find it necessary during the progress of the Work to establish the current status of performance under the Contract Documents, the Contractor shall, without limitation of any other requirements of the Contract Documents, promptly provide upon request statements, documents, or information to the Awarding Authority or others regarding the status of the Work, compliance of the Work with the Contract Documents, compliance by the Contractor or any Subcontractor with the Contract Documents, the names of Subcontractors or suppliers, amounts due or to become due, amounts previously paid to Subcontractors or suppliers, estimates of the portion of the Work completed and the cost of completing the Work, and such other matters within the scope of the Contractor's performance under the Contract Documents as the Awarding Authority may reasonably require.

12. Information Confidential.

Except as required for the discharge of its duties to the Awarding Authority under this Contract, or required by subpoena or court order, the Contractor and any of its Subcontractors agree to hold all information, documents, and materials obtained or developed in connection with its performance under this Contract (including, without limitation, all prints, plans, policies, procedures, studies, specifications and drawings, which relate to internal layout and structural elements, electrical and mechanical systems, security measures, emergency preparedness, threat or vulnerability assessments, and any other records relating to the security or safety of persons or buildings, structures, facilities, utilities, transportation or other infrastructure located within the Commonwealth) that the Contractor and any of its Subcontractors should reasonably know to be of a confidential or sensitive nature ("Confidential Information") in the strictest confidence, and shall not communicate, release, or disclose Confidential Information in any to any third party without the prior written Approval by the Awarding Authority. The Contractor shall not use any Confidential Information other than for the performance of the Work under this Contract. The Contractor shall inform all persons to whom any such Confidential Information has been or will be communicated, released, or disclosed of the privileged and confidential nature of Confidential Information, and shall ensure that all necessary steps are taken so that such Confidential Information is treated confidentially. Without limiting the foregoing, if the Project is a designated "Security Sensitive Information" project, the Contractor shall execute separate "Security Sensitive Information Procedures" and confidentiality agreements and shall comply with such document protection requirements as may be referenced in said agreement.

13. Consequential Damages.

In no event shall DCAMM be liable to the Contractor except for obligations expressly assumed by the Awarding Authority or the Designer under the Contract Documents, nor shall the Awarding Authority ever be liable to the CM for indirect, special or consequential damages.

14. Conflict of Interest.

The Contractor shall familiarize its employees assigned to perform services under this Contract with the provisions of M.G.L. c. 268A (the Massachusetts conflict-of-interest statute). The Contractor that the CM is an "interested party" for purposes of the aforementioned statute. Accordingly, if the Awarding Authority is a "state agency" for

purposes of the aforementioned statute, the Contractor and its employees and agents shall not offer or provide any employee of the Awarding Authority any gift, gratuity, favor, meal, entertainment, loan or other item of monetary value. The Contractor warrants and represents that it currently has no interest and shall not acquire any interest, direct or indirect, which would be adverse to or conflict in any manner with the performance of its services under this Contract or with the interest of the Awarding Authority or the Project. The Contractor further agrees that in the performance of this Contract no person or entity having any such adverse or conflicting interest shall be employed or granted a Subcontract. Except with the Awarding Authority's knowledge and express consent, the Contractor shall not engage in any activity, or accept any employment, interest or contribution that would reasonably appear to be adverse to the interests of the Awarding Authority or to compromise the Contractor's professional judgment with respect to the Project. The Contractor has a continuing obligation to divulge to the Awarding Authority all circumstances of its relationships with third parties, as well as any other interests that may have an effect on the Awarding Authority or the Project at the time of execution of this Contract or during its effectiveness. If the Awarding Authority believes that there is or has been a conflict of interest, or the appearance of a conflict of interest, it will so notify the Contractor. The Contractor shall make full disclosure of all material facts, and shall have a period of thirty (30) days after receipt of such notice to cure the conflict of interest or the appearance of conflict of interest, including the right to request a meeting with the Awarding Authority to explain its position. If the conflict of interest or appearance of conflict of interest is not cured to the satisfaction of the Awarding Authority or the controversy otherwise resolved prior to expiration of such thirty (30) days period, the Contractor shall be deemed to be in default of this Contract and the Awarding Authority may exercise any remedies available to it under this Contract or applicable law.

15. <u>Sexual Harassment and Workplace Violence Prevention.</u>

The Contractor shall promote a workplace that is free from sexual harassment and workplace violence, and to require all of its subcontractors to agree to the same. The Commonwealth does not tolerate sexual harassment, workplace violence, or a hostile work environment. It is the goal of the Commonwealth of Massachusetts to promote a workplace where people treat each other with dignity and respect. This applies to all Commonwealth employees, consultants, contractors and subcontractors regardless of tier, and covers actions within, by, among, and across these groups as they interact with each other. Without limiting its other rights and remedies of removal and/or termination, the Awarding Authority reserves the right to remove or terminate individuals and/or contractors whose conduct violates any of the provisions of this paragraph.

END OF GENERAL CONDITIONS
APPENDICES APPEAR ON THE FOLLOWING PAGES

APPENDIX A to General Conditions of the Contract

The following provisions form Article XII of the General Conditions of the Contract where DCAMM is the Awarding Authority.

EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM.

1. Compliance Generally.

For purpose of this Article, "minority" refers to Asians, Blacks, Western Hemisphere Hispanics, Native Americans, and Cape Verdeans; "Commission" refers to the Massachusetts Commission Against Discrimination. During the performance of this Contract, the Contractor and all of its Subcontractors (hereinafter collectively referred to as the Contractor) shall comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

2. Non-Discrimination and Affirmative Action.

A. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, ancestry, sex, gender identity, sexual orientation, age, handicap, mental illness, genetic information or active military duty. 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 comply with the provisions of M.G.L. c.151B and all other applicable anti-discrimination and equal opportunity laws.

B. The Contractor shall comply with the provisions of Executive Order 526, entitled Order Regarding Nondiscrimination, Diversity, Equal Opportunity and Affirmative Action, which prohibits unlawful discrimination based on race, color, age, gender, ethnicity, sexual orientation, gender identity or expression, religion, creed, ancestry, national origin, disability, veteran's status (including Vietnam-era veterans), or background. Executive Order 526 is herein incorporated by reference and made a part of this Contract.

Pursuant to Executive Order 526 the Contractor and any subcontractors may not engage in discriminatory employment practices; and the Contractor must certify that it is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and commit to purchasing supplies and services from certified minority or women-owned businesses, small businesses, or businesses owned by socially or economically disadvantaged persons or persons with disabilities. These provisions shall be enforced through the contracting agency, the Operational Services Division, and/or the Massachusetts Commission Against Discrimination. Any breach shall be regarded as a material breach of Contract that may subject Contractor to appropriate sanctions.

C. In connection with the performance of the Work, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, age, sexual orientation, or sex, and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, and in-service or apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, age, sexual orientation, or sex. A purpose of this provision is to ensure to the fullest

extent possible an adequate supply of skilled tradesmen for future public construction projects.

D. If the Contractor shall use any subcontractor on any work performed under this Contract, the Contractor shall take affirmative steps to negotiate with qualified minority and women subcontractors. These affirmative steps shall cover both pre-bid and post-bid periods. It shall include notification to the State Office of Minority and Women Business Assistance or its designee, while bids are in preparation, of all products, work or services for which the Contractor intends to negotiate bids. In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this Contract relative to non-discrimination and affirmative action.

E. As part of its obligation of remedial action under this Article, the Contractor shall maintain on this project not less than the percent ratio set forth in the Owner - Contractor Agreement of minority employee worker hours to total worker hours in each job category including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers, and those "classes of work" enumerated in M.G. L. c. 149, s. 44F.

G. In the hiring of minority journeypersons, apprentices, trainees and advanced trainees, the Contractor shall rely on referrals from a multi-employer affirmative action program approved by the Commission, traditional referral methods utilized by the construction industry, and referrals from agencies, not more than three in number at any one time, designated by the Liaison Committee or the Awarding Authority.

3. <u>Liaison Committee, Reports and Records.</u>

A. At the option of the Awarding Authority, there may be established for the term of this Contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the Awarding Authority, the Commission and such other representatives as may be designated by the Commission in conjunction with the Awarding Authority. The Contractor (or his agent, if any, designated by him as the on-Site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

B. The Contractor shall prepare projected staffing tables on a quarterly basis. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also when updated, to the Awarding Authority and Liaison Committee. The Contractor shall prepare weekly reports in a form approved by the Awarding Authority of hours worked in each trade by each employee, identified as minority or non-minority. Copies of these shall be provided at the end of each such week to the Awarding Authority and to the Liaison Committee.

C. Records of employment referral orders, prepared by the Contractor, shall be made available to the Awarding Authority and to the Liaison Committee on request.

D. A designee of the Awarding Authority and a designee of the Liaison Committee shall each have right to access to the Site.

E. The Contractor shall comply with the provisions of M.G.L. c. 151B as amended, of the Massachusetts General Laws, both of which are herein incorporated by reference and made a part of this Contract.

F. The Contractor shall provide all information and reports required by the Awarding Authority or the Commission on forms and in accordance with instructions issued by either

of them and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the Awarding Authority or the Commission to affect the employment of personnel. This provision shall apply only to information pertinent to the Owner's supplementary affirmative action Contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the Awarding Authority or the Commission as appropriate and shall set forth what efforts he has made to obtain the information.

4. <u>Sanctions.</u>

A. Whenever the Awarding Authority, the Commission, or the Liaison Committee believes the Contractor or any Subcontractor may not be operating in compliance with the terms of this Article, the Commission shall directly, or through its designated agent, conduct an appropriate investigation, and may confer with the parties, to determine if such Contractor is operating in compliance with the terms of this Article. If the Commission or its agent finds the Contractor or any Subcontractor not in compliance, it may make a preliminary report on non-compliance, and notify such Contractor in writing of such steps as will in the judgment of the Commission or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the Commission **may** make a final report of non-compliance, and recommend to the Awarding Authority the imposition of one or more of the sanctions listed below. If, however, the Commission believes the Contractor or any Subcontractor has taken or is taking every possible measure to achieve compliance, it shall not make a final report of non-compliance. Within fourteen days of the receipt of the recommendations of the Commission, the Awarding Authority shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement:

(1) The recovery by the Awarding Authority from the Contractor of 1/100 of 1% of the Contract award price or $1,000 whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the Awarding Authority from the Contractor, to be assessed by the Contractor as a back charge against the subcontractor, of 1/10 of 1% of the sub-Contract Price, or $400 whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply;

(2)The suspension of any payment or part thereof due under the Contract until such time as the Contractor or any subcontractor is able to demonstrate his compliance with the terms of the Contract;

(3) The termination or cancellation of the Contract, in whole, or in part, unless the Contractor or any Subcontractor is able to demonstrate within a specified time his compliance with the terms of the contract;

(4)The denial to the Contractor or any subcontractor of the right to participate in any future contracts awarded by the Awarding Authority for a period of up to three years.

B. If at any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that it is in compliance with this Article, the Contractor may request the Awarding Authority, in consultation with the Commission, to suspend the sanctions conditionally, pending a final determination by the Commission as to whether the Contractor is in compliance. Upon final determination of the Commission, the Awarding Authority, based on the recommendation of the Commission, shall either lift the sanctions or reimpose them.

C. Sanctions recommended by the Commission and enumerated under Section 4 above shall not be imposed by the Awarding Authority except after an adjudicatory proceeding, as that term is used M.G.L. c. 30A, has been conducted. No investigation by the Commission

or its agent shall be initiated without prior notice to the Contractor. **D.** Notwithstanding the provisions of 4A-4C above, if the Awarding Authority determines after investigation that the Contractor or any Subcontractor is not in compliance with the terms of this Article, it may suspend any payment or portion thereof due under the Contract until the contractor demonstrates to the satisfaction of the Awarding Authority compliance with the terms of this Article. This temporary suspension of payments by the Awarding Authority is separate from the sanctions set forth in Section 4A-4C of this Article above, which are determined by MCAD and recommend to the Awarding Authority. Payment may be suspended only after the Contractor and any other interested party shall have been given the opportunity to present evidence in support of its position at an informal hearing held by the Awarding Authority, and the Awarding Authority has concluded upon review of all the evidence that such penalty is justified. Payment shall not be suspended if the Awarding Authority finds that the Contractor made its best efforts to comply with this Article, or that some other justifiable reason exists for waiving the provisions of this Article in whole or in part.

END OF APPENDIX A

APPENDIX B to General Conditions of the Contract

The following provisions form Article XIII of the General Conditions of the Contract where DCAMM is the Awarding Authority.

GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES AND WOMEN BUSINESS ENTERPRISES (M.G.L. c. 7C, § 6 and EXECUTIVE ORDERS 526 & 565)

1. Goals.

A. The goals for minority business enterprise and woman business enterprise participation established for this Contract are as set forth in the Owner - Contractor Agreement**.**

B. The Contractor and all Subcontractors, sub-subcontractors, and materials suppliers shall comply with all of the terms and conditions of this Article, which include the provisions pertaining to MBE/WBE participation set forth in the Owner - Contractor Agreement in order to meet the MBE/WBE participation goals established for this Contract.

2. MBE/WBE Participation Credit.

A. If the Contractor is itself an MBE or WBE, MBE or WBE participation credit shall be given in an amount equal to the entire Contract Price less the value of the work actually performed by other MBE or WBE firms on the Contract. If the Contractor is not an MBE or WBE, then MBE/WBE participation credit will be given for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.

B. If the Contractor is a joint venture with one or more MBE/WBE joint venturers, MBE/WBE participation credit shall be given to the joint venture as follows:

(1) If the joint venture is certified by the Massachusetts Supplier Diversity Office (SDO) as an MBE or WBE, MBE/WBE participation credit shall be given in an amount equal to the entire Contract Price.

(2) If the joint venture is not certified as an MBE or WBE by the SDO, MBE/WBE participation credit shall be given to the joint venture for the value of the Work that is performed by the MBE/WBE joint venturer(s), and for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.

C. If an MBE/WBE supplies but does not install equipment or materials, MBE/WBE participation credit shall be given only if the MBE/WBE supplier is regularly engaged in sales of equipment or supplies to the construction industry from an established place of business. MBE/WBE participation credit shall be given the full amount of the purchase order only if the MBE/WBE supplier manufactures the goods or substantially alters them before resale. In all other cases, MBE/WBE participation credit shall be given for 15% of the purchase order.

D. MBE participation credit shall be given for the work performed by MBEs only, and WBE participation credit shall be given for the work performed by WBEs only. MBE participation may not be substituted for WBE participation, nor may WBE participation be substituted for MBE participation.

3. Establishing MBE/WBE Status.

A. A minority owned business shall be considered an MBE only if it has been certified as a minority business enterprise by the Supplier Diversity Office ("SDO").

B. A woman owned business shall be considered a WBE only if it has been certified as a woman business enterprise by SDO.

C. Certification as a disadvantaged business enterprise ("DBE"), certification as an MBE/WBE by any agency other than SDO, or submission of an application to SDO for certification as an MBE/WBE shall not confer MBE/WBE status on a firm for the purposes of this Contract. Please note that only firms SDO certified as MBE or WBEs can be credited toward meeting project MBE or WBE goals.

4. Subcontracts With MBE/WBEs.

Within thirty (30) days after the award of this Contract, the Contractor shall (i) execute a subcontract with each MBE/WBE Subcontractor which has executed a Letter of Intent Approved by the Awarding Authority, (ii) cause its Subcontractors to execute a sub-subcontract with each MBE/WBE sub-subcontractor they committed to utilize, and (iii) furnish the Awarding Authority with a signed copy of each such subcontract and sub-subcontract through DCAMM's Online Compliance Reporting System.

5. Performance of Contract Work by MBE/WBEs.

A. The Contractor shall not perform with its own organization, or subcontract or assign to any other firm, work designated to be performed by any MBE/WBE in the Letters of Intent or Schedule for MBE/WBE Participation without the prior written Approval of the Awarding Authority, nor shall any MBE/WBE assign or subcontract to any other firm, or permit any other firm to perform any of its MBE/WBE Work without the prior written Approval of the Awarding Authority. Any such unapproved assignment, subcontracting, sub-subcontracting, or performances of MBE/WBE Work by others shall be a change in the MBE/WBE Work for the purposes of this Contract. The Awarding Authority WILL NOT APPLY TO THE MBE OR WBE PARTICIPATION GOAL(S) ANY SUMS ATTRIBUTABLE TO SUCH UNAPPROVED ASSIGNMENTS, SUB-CONTRACTS, SUB-SUBCONTRACTS, OR PERFORMANCE OF MBE/WBE WORK BY OTHERS.

B. The Contractor shall be responsible for monitoring the performance of MBE/WBE Work to ensure that each scheduled MBE/WBE performs its own MBE/WBE Work with its own workforce.

C. The Contractor and each MBE/WBE shall provide the Awarding Authority with all information and documentation that the Awarding Authority determines is necessary to ascertain whether or not an MBE/WBE has performed its own MBE/WBE Work. At the discretion of the Awarding Authority, failure to submit such documentation to the Awarding Authority shall establish conclusively for the purpose of giving MBE/WBE participation credit under this Contract that such MBE/WBE did not perform such work.

6. Notification of Changes in MBE/WBE Work.

A. If at any time during the performance of the Contract the Contractor determines or has reason to believe that a scheduled MBE/WBE is unable or unwilling to perform its MBE/WBE Work, or that there has been or will be a change in any MBE/WBE Work, or that the Contractor will be unable to meet the MBE/WBE participation goal(s) for this Contract for any reason, the Contractor shall immediately notify the Awarding Authority Contract Compliance Office in writing of such circumstances.

B. Any notice of a change in MBE/WBE Work pursuant to subparagraph "A" above shall include a revised Schedule for MBE/WBE Participation, and additional or amended Letters of Intent and subcontracts, as the case may be.

7. <u>Actions Required If There is a Reduction in MBE/WBE Participation.</u>

A. In the event there is a change or reduction in any MBE/WBE Work which will result in the Contractor failing to meet the MBE/WBE participation goal(s) for this Contract, other than a reduction in MBE/WBE Work resulting from a Change Order initiated by the Awarding Authority, then the Contractor shall immediately undertake a diligent, good faith effort to make up the shortfall in MBE/WBE participation as follows:

(1) The Contractor shall identify all items of the Work remaining to be performed under the Contract that may be made available for subcontracting to MBE/WBEs. The Contractor shall send a list of such items of work to the Awarding Authority, together with a list of the remaining items of the Work that were not made available to MBE/WBEs and the reason for not making such work available for subcontracting to MBE/WBEs.

(2) The Contractor shall send written notices soliciting proposals to perform the items of the Work that may be made available for subcontracting to MBE/WBEs to all MBE/WBEs qualified to perform such work. The Contractor shall advise the Awarding Authority of (i) each MBE/WBE solicited, and (ii) each MBE/WBE listed in the SDO directory under the applicable trade category who was not solicited and the reasons therefor. The Contractor shall also advise the Awarding Authority of the dates notices were mailed and provide a copy of the written notice(s) sent.

(3) The Contractor shall make reasonable efforts to follow up the written notices sent to MBE/WBEs with telephone calls or personal visits in order to determine with certainty whether the MBE/WBEs were interested in performing the work. Phone logs or other documentation must be submitted to the Awarding Authority evidencing this effort.

(4) The Contractor shall make reasonable efforts to assist MBE/WBEs that need assistance in obtaining insurance, bonds, or lines of credit in order to perform work under the Contract, and shall provide the Awarding Authority with evidence that such efforts were made.

(5) The Contractor shall provide the Awarding Authority with a statement of the response received from each MBE/WBE solicited, including the reason for rejecting any MBE/WBE who submitted a proposal, if applicable.

(6) The Contractor shall take any additional measures reasonably requested by the Awarding Authority to meet the MBE/WBE participation goal(s) established for this Contract, including, without limitation, placing advertisements in appropriate media and trade association publications announcing the Contractor's interest in obtaining proposals from MBE/WBEs, and/or sending written notification to MBE/WBE economic development assistance agencies, trade groups and other organizations notifying them of the project and of the work available to be subcontracted by the Contractor to MBE/WBEs.

B. If the Contractor is unable to meet the MBE/WBE participation goals for this Contract after complying fully with each of the requirements of paragraph "A" above, and the Contractor is otherwise in full compliance with the terms of this Article, the Awarding Authority may reduce the MBE/WBE participation goals for this Contract to the extent that such goals cannot be achieved.

8. <u>Suspension of Payment and/or Performance for Noncompliance.</u>

A. If at any time during the performance of this Contract, the Awarding Authority determines or has reason to believe that (1) there has been a change or reduction in any MBE/WBE Work which will result in the Contractor failing to meet the MBE/WBE

participation goal(s) for this Contract, other than a reduction in MBE/WBE Work resulting from a change in the Contract work ordered by the Awarding Authority, and (2) the Contractor has failed to comply fully with all of the terms and conditions of paragraphs 1 through 7 above, the Awarding Authority may:
(1) suspend payment to the Contractor of an amount up to the full value of the work which was to have been performed by an MBE/WBE pursuant to the Contractor's Schedule for MBE/WBE Participation but which was not so performed, in order to ensure that sufficient Contract funds will be available if liquidated damages are assessed pursuant to paragraph 9, and/or
(2) suspend the Contractor's performance of this Contract in whole or in part.

B. The Awarding Authority shall give the Contractor prompt written notice of any action taken pursuant to paragraph A above and shall give the Contractor and any other interested party, including any MBE/WBEs, an opportunity to present evidence to the Awarding Authority that the Contractor is in compliance with the requirements of this Article, or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The Awarding Authority may invite SDO and the Massachusetts Commission Against Discrimination to participate in any proceedings undertaken pursuant to this paragraph.

C. Upon a showing that the Contractor is in full compliance with the requirements of this Article, or that the Contractor has met or will meet the MBE/WBE participation goals for this Contract, the Awarding Authority shall release any funds withheld pursuant to clause A(1) above, and lift any suspension of the Contractor's performance under clause A(2) above.

9. <u>Liquidated Damages; Termination.</u>

A. If payment by the Awarding Authority or performance by the Contractor is suspended by the Awarding Authority as provided in paragraph 8 above, the Awarding Authority shall have the following rights and remedies if the Contractor thereafter fails to take all action necessary to bring the Contractor into full compliance with the requirements of this Article, or if full compliance is no longer possible because the default of the Contractor is no longer susceptible to cure, if the Contractor fails to take such other action as may be required by the Awarding Authority to meet the MBE/WBE participation goals set forth in this Contract:
(1) the Awarding Authority may terminate this Contract, and/or
(2) the Awarding Authority may retain from final payment to the Contractor, as liquidated damages, an amount equal to the difference between (x) the total of the MBE/WBE participation goals set forth in this Contract, and (y) the amount of MBE/WBE participation credit given to the Contractor for MBE/WBE Work performed under this Contract as determined by the Awarding Authority, the parties agreeing that the damages for failure to meet the M/BE/WBE participation goals are difficult to determine and that the foregoing amount to be retained by the Awarding Authority represents the parties' best estimate of such damages. Any liquidated damages will be assessed separately for MBE and WBE participation.

B. Before exercising its rights and remedies hereunder, the Awarding Authority may, but the Awarding Authority shall not be obligated to, give the Contractor and any other interested party another opportunity to present evidence to the Awarding Authority that

the Contractor is in compliance with the requirements of this Article or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The Awarding Authority may invite SDO and the Massachusetts Commission Against Discrimination to participate in any proceedings undertaken hereunder.

10. <u>Reporting Requirements.</u>

The Contractor shall submit to the Awarding Authority all information or documentation that is necessary in the judgment of the Awarding Authority to ascertain whether or not the Contractor has complied with any of the provisions of this Article.

11. <u>Awarding Authority's Right to Waive Provisions of this Article in Whole or In Part.</u>
The Awarding Authority reserves the right to waive any provision or requirement of this Article if the Awarding Authority determines that such waiver is justified and in the public interest. No such waiver shall be effective unless in writing and signed by a representative of the Awarding Authority's Compliance Office or the Office of its General Counsel. No other action or inaction by the Awarding Authority shall be construed as a waiver of any provision of this Article.

END OF APPENDIX B

APPENDIX C to the General Conditions of the Contract

INDEX OF REQUIRED CONTRACT ADMINISTRATION FORMS
(Forms used during bidding are located in Attachment B to the Instructions to Bidders)

- ☐ ~~**Form of Subcontract MGL c.149 §44F**~~
- ☐ ~~**Procedure for Payment to Contractors**~~
- ☐ ~~**Payment Voucher Input**~~
- ☐ ~~**Requisition for Payment (DCAMM Form S1b) and Instructions**~~
- ☐ **Instructions and Procedures Regarding Change Orders, Contract Modifications and Equitable Adjustments (DCAMM Form 13)**
- ☐ **Request for Approval of Wages and Rates for Change Order Pricing (DCAMM Form 14)**
- ☐ **Format for Submission of Change Order (DCAMM Form 15) (3 pages)**
- ☐ **Change Order Log (1 Page)**
- ☐ ~~**Daily Time and Material Report for Change Orders 10/17 rev**~~
- ☐ ~~**Request and Agreement for a Change in the Plans**~~
- ☐ **Request and Agreement For Change In the Plans And/Or Specifications and/or Contract (DCAMM Form 5)**
- ☐ **Weekly Payroll Report Form and Statement of Compliance**
- ☐ ~~**Quarterly Projected Workforce Table**~~
- ☐ ~~**Veteran and Service Disabled Veteran Owned Business Enterprise**~~
- ☐ ~~**(VBE/SDVOBE) Participation**~~
- ☐ ~~**Form for Transfer of Title (Work Not Incorporated, DCAMM Form 16)**~~
- ☐ **Payroll & Workforce Report**
- ☐ **Payment Requisition Transmittal (3 pages)**~~**-**~~
- ☐ ~~**Submittal Transmittal (1 page)**~~
- ☐ **Submittal Log**
- ☐ **Request for Information Transmittal (1 page)**
- ☐ **Request for Information Log**
- ☐ ~~**Weekly Site Meeting Template (1 Page)**~~
- ☐ **Certificate of Substantial Completion (E-1)**
- ☐ **Certificate of Final Inspection, Release and Acceptance (E-2)**
- ☐ **Certificate of Payment MBE, WBE, Veteran, Etc.**
- ☐ **Certificate of Payment to Subcontractors, Sub-bidders, suppliers**

END OF APPENDIX C

DCAMM General Conditions of the Contract c. 149 Rev. 06/2020
DMH Revised 8/24/2021

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE FOR ADMINISTRATION AND FINANCE
DIVISION OF CAPITAL ASSET MANAGEMENT
ONE ASHBURTON PLACE, 15th Floor
BOSTON, MASSACHUSETTS 02108

INSTRUCTIONS AND PROCEDURES REGARDING CHANGE ORDERS, CONTRACT MODIFICATIONS AND EQUITABLE ADJUSTMENTS

SECTION 1. STATUTORY AND CONTRACTUAL PROVISIONS

1.01 These procedures and instructions (hereinafter "Procedures") supplement Article VII of DCAMM's General Conditions of the Contract. These Procedures and Article VII are to be considered together and are intended to be mutually complementary, so that all terms are to be considered as part of this Contract. All provisions are intended to be consistent with the Massachusetts Laws governing Change Orders and Equitable Adjustments. Those laws include, but are not limited to: M.G.L. Chapter 7C, Sections 17-21; M.G.L. Chapter 30, Sections 39I, 39J, 39N, 39O, 39P, and 39Q. All parties must keep themselves informed of these laws and any amendments affecting said statutes.

NO CHANGES (ADDITIONS, SUBSTITUTIONS OR ELIMINATIONS) IN THE PLANS, SPECIFICATIONS OR CONTRACT SHALL BE COMMENCED UNTIL RECEIPT BY THE CONTRACTOR OF: (a) **AN APPROVED DCAMM FORM 5** (Gold Sheet Change Order) OR (b) a WRITTEN DIRECTIVE from the DCAMM PROJECT MANAGER AUTHORIZING or DIRECTING such CHANGE. A Directive issued by the Deputy Commissioner, Director, or Deputy Director shall carry the same force as though issued by the Project Manager.

1.02 The purpose of these instructions and procedures is to provide additional detail for calculating equitable adjustments and outlining the change order submission process. The Contractor must provide satisfactory documentation supporting the nature and cost of each change, for an informed decision to be made on whether or not the change order is necessary, justified and priced properly. All parties shall utilize the POTENTIAL CHANGE ORDER PROCESS explained in section 3 below, as well as maintain a POTENTIAL CHANGE ORDER LOG.

1.03 All requests for changes modifying the contract price must be submitted on DCAMM Form 5, prior to the final acceptance of the project. The Contractor waives all rights against the Commonwealth if it fails to comply with this requirement. DCAMM shall be under no obligation to process a request for change after final acceptance of the project.

1.04 The term "request for change" is used throughout these procedures and applies to every request to revise the contract requirements. The request for change must be made in writing, and in accordance with the provisions of the Contract, the General laws, rules, regulations and other procedures of DCAMM.

1.05 If the request for a change is deemed a Life Safety Issue by DCAMM, or if waiting for a formal change order approval will cause damage or increase the cost of the Work, the DCAMM Project Manager may deem the change "Urgent" and issue an email to the Contractor, Deputy Director, Designer, Resident Engineer and any other parties that are involved in the potential change. The email will outline the scope of work, a Not to Exceed dollar value, and a deadline for the paperwork to be submitted to substantiate the cost and completion of the work. The Contractor will add this "Urgent" Potential Change Order to the Log with a status of URGENT and proceed with the work in accordance with the email. If the costs to complete the "Urgent" work are expected to exceed the stated Not to Exceed value, then the Contractor shall advise the DCAMM Project Manager of the anticipated extra costs as soon as known, and shall await further written direction from DCAMM before proceeding with work above the Not to Exceed value.

1.06 Prior to any change order work being performed, the DCAMM Project Manager must have all quotes, estimates and potential costs identified to determine if the change order work should be performed as a lump sum cost to the project, or if the nature of the change is difficult to quantify, then it may be determined to perform the work on a Time and Material basis.

SECTION 2. DIRECTIONS FOR COMPUTING COSTS FOR CHANGES IN THE WORK

2.01 Construction Managers, General Contractors, Subcontractors, Sub-tier Subcontractors and service providers must submit for approval the DCAMM Wage Rate Form (Form 14) at the time their contract is awarded and prior to any change order work being started. DCAMM has changed the calculation for establishing **LABOR BILLING RATES.** Billing rates are calculated by taking the job specific **published** Prevailing Wage Rate for each trade classification and multiplying it by 1.40. Union Contractors may submit their collective bargaining agreement if there are excess fringe expenses over the published prevailing wage rate. These excess fringes will be applied with no mark-ups. The attached forms (as noted in Article VII) will automatically calculate rates as described. That rate calculation establishes the **LABOR BILLING RATE** for the project by trade and classification. If a contractor or subcontractor submits documentation from their insurance company that identifies their Workmen's Compensation rate is greater than 12.5% then the multiplier of 1.40 will be adjusted to include the percentage over 12.5%. For example, an Iron Worker's Workmen's compensation percentage is 14.5%; the calculation for that Trade's LABOR BILLING RATE would become 1.42 rather than 1.40. In the case of Premium Time, Time and Half, or Double Time DCAMM will accept a multiplier of 1.40 on the premium portion of wages over the approved prevailing wage rate only. These **LABOR BILLING RATES** are inclusive of overhead, profit, and all other expenses incurred. No additional markups on labor are allowed. If a credit is due to the project a percentage of 85% of the approved labor billing rate is to be credited to the project. The **LABOR BILLING RATES** will be established for each trade and classification at the beginning of the project. If there are any disputes regarding the **LABOR BILLING RATES** they must be resolved prior to change order work being started.

2.02 Equipment Schedules and associated rates must be submitted at the beginning of the project for any contractor that anticipates renting or using equipment as part of their scope of work for approval of desired rates to be used on change orders. If the contractor cannot provide an equipment schedule, including established rates, DCAMM has elected to use *R.S. Means* to determine fair market value rates. When computing the cost of equipment the rate resulting in the lowest value (daily, weekly, monthly) is to be used. The Contractor can add 15% for overhead and profit mark up to the equipment rental cost as part of the final change order pricing. The allowance for overhead and profit shall be considered to include all additional expenses associated with hand and power tools normally required in the performance of the base bid work, "tools of the trade".

2.03 Back up for material costs is required and shall be a formal quote from the supplier providing the materials or an agreed upon industry standard determined at the beginning of the project, for example, NECA, MCCA, or Harrison. The Contractor may add 15% overhead and profit mark up to the material cost as part of the final change order pricing.

2.04 Miscellaneous Items and Services such as Police or Fire details, utility charges, and attic stock charges must be identified and estimated as part of the initial change request and back up for the cost is required. For any change that does not include labor performed, Equipment used, or materials installed in the project that results in a net increase in the contract price is considered a miscellaneous item or service. Shipping, handling and fuel surcharges must be estimated prior to orders being placed. Expedited shipping costs must be approved before an order is placed, otherwise normal shipping cost will be paid. The Contractor may add 5% for overhead and profit mark up to Miscellaneous Items and Services as part of the final change order pricing.

2.05 For changes that involve work performed by Subcontractors the Prime Contractor may add 5% markup on all subcontracted work. Subcontractors also shall be permitted to add 5% markup on all work subcontracted to Sub-tier subcontractors. Any work self-performed by either the Prime Contractor or Subcontractor is not subject to the additional 5% markup.

2.06 Travel expenses are only paid in accordance with Union Agreements or documented costs and no additional overhead and profit will be allowed on these costs. Travel will only be paid when requested on changes that result in additional time subject to the approval of the Project Manager on a case by case basis.

2.07 The General Contractor, Construction Manager, or Sub Contractor's (if applicable) bond premium shall be included at the following rates. If a Contractor's bond rate differs from this list verification from the bond carrier must be submitted showing the actual rates prior to any change order work starting on the Project.

	Contract Price	**Rates per Thousand**
(a)	Contracts up to $500,000.....	$14.40
(b)	$500,000 to $2,500,000.....	$ 8.70
(c)	$2,500,000 to $5,000,000.....	$ 6.90
(d)	$5,000,000 to $7,500,000.....	$ 6.30
(e)	$7,500,000 and up.....	$ 5.76

2.08 Changes which involve Time and Material slips must have DCAMM Daily Time and Material Reports attached, verified, and signed by the Resident Engineer or authorized representative beginning on the day the work commences, and continuing every day work occurs thereafter until the work is complete. Timesheets verifying labor hours and classification

and invoices verifying actual material cost from vendors are required when submitting the change to substantiate all costs being billed. Costs without back up will be deducted and not reimbursed.

2.09 The Project Manager may approve lump sum change order requests on changes costing $2,000 or less, without requiring the Contractor to provide a detailed breakdown for the costs incurred on the change order. A basic level breakdown of Labor, material, and equipment on the contractors letterhead is still required.

SECTION 3. PROCESSING CHANGE REQUESTS AND EQUITABLE ADJUSTMENTS

3.01 Article VII of the Contract outlines the notification requirements for any potential change order. Time is of the essence with every potential change order and all parties, Contractors, Subcontractors, User Agency Representatives, Architect/Designer and DCAMM project team members are obligated by the Contract to expedite processing of these potential changes in an efficient and timely manner. The Prime Contractor must maintain a Potential Change Order (PCO) log for the entire project. A sample PCO log is included in the Contract Documents. The PCO log will be reviewed at each weekly Owner Meeting and have status changes updated in writing on a weekly basis.

3.02 If a request for a change has been identified, then the Prime Contractor must create a draft request for equitable adjustment referred to as a Change Order Request (COR) from their own project management system for review by the Architect/Designer and the DCAMM project team. The draft COR shall include requests for equitable adjustment from affected subcontractors, if any. The Prime Contractor's COR form must be approved in writing by the DCAMM project team prior to the first COR submission, otherwise the DCAMM Form 15 shall be used.

Each COR shall be for a specific scope of work and it shall be identified as an extra service with an explanation of reasons the change is not included in the base scope of work, such as; change in plans and specifications or other scope as outlined in Article VII. The Prime contractor shall also review each COR in accordance with Article VII of the Contract General Conditions. A COR may include multiple subcontractors for one scope of work, however all of their back up, including quotes, estimates and labor estimates must be attached to the COR for review. Having more than one COR for the same scope of work because subcontractors are late in submitting is not recommended, however there are times it is necessary. If a time extension to the contract is part of the change request, a critical path schedule from the Prime Contractor must be included in the COR. DCAMM requires all project schedules to be submitted in an electronic format as required by the Specifications of the project.

Each COR will be reviewed by the Architect/Designer, the Resident Engineer, and the Project Manager. If there is additional information required or a correction needs to be made a notification will be sent in a timely manner to the Prime Contractor with all parties copied. The Architect/Designer, Resident Engineer and Project Manager shall request any necessary additional information or corrections within 30 days of when the COR is submitted. If additional time is required to evaluate a COR, then the Contractor shall be notified within the same 30 days of the extended date by which a decision will be made. The Prime Contractor can resubmit the COR with the original COR number with an "R1" noted for the revision. This revision should be noted on the PCO log for tracking purposes and updated each time a revision is needed. No work shall begin until the COR is signed by all parties.

3.03 If the COR is complete and acceptable the Architect/Designer and DCAMM project team will advise the Prime Contractor of its acceptance consistent with section 3.05, below. Once the COR is accepted, the Prime Contractor is authorized to start the work and immediately initiate the formal Change Order ("The Gold Sheet"), Form 5, for billing purposes. Multiple signed CORs may be incorporated into one formal Change Order (Form 5) for approval: however, the original COR and all back up information must be provided. If the formal Change Order (Form 5) is incomplete or incorrect, the entire Change Order will be returned to the contractor. In such a case when multiple CORs are submitted together into one formal Change Order and the submission is either incomplete or incorrect, no single COR will be processed. Prime Contractors cannot bill for the work until a formal Change Order (Form 5) is signed by all parties and a double digit CO number is issued by the DCAMM Project Controls team. This number is to be displayed on the Schedule of Values with the change description when billing.

3.04 If the COR is not acceptable, all parties must work in good faith, and in a timely manner to resolve any issues prior to any work starting. If the issues cannot be resolved at the Project Manager or Deputy Director level within 30 days, a Project Executive from the Prime Contractor and the Director or Deputy Commissioner for Design and Construction will meet in order to reach final resolution. If the issues still cannot be resolved, the Project Manager may issue a unilateral Change Order and the Prime Contractor must commence work in accordance with Article VII of the Contract General Conditions and should refer to Article VII of the Contract General Conditions for performing work under protest and the dispute resolution process. This status will be updated on the PCO log and the Prime Contractor and DCAMM Project Team will continue to work to resolve the issues as outlined in Article VII.

3.05 The Architect/Designer and the Resident Engineer will provide written back up, either in an email or memorandum, approving the Prime Contractor's submitted COR and Form 5 Change Order. They are not required to sign the actual form submitted. The following approvers must sign the actual Change Order for it to be a binding Contract amendment based on the delegation authority granted by the Commissioner of DCAMM:

The Director or Deputy Commissioner for Design and Construction approval shall be required whenever:

a. the estimate for the work on the Form 5's (CORs) exceeds $50,000 (absolute value); OR

b. the cumulative cost of previously approved Form 5's (CORs) exceeds five percent of the original contract award price (or the amount of the GMP amendment in the case of a Chapter 149A project) and the amount of the Form 5 (COR) being approved is greater than $2,000.00; OR

c. The change order includes a time extension.

A Deputy Director of Design and Construction shall approve change orders for DCAMM when:

a. The cumulative cost of previously approved Form 5's (CORs) is less than five percent of the original contract award price and the value of the Form 5 (COR) does not exceed $50,000.00 (absolute value).

With the prior written approval of the Director or Deputy Commissioner for Design and Construction, the Project Manager shall approve change orders for DCAMM when:

a. The cumulative cost of previously approved Form 5's (CORs) is less than five percent of the original contract award price and the value of the Form 5 does not exceed $5,000.00 (absolute value); OR

b. The estimate for the Form 5 is less than $2,000.00 (absolute value).

BILLING FOR CHANGE ORDERS PRIOR TO RECEIVING THE CHANGE ORDER NUMBER FROM THE DCAMM PROJECT CONTROLS TEAM WILL RESULT IN THE PAYMENT APPLICATION BEING REJECTED.

SECTION 4. RESPONSIBILITY FOR PROCESSING AND APPROVING CHANGES

4.01 The Prime Contractor is responsible for verifying and validating all subcontractor, vendor and supplier costs and time extensions being requested as part of any change in the work. Refer to Contract General Conditions at Article VII.

4.02 The Prime Contractor, Architect/Designer, and DCAMM project team will review all PCO, COR, and Change Orders during the weekly Owner Meetings. There may be additional time needed to approve the changes and a timeframe for resolution are to be noted in the meeting minutes and on the PCO log.

DIVISION OF CAPITAL ASSET MANAGEMENT & MAINTENANCE

c.30, c.149, and c.149A ONLY

PROJECT NAME <project-name> **PROJECT NO.** <project-number> **P. C.** <Prime Contractor>

REQUEST FOR APPROVAL OF WAGES AND RATES FOR CHANGE ORDER PRICING

NAME OF SUBCONTRACTOR:

This form must be completed, submitted and approved prior to the submission of any change order price proposals. Complete the below for every Trade and Classification that is likely to work on the project. If any contractor seeks to utilize a total hourly wage rate (wages plus benefits) for change order pricing that is in excess of the applicable published prevailing wage rate, then this form must be completed, submitted (with backup documentation - i.e. union agreement) and approved prior to the submission of any change order price proposals. The information supplied below must be consistent with certified payroll submissions.

			Employee 1	Employee 2	Employee 3	Employee 4	Employee 5	Employee 6	Employee 7
1	Rate (Select type from drop down)	----->	Straight Time	Straight Time	Straight Time	2x Differential	1/2 Differential	Double Time	Time & Half
2	Trade Description (e.g., Carpenter, Pipefitter, Electrician, etc.)								
3	Classification (Foreman, Journeyman, Apprentice)		Journeyman	Foreman	Apprentice Step 1	Apprentice Step 3	Apprentice Step 5	Apprentice Step 7	Apprentice Step 9
4	Prevailing Wage Rate (Per Contract Specifications)								
			Subcontractor Proposed Rates For Approval						
		Rate				Premium	Premium	Premium	Premium
5	**Requested Published Rate[2] (must match certified payroll)**								
6	Enter Premium Portion of Base Rate (If Applicable)								
	O&P, Insurance, and Taxes								
7	Base Prevailing Markups[1&4] *(Multiply by Item 4 and Item 6 when applicable)*	*40.0%*	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	Workmen's Compensation Insurance Above 12.5% *(applicable to straight time only, Multiply by Item 4)*	0.00%	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subtotal *All Inclusive Markups*	**40.00%**	$ -	$ -	$ -	$ -	$ -	$ -	$ -
9	Excess Wages/Fringes[3] *(Item 5 minus Item 4)*		$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Subcontractor Proposed Rate		$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Total Loaded Rate		$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Credit Change Order Value	**85.00%**	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Effective Dates From To

The Above Total Loaded Rate Is Being Requested For Approval For Use On Change Orders Expected to Be Performed Prior To The Noted Effective Dates

ENTER EFFECTIVE DATES ABOVE BEFORE SUBMITTING FOR APPROVAL

Sub-contractor Authorized Representative

Prime Contractor Authorized Representative

DCAMM Authorized Representative

NOTES:

1. Contractor may utilize a rate of 40% for insurance/taxes without providing documentation. If a rate in excess of 40% is requested, documentation must be provided and is only applicable to Workmen's
2. Attach all relevant supporting documentation such as union wage rate sheets and workers compensation rate tables.
3. Excess wages/fringes are those fringes required to be paid which exceed the contract prevailing wage. DCAMM will reimburse these costs, once approved, as cost only (i.e., no markups allowed). Not all excess fringe benefits are reimbursable by DCAMM. Note that the following benefits are explicitly not allowed as part of the Published Rate: Union Dues, Vacation Funds, Uniforms, Earned Sick Leave, Etc.
4. Time and a Half, Double Time, and Differential rates are calculated with 40% markup on the portion of wages above the straight time wage.

DIVISION OF CAPITAL ASSET MANAGEMENT & MAINTENANCE				c.30, c.149, c.149A ONLY	
PROJECT NAME	<project-name>	PROJECT NO.	<project-number>	P. C. :	<Prime Contractor>
PCO NUMBER		PCO DESC.			
PCO DATE					

FORMAT FOR SUBMISSION OF CHANGE ORDER

WORK OF SUBCONTRACTOR AND/OR PRIME CONTRACTOR

NAME OF FIRM SUBMITTING CHANGE ORDER

1. DIRECT LABOR: "CONTRACTOR":

Use only DCAM-Approved Billing Rates

Applicable Billing Rate for each Trade and Classification MUST be completed!

Trade	Classification	Total Hrs. Worked	Fully Loaded Wage Rate (Per Wage Rate Approval Form) THIS FIELD IS REQUIRED	Total Direct Labor Cost (Includes All Markups as Approved by DCAMM on the Wage Rate Approval Form)
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -

TOTAL BASE, EXCESS AND DIRECT LABOR COSTS $ -

2. MATERIALS: "CONTRACTOR" :

(For extensive material lists, attach detailed backup and enter as a lump sum below)

Material Description	Qty	Unit	Cost Per Unit	Total
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -

TOTAL MATERIALS COST: $ -

DIVISION OF CAPITAL ASSET MANAGEMENT & MAINTENANCE				c.30, c.149, c.149A ONLY	
PROJECT NAME	<project-name>	PROJECT NO.	<project-number>	P. C. :	<Prime Contractor>
PCO NUMBER		PCO DESC.			
PCO DATE					

FORMAT FOR SUBMISSION OF CHANGE ORDER

WORK OF SUBCONTRACTOR AND/OR PRIME CONTRACTOR

NAME OF FIRM SUBMITTING CHANGE ORDER	

3. **EQUIPMENT: "CONTRACTOR" :**
(For extensive equipment lists, attached detailed backup and enter as a lump sum below)

Equipment Description	Qty	Unit	Cost Per Unit	Total
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -

TOTAL EQUIPMENT COST: $ -

4. **SUB TOTAL "CONTRACTOR" DIRECT COST FOR ITEMS 2 & 3:** **SUB TOTAL:** $ -

5. **MISC. LUMP SUM SERVICES (POLICE DETAIL, UTILITIES, ETC.) OR SUBCONTRACTED WORK PROVIDED TO "CONTRACTOR":**

Description of Miscellaneous Lump Sum Service - attach backup	Total
	$ -
	$ -
	$ -
	$ -
	$ -
	$ -

TOTAL MISC. LUMP SUM SERVICES COST: $ -

6. **"CONTRACTOR" ALLOWED 5% O&P Mark Up - MISC. LUMP SUM SERVICES:** **5.00%** $ -

7. **SUB TOTAL "CONTRACTOR" LINE ITEMS 4., 5. & 6.:** **SUB TOTAL:** $ -

DIVISION OF CAPITAL ASSET MANAGEMENT & MAINTENANCE				c.30, c.149, c.149A ONLY
PROJECT NAME	<project-name>	PROJECT NO.	<project-number>	P. C. : <Prime Contractor>
PCO NUMBER		PCO DESC.		
PCO DATE				

FORMAT FOR SUBMISSION OF CHANGE ORDER

WORK OF SUBCONTRACTOR AND/OR PRIME CONTRACTOR

NAME OF FIRM SUBMITTING CHANGE ORDER

8. OVERHEAD AND PROFIT OF "CONTRACTOR":

The "Contractor" shall receive 15% of actual total cost of Item 4. For a net CREDIT change order amount, use 0%

Contractor 15.00% x ITEM 4: $ -

9. TOTAL OF ITEMS 1., 7. and 8.

TOTAL COST OF WORK PERFORMED BY "CONTRACTOR" : $ -

9a. CONTRACTOR PREMIUM FOR BOND

Only allowed for "Filed Sub Contractor" if required by Page "F." of the Contract. Percentage of bond per contract or verified/approved amount:

Percentage of approved bond x item 9. 0.00% x ITEM 9: $ -

10 TOTAL COST OF WORK PERFORMED BY PRIME CONTRACTOR, including bond cost $0.00

Enter the Value of Item 10 on the Summary Sheet

NOTE:

ALL change order proposals and invoices from the PRIME CONTRACTOR AND/OR SUBCONTRACTORS must include a cover letter on company letterhead identifying the PCO number, a description of the scope of work and the total cost of the proposed change order from that company. This information must be completed by every contractor doing work created by the change.

CHANGE ORDER LOG
CONTRACT NO.: 2022-0XX
CONTRACT TITLE: JOHN SMITH PROJECT

CHANGE ORDER TYPE					DATE	INCREASE TO CONTRACT			CHANGE ORDER TYPE				AMOUNT					DATE
CO NO.	Rev. qty RQ#	Extra work EWO#	Alter-ation ALT#	Time ext. TM#	SUBMITTED to PM	co items	co subtotal	co total	Rev. qty RQ#	Extra work EWO#	Alter-ation ALT#	Time ext. TM#	Financed from contract	Funding Item	ITEM NUMBER	DESCRIPTION OF CHANGE ORDER	REASON FOR INCREASE	OF Approval
1	1																	
2-1	2																	
2-2																		
3-1	3																	
3-2																		
3-3																		
3-4																		
3-5																		
3-6																		

DIVISION OF CAPITAL ASSET MANAGEMENT & MAINTENANCE

CONTRACTOR CHANGE REQUEST NO. 0 Rev. _____

Request and Agreement For Change in The Plans And/Or Specifications And/Or Contract

Project No. _____ Contract No. _____ Project Name _____

Location _____

I. PROPOSED CHANGE

(a) Requested BY _____

(b) Proposed Scope/Description:

II. CONTRACTOR PRICE PROPOSAL

For all costs involved in this change including extensions of time herein requested, the undersigned Contractor/CM proposes to perform the work described above in accordance with the provisions of Article VII of the General Conditions and certifies that: The Change Order Request is made in good faith; The validity of the Contractor/CM/Subcontractor/supplier change requests have been verified; the supporting data is accurate and complete to the best knowledge and belief of the Contractor/CM; and the Contractor/CM actually believes DCAMM is liable for the add amount, or entitled to the deduct amount of the Change Order Request, whichever is applicable. Any attempted amendment to this form shall be interpreted as superseded by the original printed language in the executed contract documents.

Request payment be made on the basis of:

(a) _____ Predetermined lump sum total of $ _____

(b) _____ Lump sum not to exceed $ _____
(max price based on contract unit prices or negotiated agreed unit prices)

(c) _____ Time and Materials Basis Not to Exceed $ _____
(computed in accordance with Article VII of the General Conditions)

Place X beside selected proposal method and identify (add) or (deduct) which ever applies. Attach detailed estimates and breakdown for above in accordance with change order instructions. If additional time is requested, furnish an explanation with the breakdown. A claim for work performed under protest shall be submitted per (c) above.

An extension of contract time of _____ Calendar days is requested.

Contractor _____ By _____ _____
Firm Name Authorized Signature Date

III. DCAMM REVIEW *(This Section To Be Completed By DCAMM PM Team)*

(a) _____ Approved as Submitted

(b) _____ Unilaterally Approved as Adjusted
Revised Price *add / (deduct)* _____
Revised Time Extension _____ Calendar Days

(c) _____ Disapproved; Returned to Prime Contractor by _____

(d) Operating Agency letter Attached _____

(e) Resident Engineer letter Attached _____

(f) Lead Design firm letter Attached _____

IV. CONTRACT MODIFICATION *(This section To Be Completed By Project Controls)*

(a) The Original Contract Value $ _____

(b) Net Change by previously authorized Change Orders $ _____

(c) The Contract Value prior to this Change Order was $ _____

(d) The Contract Value will be *add / (deduct)* By this Change Order
in this Amount of $ _____

(e) ***The new Contract Value including this Change Order will be*** $ _____

(f) The Contract Time will be *add / (deduct)* by _____ Calendar Days

(g) The New contract Completion date is therefore revised from _____ To _____

Approval Recommended By (Initial/Date If Applicable): Deputy Director _____ Project Manager _____ Project Engineer _____

This change is in the best interest of the Commonwealth and constitutes an equitable adjustment of the Contract in compliance with Art. VII

_____ _____
DCAMM Authorized Signature Date

☐ Project Manager ☐ Deputy Director ☐ Director ☐ Deputy Commissioner

DCAMM Change Order Number _____

Form 5 REV 20191206

WEEKLY PAYROLL REPORT FORM
THE COMMONWEALTH OF MASSSCHUSETTS
DEPARTMENT OF MENTAL HEALTH

DMH Project No._____Project Name_____

Project Location _____

Name of General Contractor_____

Name of Contractor Filing Report_____

Address_____

Week Ending_____Date Work Began_____Date work completed_____

Report No._____ Check here if this is a final report

Employee Name & Address	Work Classification	Hours Worked							(A) Total Hours	(B) Hourly Base Wage	Employer Contributions			(F) [B+C+D+E] Hourly Total Wage (prev.	(G) [A*F] Weekly Total Amount
		S	M	T	W	T	F	S			(C) Health & Welfare	(D) Pension	(E) Supp. Unemp.		

NOTE: Every contractor and subcontractor is required to submit a copy of their weekly payroll records to DCR.
The undersigned states under the pains & penalties of perjury that the above provided and attached information is a true and accurate record of each person employed on the project and the hours worked and wages paid to each such employee, including payments to the referenced benefits. M.G.L. c. 149 §27B.

Authorized signature _____ Print Name_____

Print Title_____

Mail to: Department of Mental Health
Mariana G. O'Brien
167 Lyman Street
Westborough, MA 01581

Weekly Payroll Report - Revised 10/01

WEEKLY PAYROLL RECORDS REPORT & STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works construction project for which the enclosed rates have been provided. The ***Weekly Payroll Report Form*** includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the project.

In addition, every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority. This is required to be done on a weekly basis. Once collected, the awarding authority is also required to preserve those records for three years.

In addition, each such contractor, subcontractor, or public body shall furnish **to the Executive Office of Labor**, within fifteen days after completion of its portion of the work, a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

Date:_____/_____, 200_____

I,_____, _____
(Name of signatory party) (Title)

do hereby state:

That I pay or supervise the payment of the persons employed by

_____on the _____
(Contractor, subcontractor or public body) (Building or project)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty nine of the General Laws.

Signature _____

Title _____

PAYROLL & WORKFORCE REPORT CONTRACT NO.: 2022-0XX CONTRACT: JOHN SMITH PROJECT	Legend: ps Professional services claiming exemption io Independent oper. Claiming exemption rec DCR received dpr disputing payroll require. diss received letter of dissolution

Week ending	General Contractor		Sub-bidder #01		Sub-bidder #02		Sub-bidder #03		Sub-bidder #04		Sub-bidder #05		Sub-contractor non-filed #1		Sub-contractor non-filed #2		Sub-contractor non-filed #3		Sub-contractor non-filed #4							
	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF
9/13/2014																										
9/20/2014																										
9/27/2014																										
10/4/2014																										
10/11/2014																										
10/18/2014																										
10/25/2014																										
11/1/2014																										
11/8/2014																										
11/15/2014																										
11/22/2014																										
11/29/2014																										
12/6/2014																										
12/13/2014																										
12/20/2014																										
12/27/2014																										
1/3/2015																										
1/10/2015																										
1/17/2015																										
1/24/2015																										

PAYROLL & WORKFORCE REPORT
CONTRACT NO.: 2022-0XX
CONTRACT: JOHN SMITH PROJECT

Legend:
- ps Professional services claiming exemption
- io Independent oper. Claiming exemption
- rec DCR received
- dpr disputing payroll require.
- diss received letter of dissolution

Week ending	General Contractor		Sub-bidder #01		Sub-bidder #02		Sub-bidder #03		Sub-bidder #04		Sub-bidder #05		Sub-contractor non-filed #1		Sub-contractor non-filed #2		Sub-contractor non-filed #3		Sub-contractor non-filed #4						
	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF	PR	WF
1/31/2015																										
2/7/2015																										
2/14/2015																										
2/21/2015																										
2/28/2015																										
3/7/2015																										
3/14/2015																										
3/21/2015																										
3/28/2015																										
4/4/2015																										
4/11/2015																										
4/18/2015																										
4/25/2015																										

ESTIMATE NUMBER: XX Partial **ESTIMATE DATE:** 1/1/2021 **PERIOD:** From: 1/1/2021 to 2/1/2021

PROJECT NAME: 2022-0XX CONTRACT FULL NAME
LOCATION OF WORK: SOMEPLACE MENTAL HEALTH FACILITY
ADDRESS: STREET NAME, TOWN, STATE, ZIPCODE

CONTRACTOR: JOHN SMITH CONSTRUCTION, INC **VENDOR CODE:** VC xxxxxxx
ADDRESS: STREET NAME, TOWN, STATE, ZIPCODE

Basis of Award: $ 100,000.00 Contract Start Date: 1/1/2021
Award + Extras: $ 100,000.00 Original Completion Date: 2/1/2021
Revised Completion Date: 2/1/2021

Utilization To-Date: $ - **0.00% by Value** **100.00% by Time**
Retainage Held To-Date: $ - **#DIV/0!**

CONTRACT SUMMARY

	Previous Periods	Current Period	Total To-Date
UTILIZATION:	**$ -**	**$ -**	$ -
UTILIZATION NO RETAINAGE			
ACTUAL UTILIZATION:	$ -	$ -	$ -
RETAINAGE:		**$ -**	$ -
RETAINAGE RELEASED:	$ -		$ -
PAID:	$ -	$ -	$ -

MMARS FUNDING CODES (as required)

PAYMENT NO.	CODE	UTILIZED	-5%
TOTALS:		$ -	$ -

I HEREBY CERTIFY, UNDER THE PAINS AND PENALTIES OF PERJURY THAT ALL CONTRACT ITEMS FOR WHICH PAYMENT IS HEREBY REQUESTED HEREIN HAVE BEEN DELIVERED TO THE DCR AND ALL WORK FOR WHICH PAYMENT IS HEREBY REQUESTED HEREIN HAS BEEN PERFORMED ON THE BEHALF OF THE DCR.

Contractor signature here or AIA letter signature
CONTRACTOR/CONSULTANT AUTHORIZED SIGNATURE DATE

PROJECT ENGINEER SIGNATURE DATE

DIRECTOR, OEFM SIGNATURE (FOR FINAL PAYMENT ONLY) DATE

DMH CONTRACT PAYMENT REVIEW AND TRACKING FORM

Vs. 8/20/2021

PROJECT NAME: 2022-0XX CONTRACT FULL NAME
LOCATION OF WORK: SOMEPLACE MENTAL HEALTH FACILITY
PROJECT NUMBER: STREET NAME, TOWN, STATE, ZIPCODE

CONTRACTOR: JOHN SMITH CONSTRUCTION, INC

Original Contract Value: $100,000.00
Current Contract Value: $100,000.00

Notice To Proceed Date: 1/1/2021
Original Contract Completion Date: 2/1/2021
Current Completion Date: 2/1/2021
Duration: -31 Days
Current Percent Expired: 100.00%

Invoicing Details

Current Invoice No: XX Partial

	THROUGH DATE	PAID AMOUNT	RETAINAGE	UTILIZATION	%
Current Invoice	2/1/2021	$ -	$ -	$ -	0.00%
Total Prior Invoices		$ -	$ -	$ -	0.00%
Total to date	2/1/2021	$ -	$ -	$ -	0.00%

Description of work since last review

DESCRIPTION OF WORK $0.00

Contract changes and status

Amendment Description (Time, Value, etc.)	Change No.	Change in Value	% of Change	Current End Date	New Total Value	Approval Date
AWARD CONTRACT				2/1/2021	$100,000.00	1/1/2021
CO#01	1		0.0%	2/22/2021	$100,000.00	1/1/2021

Submitted by: FIRSTNAME LASTNAME, DMH PROJECT ENGINEER Date: 1/1/2021

PAYMENT SUMMARY

PROJECT NAME: 2022-0XX CONTRACT FULL NAME
LOCATION OF WORK: SOMEPLACE MENTAL HEALTH FACILITY
ADDRESS: STREET NAME, TOWN, STATE, ZIPCODE
CONTRACTOR: JOHN SMITH CONSTRUCTION, INC

start date	end date	Payment	Utilization current period	Utilization previous period	Utilization to date	5% retainage current period	retainage previous periods	retainage paid current period	retainage paid to date	retainage held to date	Paid Current Period	Previous payment Paid	Total Paid to date
1/1/2021	2/1/2021	1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		2	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		3	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		4											
		5											
		6											
		7											
		8											
		9											
		10											
		11											
		12											
		13											
		14											
		15											
		16											
		17											
		18											
		19											
		20											
		21											
		22											
		23											
		24											

Award + Extras:	$ 100,000.00
Utilization remaining:	$ 100,000.00

SUBMITTTAL LOG **- SHOP DRAWINGS AND SAMPLES**

CONTRACT NO.: 2022-0XX

CONTRACT TITLE: JOHN SMITH PROJECT

Sub-mitt NO.	DATE OF SUBMITTAL	DATE Received by PM	DATE Received by Consult.	DATE Returned by Consult.	DATE Returned by PM	Turn-around (days)	SPEC. ITEM NUMBER	DESCRIPTION OF SHOP DRAWING, SAMPLE, OR PROCEDURE WITH NAME OF VENDOR	No of pages including covers	DATE NO EXCEPTION TAKEN	DATE MAKE CORRECTIONS AS NOTED	DATE REVISE AND RESUBMIT
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
11A												

CONTRACT NO.: 2022-0XX

PROJECT NAME: John Smith Project

AGENCY: Massachusetts Department of Mental Health

REQUEST FOR INFORMATION

DATE: 00/00/2021

TO: DMH Project Engineer, first name last name

FROM: General Contractor name

RFI No.: #0xx Item or Section No - Title

REQUESTED INFORMATION:

RESPONSE:

Response prepared by (Name): _____

Signed: _____ Date: _____

RFI#0XX RFI Title

REQUEST FOR INFORMATION LOG
CONTRACT NO.: 2022-0XX
CONTRACT TITLE: JOHN SMITH PROJECT

RFI NO.	DATE OF RFI	PREPARED BY	DATE SUBMITTED by RE or update info	SPEC. ITEM NUMBER	DESCRIPTION OF REQUEST FOR INFORMATION	DATE OF RESPONSE	DESCRIPTION OF RESPONSE	Change Order No. required

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ADMINISTRATION AND FINANCE
DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE
ONE ASHBURTON PLACE, BOSTON, MA 02108

E-1 CERTIFICATE OF SUBSTANTIAL COMPLETION (M.G.L. C.30, Section 39K)

FROM AWARDING AUTHORITY: Commonwealth of Massachusetts, Division of Capital Asset Management and Maintenance

TO: General Contractor: {Company.Name}

RE: Mass. State Project No.: {Projects.Sequence} {Projects.SuffixID}
Title: {Projects.Name}
Location: {Projects.Territory}, MA

AUTHORITY: 1) ARTICLE VI of Standard Construction Contract
2) M.G.L. Chapter 30, Section 39K

Pursuant to the authority noted above you are notified that the Commonwealth of Massachusetts, through its Division of Capital Asset Management and Maintenance, is satisfied that the portion of the above noted project, as hereinafter enumerated, is substantially complete. [IDENTIFY PORTIONS TO BE USED AND/OR OCCUPIED – IF APPLICABLE]

The Commonwealth of Massachusetts, through its undersigned representatives, hereby accepts from the Contractor, subject to contract stipulation, said portion of the project effective as of Midnight the [INSERT DAY] day of [INSERT MONTH], 20[INSERT YEAR]. The Contractor is relieved of responsibility for performing further work or supplying further materials, equipment or items, with the exception of the attached. (Append a complete list of all incomplete or unsatisfactory items of contract work which in the opinion of the Commonwealth are attributable to the fault, negligence or oversight of the Contractor, his sub-contractor, material suppliers, agents, servants or employees.)

The use of any portion of the project or the occupancy of any building or portion thereof by the Commonwealth shall not constitute a final acceptance of any work not performed in accordance with the Contract, nor relieve the Contractor of liability to perform any work required by the Contract or of liabilities with respect to any warranties or guarantees required by the Contract.

The undersigned recommend the issuance of this Certificate of Substantial Completion.

		Signature	Date
Designer:	{LegalDocInfo.ArchName}	by: _____	
Operating Agency:	{LegalDocInfo.owner}	by: _____	
DCAMM Resident Engr.:	{Projects.ProjectExecutive}	by: _____	
DCAMM Project Engr.:	{Projects.ProjectExecutive}	by: _____	
DCAMM Project Mgr.:	{Projects.ProjectManager}	by: _____	

APPROVED _____
Jay Mitchell, Deputy Commissioner, Design and Construction Date

original: Operating Agency
Project Manager
Contracts Manager
Contractor (include original E1 cover letter)

ecc: Deputy Director
Project Engineer
Designer
Resident Engineer
Economist, OFA
Director of Finance, OFA
Bid Room Manager, OFA
Deputy Director, Certification

E-2 Final Acceptance
Certificate of Final Inspection, Release and Acceptance

Title: _____

Location: _____

Contractor: _____

This is to certify that a complete inspection of the above-referenced project was made on _____ by the undersigned, and that the entire work was completed in accordance with the plans and specifications. The undersigned recommends acceptance of the project.

_____ by: _____ Title: _____ Date: _____
Designer Authorized
Signature

_____ _____
Resident Engineer Date Project Manager Date

_____
Project Engineer Date

CERTIFICATE OF RELEASE

1.) The undersigned hereby certifies that all work has been completed in accordance with the plans, specifications and contract documents and that all change orders have been supported pursuant to Article VII of the General Conditions of the Contract.

2.) Contract Award Price: $ Adjusted Contract Price: $
Authorized Additions: $ Paid to Date:$
Authorized Deductions:$ Balance Due: $

3.) The undersigned further certifies that in addition to the amount set forth above, there are outstanding and unsettled the following change orders as submitted to the DCR.

Request No.	Date:	Amount:
Request No.	Date:	Amount:
Request No.	Date:	Amount:

Subject to satisfactory disposition of change orders listed in Item 3 above, the undersigned releases the Commonwealth of Massachusetts from all further claims for wages or payments to subcontractors or suppliers except: (list on attached sheet).

_____ by: _____
Contractor Authorized Signature

The above-referenced project is accepted as of _____
Date

Deputy Commissioner, Engineering
Deputy Director
Project Manager
Resident Engineer
Office of Contract Administration
Contractor

CERTIFICATE OF PAYMENT

BY CONTRACTOR/DESIGNER TO MINORITY, WOMEN BUSINESS
& VETERAN OWNED BUSINESS ENTERPRISES

TO: Supplier Diversity Reports
Department of Mental Health
Office of Engineering and Facilities Management
167 Lyman Street
Westborough, MA 01581

Reporting Period: Fiscal Year 20__

RE: Project:
Project Number:

Contract Start Date:

The undersigned hereby certifies under the pains and penalties of perjury that the vendor named below has made the following payments to the named Minority, Women Business and Veteran Owned Enterprises for work performed on the above project:

Firm Name of General Contractor:

Authorized Signature

Date

Print Name

Print Title

Phone Number

Email address

Work performed/payments made (use additional pages if needed):

	Firm Name	**Work Performed**	**Subcontract Amount**	**Payments This Quarter**	**FY Payments to date** (this fiscal year 7/1/2018 - 6/30/2019)	**Cumulative Payments** (total payments over the life of the contract)
MBE WBE VOBE			$	$	$	$
MBE WBE VOBE			$	$	$	$
MBE WBE VOBE			$	$	$	$
MBE WBE VOBE			$	$	$	$
MBE WBE VOBE			$	$	$	$
MBE WBE VOBE			$	$	$	$
MBE WBE VOBE			$	$	$	$

* MBE, WBE and VOBE payment reports are required for each quarter of the fiscal year for each of your DMH projects. Reports are to cover the following three month periods: 1st quarter, July 1st – September 30th; 2nd quarter, October 1st – December 31st; 3rd quarter, January 1st – March 31st; 4th quarter, April 1st – June 30th. Reports must be submitted within 10 business days of your receipt of this form.

NOTICE: *Intentionally submitting false information in this document may subject the contractor/ designer to criminal prosecution and/ or debarment from public contracting.*

INSTRUCTIONS FOR COMPLETING CERTIFICATE OF PAYMENT

As part of its effort to ensure reliable, up-to-date information concerning the actual payments made to certified MBE, WBE and VOBE subcontractors on all DMH projects, we have prepared these instructions to assist you in completing the enclosed form. PLEASE READ THESE INSTRUCTIONS CAREFULLY. DMH WILL RETURN ANY CERTIFICATION OF PAYMENT THAT IS INCOMPLETE OR INACCURATE.

PLEASE NOTE: IF THIS PROJECT IS COMPLETE, ON HOLD, OR YOUR FIRM PREVIOUSLY SUBMITTED A **FINAL** CERTIFICATION OF M/WBE/VOBE PAYMENT FOR THIS PROJECT, PLEASE SO INDICATE ON THE FORM AND RETURN IT TO: SUPPLIER DIVERSITY REPORTS, DEPARTMENT OF MENTAL HEALTH, OFFICE OF ENGINEERING AND FACILITIES MANAGEMENT, 167 LYMAN STREET WESTBOROUGH, MA 01581

PLEASE INCLUDE THE FOLLOWING INFORMATION IN THE DESIGNATED SECTIONS OF THE FORM:

FIRM NAME: Include the M/WBE/VOBEs listed on the project's approved Schedule For Participation and any additional M/WBE/VOBEs that worked on the project. Be sure to check M/WBE/VOBE category for which they are certified. Note that any change in M/WBE/VOBEs participation used to meet the project goals must be pre-approved by the Project Manager or Engineer responsible for this project and a revised M/WBE/VOBE Schedule of Participation will be required. Contact the DMH Supplier Diversity coordinator immediately if you anticipate or have any changes in M/WBE/VOBE participation on this project.

WORK PERFORMED: Include a brief description of the work performed by each subcontractor listed. The description should match the M/WBE/VOBE Letter of Intent and approved Schedule of Participation. M/WBE/VOBEs must be certified in the category of work performed on this project for firms used to meet the project M/WBE/VOBE goals.

SUBCONTRACT AMOUNT: Include the contract or subcontract amounts listed on the M/WBE/VOBE Letters of Intent and approved Schedule of Participation. If the value of a MBE/WBE/VOBE contract or subcontract has decreased or increased for any reason, you must contact the Project Manager or Engineer responsible for this project immediately. If additional M/WBE/VOBE firms not listed on the Schedule for Participation worked on this project list the amount of their subcontracts.

PAYMENTS THIS QUARTER: Include the amount you paid the M/WBE/VOBE subcontractor, either directly or indirectly, for work performed on this project during the three month period covered by this Certification of Payment. If the amount paid was zero, please indicate that. Do not include payments from previous periods or estimated future payments in this column. Please note that you may be required to submit copies of cancelled checks to verify the amounts reported for firms used to meet the project's M/WBE/VOBE goals.

FY PAYMENTS TO DATE: Include the total amount you paid the M/WBE/VOBE subcontractor, either directly or indirectly, for work performed on this project for all quarters in **this fiscal year**. To ensure accurate reporting, please review the prior Certifications of Payments previously submitted for this project. Where necessary, correct any earlier mathematical or reporting errors and submit revised Certifications of Payment.

CUMULATIVE PAYMENTS: Include the total amount you paid the M/WBE/VOBE subcontractor, either directly or indirectly, for work performed over the entire life of this project (all quarters).

IF YOU HAVE ANY QUESTIONS CONTACT DMH Supplier Diversity coordinator.

INSTRUCTIONS FOR COMPLETING CERTIFICATE OF PAYMENT

As part of its effort to ensure reliable, up-to-date information concerning the actual payments made to certified Sub-bidder (SB), Non Sub-bidder (NSB) and Supplier (S) subcontractors on all DMH projects, we have prepared these instructions to assist you in completing the enclosed form. PLEASE READ THESE INSTRUCTIONS CAREFULLY. DMH WILL RETURN ANY CERTIFICATION OF PAYMENT THAT IS INCOMPLETE OR INACCURATE.

PLEASE NOTE: IF THIS PROJECT IS COMPLETE, ON HOLD, OR YOUR FIRM PREVIOUSLY SUBMITTED A **FINAL** CERTIFICATION OF SB/NSB/S PAYMENT FOR THIS PROJECT, PLEASE SO INDICATE ON THE FORM AND RETURN IT TO: DEPARTMENT OF MENTAL HEALTH, OFFICE OF ENGINEERING AND FACILITIES MANAGEMENT, 167 LYMAN STREET WESTBOROUGH, MA 01581.

PLEASE INCLUDE THE FOLLOWING INFORMATION IN THE DESIGNATED SECTIONS OF THE FORM:

FIRM NAME: Include the SB/NSB/S listed on the project's approved Schedule For Participation and any additional SB/NSB/Ss that worked on the project.

WORK PERFORMED: Include a brief description of the work performed listed.

SUBCONTRACT AMOUNT: Include the contract or subcontract amounts listed.

PAYMENTS THIS QUARTER: If applicable, include the amount, either directly or indirectly, for work performed on this project during the three month period covered by this Certification of Payment. If the amount paid was zero, please indicate that. Do not include payments from previous periods or estimated future payments in this column.

FY PAYMENTS TO DATE: Include the total amount you paid, either directly or indirectly, for work performed on this project for all quarters in **this fiscal year**. To ensure accurate reporting, please review the prior Certifications of Payments previously submitted for this project. Where necessary, correct any earlier mathematical or reporting errors and submit revised Certifications of Payment.

CUMULATIVE PAYMENTS: Include the total amount you paid, either directly or indirectly, for work performed over the entire life of this project (all quarters).

IF YOU HAVE ANY QUESTIONS, CONTACT DMH OFFICE OF ENGINEERING AND FACILITIES MANAGEMENT.

CERTIFICATE OF PAYMENT

BY CONTRACTOR/DESIGNER
to Sub-Bidder(s), Non-Sub-bidder(s), and Supplier(s)

TO: Department of Mental Health
Office of Engineering and Facilities Management
167 Lyman Street
Westborough, MA 01581

Reporting Period: Fiscal Year 20__

RE: Project:
Project Number:

Contract Start Date:

The undersigned hereby certifies under the pains and penalties of perjury that the vendor named below has made the following payments to the named SB, NSB, AND S companies for work performed on the above project:

Firm Name of General Contractor:

Authorized Signature

Date

Print Name

Print Title

Phone Number

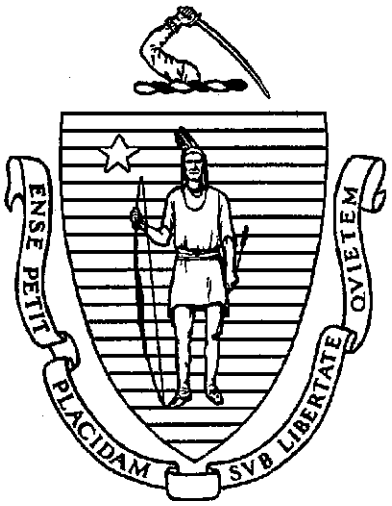
Email address

Work performed/payments made (use additional pages if needed):

	Firm Name	**Work Performed**	**Subcontract Amount**	**Payments This Quarter**	**FY Payments to date** (this fiscal year 7/1/2018 - 6/30/2019)	**Cumulative Payments** (total payments over the life of the contract)
SB NSB S			$	$	$	$
SB NSB S			$	$	$	$
SB NSB S			$	$	$	$
SB NSB S			$	$	$	$
SB NSB S			$	$	$	$
SB NSB S			$	$	$	$
SB NSB S			$	$	$	$

* Sub Bidder (SB), Non Sub-Bidder (NSB), and Supplier (S) payment reports are required for each quarter of the fiscal year for each of your DMH projects. Reports are to cover the following three month periods: 1st quarter, July 1st – September 30th; 2nd quarter, October 1st – December 31st; 3rd quarter, January 1st – March 31st; 4th quarter, April 1st – June 30th. Reports must be submitted within 10 business days of your receipt of this form.

NOTICE: *Intentionally submitting false information in this document may subject the contractor/ designer to criminal prosecution and/ or debarment from public contracting.*



BID PACKAGE

PART IV

PROJECT SPECIFICATIONS

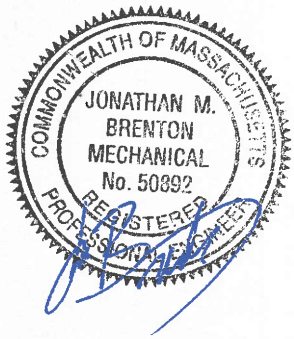
DMH PROJECT #2022-031A
COOLING TOWER REPLACEMENT
S.C. FULLER MENTAL HEALTH CENTER
85 EAST NEWTON STREET
BOSTON, MA 02118

MASSACHUSETTS DEPARTMENT OF MENTAL HEALTH

SPECIFICATIONS FOR

SOLOMON CARTER FULLER
MENTAL HEALTH CENTER
COOLING TOWER REPLACEMENT

January 14, 2022



Jonathan Brenton
Mechanical Engineer

Nicola Ferzacca
Electrical Engineer

Gunadi Karjadi
Structural Engineer

SPECIFICATIONS

MGL CHAPTER 149 - DESIGN-BID-BUILD PROJECTS

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DIVISION 08 - OPENINGS

Not Used

DIVISION 09 - FINISHES

Not Used

DIVISION 10 - SPECIALTIES

Not Used

DIVISION 11 - EQUIPMENT

Not Used

DIVISION 12 - FURNISHINGS

Not Used

DIVISION 14 - CONVEYING EQUIPMENT

Not Used

DIVISION 21 - FIRE SUPPRESSION

Not Used

DIVISION 22 - PLUMBING

Not Used

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

Section 23 00 00 Heating, Ventilating and Air-Conditioning (Mechanical Contractor as General Contractor)

DIVISION 26 - ELECTRICAL

Section 26 00 01 Electrical Systems (filed sub-bid)

DIVISION 27 – COMMUNICATIONS

Not Used

DIVISION 31 - EARTHWORK

Not Used

DIVISION 32 - EXTERIOR IMPROVEMENTS

Not Used

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SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of Article V of the CONTRACT AND GENERAL CONDITIONS.

C. All referenced to DCAMM or the Division of Capital Asset Management and Maintenance as the Owner of the building shall be consider to be DMH or the Department of Mental Health.

1.2 REQUIREMENTS INCLUDED

A. Work under this Contract.

B. Examination of Site and Documents.

C. General Contractor’s Qualifications.

D. Contract Method.

E. Work Sequence.

F. Supervision of Work.

G. General Contractor’s Use of Premises.

H. Coordination.

I. Field Engineering.

J. Reference Standards.

K. Preconstruction Conference.

L. Project Meetings.

M. Permits, Inspection, and Testing Required by Governing Authorities.

N. Cutting, Coring, Patching, Unless Otherwise Indicated.

O. Debris Removal.

P. Field Measurements.

Q. Safety Regulations.

R. OSHA Safety and Health Course Documentation.

S. Damage Responsibility.

T. Owner Furnished Products.

U. User Agency Occupancy.

V. Asbestos and Hazardous Materials Discovery.

W. Special Requirements.

X. List of Drawings.

1.3 WORK UNDER THIS CONTRACT

A. The work to be done under this contract consists of executing and completing all work required for this project. The scope below is listed for reference purposes and is not all inclusion.
   1. Solomon Carter Fuller Mental Health Center 85 E Newton St, Boston, MA 02118.
      a. The mechanical scope consists primarily of the replacement of two (2) cooling towers. The existing open cell cooling towers will be removed and replaced. New PP-RCT piping will be provided, including a new dirt separator. New DDC controls will be provided for all equipment and connected to the existing campus front end building management system and provided with new graphics, trending, alarms, etc.
         1) A new free cooling heat exchanger will be provided and connected to existing chilled water and condenser water piping.
         2) New control valves will be provided for the existing chillers.
         3) The existing condenser water pumps will be replaced.
         4) One (1) existing chilled water pump will be replaced.
         5) All work will occur in a phased approach.
         6) New steel dunnage will be provided for the new cooling towers.

B. The work will include all operations necessary to deliver the building(s) and ancillary on and off site amenities in a fully installed and operable condition including all utility and site work and obtaining all necessary licenses, permits, and certificates. Where utilities exist within and

adjacent to the building(s) and ancillary parking lots, and are known by the Owner, they have been shown on the site plan(s) appearing in, but not restricted to, the exhibits. Connections to these existing utility lines will be the responsibility of the General Contractor.

C. The scope of work, without limiting the generality thereof, includes all labor, materials, equipment and services required to perform the work described fully in the Drawings and Specifications and includes, but is not limited to the following major work:
1. Masonry and concrete work.
2. Carpentry, waterproofing, dampproofing, caulking.
3. Roofing.
4. Doors and windows.
5. Interior finishes.
6. Mechanical and electrical.
7. Sitework and utilities work.

D. Reference To Drawings: The work to be done under this Contract is shown on the Drawings listed at the end of this Section.

E. Work will include all demolition and new construction including underground and overhead utilities, HVAC work, plumbing work, and electrical work as required. The General Contractor will provide a schedule for completion of the project to the Owner within the required construction period.

F. The Massachusetts Standard Labor Wage rates, as outlined in the exhibits, will be used in the construction of this project.

1.4 EXAMINATION OF SITE AND DOCUMENTS

A. A pre-bid conference will be held at the job site on the date and at the time indicated in the Invitation to Bid.

B. Bidders shall visit the site on a non-holiday weekday acceptable to the Owner and the Owner's Project Manager, between the hours of 9:00 AM and 3:00 PM to visually inspect the location of the work and existing conditions that may affect new work.

C. The bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which the work is to be carried out. The Commonwealth will not be responsible for errors, omissions, and/or charges for extra work arising from the General Contractors or Subcontractors failure to familiarize themselves with the contract documents. The General Contractor and Subcontractor acknowledge that they are familiar with the conditions and requirements of the contract documents where they require, in any part of the work a given result to be produced, and that the contract documents are adequate and will produce the required results.

D. Contact:
Gerald McCullough MSME , DMH—Project Engineer
Office of Engineering and Facilities Management

Central Office
167 Lyman Street
Westborough, MA 01581
Office -508-616-2248
Cell ---617-571-5254

1.5 GENERAL CONTRACTOR'S QUALIFICATION

A. The General Contractor must be currently certified by the Division of Capital Asset Management and Maintenance (DCAMM) for Mechanical Systems.

B. The General Contractor shall certify in writing that he has successfully performed on at least three new construction projects of equivalent size and complexity.

C. It is the Bidder's responsibility to obtain the necessary forms from DCAMM and make application to DCAMM not less than three weeks prior to advertised bid opening for DCAMM to evaluate the application and issue a Certificate of Eligibility.

D. The General Contractor's Updated Statement is not a public record as defined in M.G.L., Chapter 4, Section 7, and will not be open to public inspection.

1.6 CONTRACT METHOD

A. Work under this contract shall be lump sum price, for the scopes of work as described in these specifications and shown on the Drawings.

1.7 WORK SEQUENCE

A. The Work will be conducted in the following sequence of demolition/construction:
   1. Cooling Tower Installation
      a. Work shall commence immediately following the notice to proceed.
      b. Work must be phased to eliminate downtime of systems.
         1) Demolish and remove existing cooling tower CT-2.
         2) Install new cooling tower CT-2 and all associated piping, controls, power, etc.
         3) Replace existing condenser water pumps in a phased approach.
         4) Connect new cooling tower CT-2 to new condenser water pumps.
         5) Perform startup and testing of CT-2
         6) Demolish and remove existing cooling tower CT-1. One month of successful runtime on CT-2 must be obtained before demolition of CT-1 can begin.
         7) Install new cooling tower CT-1 and all associated piping, controls, power, etc.
         8) Connect new cooling tower CT-1 to new condenser water pumps.
         9) Install and pipe free cooling heat exchanger.

10) Replacement of chilled water pump must occur after October 15th or after the building chillers have been shutdown, which ever occurs later.

2. Shop drawings for all long lead items, including the boilers, water heaters, pumps, and controls shall be submitted seven (7) calendar days after the Notice to Proceed
3. Refer to Division 00 for substantial completion dates.

1.8 SUPERVISION OF WORK

A. The General Contractor shall be held directly responsible for the correct installation of all work performed under this Contract. The General Contractor must make good repair, without expense to the Owner, of any part of the new work, or existing work to remain, which may become inoperative on account of leaving the work unprotected or unsupervised during construction of the system or which may break or give out in any manner by reason of poor workmanship, defective materials or any lack of space to allow for expansion and contraction of the work during the General Contractor's warranty period, from the date of final acceptance of the work by the Owner.

B. The General Contractor shall furnish a competent Massachusetts licensed superintendent satisfactory to the Owner's Project Manager and to the Designer. The licensed superintendent 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.

1. Submit the name and resume of the superintendent for approval to the Owner's Project Manager. Include experience with projects of equal size and complexity.

1.9 GENERAL CONTRACTOR'S USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated within the construction fence shown on the site drawing(s). Coordinate work of all Subcontractors required outside the construction fence boundary shown on the site drawing(s). Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public (if applicable).
2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Schedule and perform work to afford minimum of interruption to normal and continuous operation of utility systems. The General Contractor shall submit to the Owner and the Designer for approval, proposed schedule for performing work; including construction of new utilities, re-routing of existing utilities and final connection of new work to existing work. Schedule shall indicate shutdown time required for each operation.

1. Work includes checking all safety devices to verify that they have come back on-line after interruption. This requirement will not be waived.

C. The General Contractor shall notify the Owner and Operating Agency in writing, 72 hours in advance of the proposed time for shutting down or interrupting any utilities, services or facilities which may affect the operation of other buildings, services or facilities of the Operating Agency.

D. Coordinate with the Owner and the Designer, work in connection with adjacent driveways, walks, or other facilities which would prevent access thereto or interrupt, restrict, or otherwise infringe upon the Operating Agency's use thereof.

E. The General Contractor shall be aware of the sensitivity of the neighborhood organizations to noise, dust, debris, vibration, and site maintenance and take appropriate precautions to avoid conflict.

F. Damage to existing work, if caused by the General Contractor's operations under this Contract, shall be repaired at the General Contractor's expense.

1. An existing conditions survey shall be conducted, with the Designer, the Owner's Project Manager, and User Agency representatives, at which existing conditions will be videotaped by the General Contractor. A copy of the videotape will be provided to the Owner's Project Manager.

G. Trenching and other work outside construction limits shall be expedited to fullest extent and carried out with minimum of inconvenience to normal operation of the Operating Agency and public traffic. Walks, paved or landscaped areas over which temporary driveways cross, shall upon completion of the work, be restored to their original condition. Temporary roadways shall be bridged over trenched areas. Filing is required for a trench permit.

H. The General Contractor can gain access to the premises during the hours specified below. In addition, the General Contractor and his personnel will limit themselves only within the working premises during working hours. If work needs to be scheduled during times other than those listed below, General Contractor shall inform the Owner's Project Manager one week prior to work.

1. Deliveries: 7:00am to 3:00pm
2. General Access: 7:00am to 3:00pm

I. Confine operations at the site to areas permitted by:

1. Laws
2. Ordinances
3. Permits
4. Contract Documents
5. Owner's Regulations

J. If required by User Agency or the Owner's Project Manager, workers will be required to wear identifying name badges. In secure areas, submit names of workers for clearing by the Owner's Project Manager.

K. General Contractor shall supervise the use of the site related to construction and be responsible for correcting any damage identified by the Owner's Project Manager to the Owner's Project Manager's satisfaction.

1. An existing conditions survey shall be conducted, with the Designer, The Owner's Project Manager, and User Agency representatives, at which existing conditions will be videotaped by the General Contractor. A copy of the videotape will be provided to the Owner's Project Manager.

L. All available existing utilities adjacent to the construction site will be available for use during construction unless indicated otherwise. Temporary connections to these utilities, all metering, transformers, removal, usage, and their associated costs will be the responsibility of the appropriate Subcontractor.

M. The General Contractor shall verify that Subcontractors have visited the site and included all costs associated with the location of the project, and any restriction or limitations the location of the project may pose.

N. The Subcontractors shall at all times conduct their operations in a courteous, professional manner while on the project or in the vicinity of the project. Harassment, offensive language or behavior will not be permitted on the site.

1.10 COORDINATION

A. The General Contractor shall be responsible for the proper fitting of all the work and for the coordination of the operations of all Subcontractors or material and persons engaged upon the work. The General Contractor shall do, or cause his agents to do, all cutting, fitting, adjusting, and repair necessary in order to make the several parts of the work come together properly.

1. Examine Contract Documents in advance of start of construction and identify in writing questions, irregularities or interference to the Owner's Project manager in writing. Failure to identify and address such issues in advance becomes the sole responsibility of the General Contractor. A conflict that would cause the reduction of the normal ceiling height of any occupied space is considered to be an interference.

B. Execute the work in an orderly and careful manner with due regard to the occupants of the facility, the public, the employees, and the normal function of the facility.

C. The work sequence shall follow planning and schedule established by the General Contractor as approved by the Designer and the Owner's Project Manager. The work upon the site of the project shall commence promptly and be executed with full simultaneous progress. Work operations which require the interruption of utilities, service, and access shall be scheduled so as

to involve minimum disruption and inconvenience, and to be expedited so as to insure minimum duration of any periods of disruption or inconvenience.

D. The General Contractor shall review the tolerances established in the specifications for each type of work and as established by Subcontractor organizations. The General Contractor shall coordinate the various Subcontractors and resolve any conflicts that may exist between Subcontractor tolerances without additional cost to the Owner. The General Contractor shall provide any chipping, leveling, shoring or surveys to ensure that the various materials align as detailed by the Designer and as necessary for smooth transitions not noticeable in the finished work.

1.11 FIELD ENGINEERING

A. Provide field engineering services; establish grades, lines and levels, by use of recognized engineering survey practices. All field engineering surveying shall be performed by a licensed Land Surveyor registered in the Commonwealth of Massachusetts.

B. The General Contractor shall survey and submit exact dimensional layouts as required. Engage and pay for the services of a Massachusetts Registered Surveyor acceptable to the Owner's Project Manager to locate and protect control and reference points.

1.12 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements for the standard, except where more rigid requirements are specified or are required by codes. Refer to Section 01 42 00 - REFERENCES.

B. Where reference is made in the Contractual Documents to Publications and Standards issued by Associations or Societies, the intent shall be understood to specify the current edition of such Publications or Standards (including tentative revision) in effect on the date of the contract advertisement notwithstanding any reference to a particular date.

1.13 PRE-CONSTRUCTION CONFERENCE

A. In accordance with Article V of the CONTRACT AND GENERAL CONDITIONS, a pre-construction conference to review the work will be conducted by the Owner's Project Manager.

B. Representatives of the following shall be required to attend this conference:
1. Owner
2. Owner's Project Manager
3. Designer
4. General Contractor
5. All Subcontractors

C. The General Contractor shall have a responsible representative at the pre construction conference to be called by the Owner's Project Manager following the award of the contract, as well as representatives of field or office forces and major Subcontractors. All such representatives shall have authority to act for their respective firms. The pre-construction conference is to be held within five days of Notice to Proceed, or as otherwise determined by the Owner.

1.14 PROJECT MEETINGS

A. Project meetings shall be held on a weekly basis and as required subject to the discretion of the Owner's Project Manager.

B. As a prerequisite for monthly payments, ordering schedules, shop drawing submitted schedules, and coordination meeting schedules shall be prepared and maintained by the General Contractor and shall be revised and updated on a monthly basis, and a copy shall be submitted to the Owner's Project Manager and Designer.

C. In order to expedite construction progress on this project, the General Contractor shall order all materials immediately after the approval of shop drawings and shall obtain a fixed date of delivery to the project site for all materials ordered which shall not impede or otherwise interfere with construction progress. The General Contractor shall present a list and written proof of all materials and equipment ordered (through purchase orders). Such list shall be presented at the meetings and shall be continuously updated.

D. Scheduling shall be discussed with all concerned parties, and methods shall be presented by the General Contractor, which shall reflect construction completion not being deferred or foreshortened. Identify critical long-lead items and other special scheduling requirements. The project schedule is to include time for submission of shop drawing submittals, time for review, and allowance for resubmittal and review.

E. Project meetings shall be chaired by the Designer.

F. Minutes of the project meetings shall be prepared by the Designer and shall be distributed to all present. The Designer's meeting minutes shall be the only official meeting record.

1.15 PERMITS, INSPECTION, AND TESTING REQUIRED BY GOVERNING AUTHORITIES

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having any jurisdiction require any portion of the Work to be inspected, tested, or approved, the General Contractor shall give the Designer, the Owner's Project Manager or his/her designated representative, and such Authority timely notice (5 business days' minimum) of its readiness so the Designer may observe such inspecting, testing, or approval.

B. Prior to the start of construction, the General Contractor shall complete application to the applicable Building Code enforcement authority for a Building Permit. Such Permit shall be displayed in a conspicuous location at the project site.

C. Unless otherwise specified under the Sections of the Specifications, the General Contractor shall pay such proper and legal fees to public officers and others as may be necessary for the due and faithful performance of the work and which may arise incidental to the fulfilling of this Contract. As such, all fees, charges, and assessments in connection with the above shall be paid by the General Contractor

D. The General Contractor shall maintain at the site, for the duration of construction operations, at least one (1) up-to-date copy of all relevant codes and standards listed in the Contract Documents or determined to be applicable to the work. One (1) copy of such codes shall be for the exclusive use of Owner's Project Manager and the Designer and its Consultants, and shall be kept in the General Contractor's site office.

E. The General Contractor shall furnish and install all information required by the building official and shall secure the general building permit for the work promptly on award of the Contract. The General Contractor shall conform to all conditions and requirements of the permit and code enforcement authority. The General Contractor shall provide names and license numbers of its responsible representatives to complete the application for permit, and shall receive the permit and promptly distribute copies to the Owner's Project Manager and the Designer.

F. General Contractor and specialized Subcontractors as applicable shall identify all permits (other than general building permit) required from Authorities having jurisdiction over the Project for the construction and occupancy of the work. The General Contractor shall prepare the necessary applications and submit required plans and documents to obtain such permits in a timely manner, and shall furnish the required information to the Building Official and obtain the required permits as early as practicable after award of the Contract.

1. The General Contractor shall display all permit cards as required by the Authorities, and shall deliver legible photocopies of all permits to Owner's Project Manager and the Designer promptly upon their receipt.
2. The General Contractor shall arrange for all inspections, testing and approvals required for all permits, and shall notify the Designer and Owner's Project Manager of such inspections at least three (3) business days in advance (longer if so required in the various Sections of the Specifications), so they may arrange to observe.
3. The General Contractor shall comply with all conditions and provide all notices required by all permits.
4. The General Contractor shall perform and/or arrange for and pay all testing and inspections required by the Governing Codes and Authorities, other than those provided by the Owner, and shall notify the Designer and Owner's Project Manager of such inspections at least three (3) business days in advance of all such testing or inspection, so they may arrange to observe.
5. Where Inspecting Authorities require corrective work for conformance with applicable Codes and Authorities, the General Contractor shall promptly comply with such requirements, except in cases where such requirements clearly exceed the requirements of the Contract Documents, in which case the General Contractor shall proceed in accordance with the procedures for modifications or changes in the work established in the Contract Documents, as amended.

1.16 CUTTING, CORING, AND PATCHING, UNLESS OTHERWISE INDICATED

A. The General Contractor shall coordinate all cutting, coring, fitting and patching of the work that may be required to make its several parts come together properly and fit it to receive or be received by work of the Subcontractors shown on the Drawings and Specifications. The Subcontractor shall perform all cutting, coring or patching.

B. The General Contractor shall coordinate that the work of the Subcontractor is not endangered by any cutting, coring, excavating, or otherwise altering of the work and shall not allow the cutting or altering the work of any Subcontractor except with the written consent of the Designer.

C. Submit a written request to Designer well in advance of executing any cutting or alteration which affects:

1. Work of Owner or separate Contractor.
2. Structural value or integrity of any element of the Project.
3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. Efficiency, operational life, maintenance, or safety of operational elements.
5. Visual qualities of sight-exposed elements.
6. Request shall include:
    a. Identification of the Project.
    b. Description of affected work.
    c. The necessity for cutting, alteration, or excavation.
    d. Effect on work of Owner or any separate General Contractor, or on structural or weatherproof integrity of Project.
    e. Description of proposed work:
    f. Alternatives to cutting and patching.
    g. Cost proposal, when applicable.
    h. Written permission of any separate General Contractor whose work will be affected.
7. Should conditions of Work or the schedule indicate a change of products from original installation, General Contractor shall submit request for substitution.
8. Submit written notice to Designer designating date and time the work will be uncovered a minimum of three business days in advance.

D. Performance:

1. Execute cutting and patching by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
    a. In general, where mechanical cutting is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.
    b. Comply with the requirements of Section 31 22 00 - EARTHWORK where cutting-and-patching requires excavating and backfilling.
    c. Prior to cutting and structural steel or concrete work, contact Designer and Project Structural Engineer in writing. Do not cut any structural steel and concrete work until approval has been granted by the Designer and the Project Structural Engineer.

2. Employ original installer or fabricator to perform cutting and patching for:
   a. Weather-exposed or moisture-resistant elements.
   b. Sight-exposed finished surfaces.
3. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
4. Restore work which has been cut or removed; install new products matching existing to provide completed Work in accordance with requirements of Contract Documents.
5. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
6. Patch with seams which are durable and as invisible as possible. Flash and seal all penetration of exterior work. Comply with specified tolerances for the work.
7. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching.
   a. Where patch occurs in a smooth painted surface, extend final paint coat over the entire unbroken surface containing the patch.
8. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
   a. For continuous surfaces, refinish to nearest intersection.
   b. For an assembly, refinish entire unit.

E. Existing Utilities Services:

1. Interruptions to critical existing utility services will not be allowed.
   a. Sanitary sewer, storm drainage, and water changeovers as affecting existing services shall be done with no disruptions of existing services and scheduling of such work will require approval in writing by the User Agency.
   b. All relocation of existing electrical, telephone, and gas services that are utility company owned shall be performed by the respective utility company, and the cost of any charges for such work shall be paid by the General Contractor. All utility installations and relocation shall be the responsibility of the General Contractor. Coordination of all of the aforesaid work is the responsibility of the General Contractor.
2. The General Contractor shall locate and record on Drawings all existing utilities along the course of the work by such means as the Designer and the Owner's Project Manager may approve, and shall preserve such marked locations until the work has progressed to the point where the encountered utility is fully exposed and protected as required. It shall be the General Contractor's responsibility to notify the proper authorities and/or utility company before interfering therewith.
3. Existing utilities that are indicated on the Drawings or whose locations are made known to the General Contractor prior to excavations, though accuracy and information as to grades and elevations may be lacking, shall be protected from damage during the excavation and backfilling operations and, if damaged by the General Contractor, it shall be repaired by the General Contractor at his/her own expense.
4. All exposed conduits, wires, and/or cables shall be provided with sufficient protection and support to prevent failure, fraying, or damage due to backfilling or other construction operations.
5. The General Contractor shall not obstruct access to existing active utility system manholes and catch basins which continue to serve facilities other than the project construction site. The General Contractor shall exercise measures as necessary to prevent the placement of impediments that limit continuous access by authorized utility company

or User Agency maintenance personnel and shall be required to reimburse the utility company or User Agency for any expense incurred as a result of need to remove any such impediments to access.

F. Dig-Safe:

1. Within the Commonwealth, "Dig-Safe" (Dig Safe Systems, Inc.) is the name of the Utility Underground Plant Damage Prevention Authority. They are located at 331 Montvale Avenue; Woburn, MA 01801. The telephone number is 1-888-DIGSAFE (344-7233). General Contractors must notify "Dig-Safe" of contemplated excavation, demolition, or explosive work in public or private ways, and any utility company right-of-way easement. Notification must be made at least seventy-two (72) hours prior to the work, but not more than sixty (60) days before the contemplated work.
2. The Owner requires that notification be sent to "Dig-Safe" by certified mail with copies to the Designer and the Owner's Project Manager. The Owner requires a copy of the signed receipt of delivery.
3. "Dig-Safe" is required to respond to the notice within seventy-two (72) hours from the time said notice is received by designating at the locus the location of pipes, mains, wires, or conduits.
4. General Contractors shall not commence with work until "Dig-Safe" has responded as noted above.
5. Prior to the "Dig-Safe" notification, the Owner requires General Contractors to provide their Superintendent with current "Dig-Safe" regulations, and a copy of Massachusetts General Laws, Chapter 82, Section 40.

1.17 DEBRIS REMOVAL

A. The General Contractor shall coordinate the removal of all demolition and construction waste by the Subcontractor from the job site on a daily basis. Waste shall be segregated for recycling. Comply with requirements of Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

B. Debris shall be legally disposed of in a D.E.P. approved disposal site. The site to be used shall be submitted to and approved by the Owner's Project Manager prior to the start of construction. All required dumping permits shall be obtained prior to start of construction. General Contractor shall submit receipts from the disposal site(s) as evidence of legal disposal. The Subcontractor shall pay the cost of any charges for debris removal.

C. The General Contractor shall bear responsibility for maintaining the building and site clean and free of debris, leaving all work in clean and proper condition satisfactory to the Owner and the Designer. The General Contractor shall ensure that each of the Subcontractors clean up during and immediately upon completion of their work. Clean up includes the following tasks:

1. Remove all rubbish, waste, tools, equipment, appurtenances caused by and used in the execution of work.

D. Prevent the accumulation of debris at the construction site, storage areas, parking areas, and along access roads and haul routes.

E. Provide containers for deposit of debris and schedule periodic collection and disposal of debris.

F. Prohibit overloading of trucks to prevent spillage on access and haul routes.

G. The General Contractor shall be responsible for proper disposal of all construction debris leaving the site.

1.18 FIELD MEASUREMENTS

A. Although care has been taken to ensure their accuracy, the dimensions shown for existing items and structures are not guaranteed. It is the responsibility of the General Contractor to verify these dimensions in the field before fabricating any construction component. No claims for extra payment due to incorrect dimensions will be considered by the Commonwealth.

1.19 SAFETY REGULATIONS

A. This project is subject to compliance with Public Law 91 596 "Occupational Safety and Health Act" latest edition (OSHA 29 CFR 1926), with respect to all rules and regulations pertaining to construction, including Volume 36, numbers 75 and 105, of the Federal Register, as amended, and as published by the U.S. Department of Labor.

B. Submit the name of the General Contractor's safety officer to the Owner’s Project Manager. Submit copies of safety reports to the Owner’s Project Manager monthly.

C. All accident reports are to be transmitted to the Resident Engineer within 24 hours of occurrence.

1.20 OSHA SAFETY AND HEALTH COURSE DOCUMENTATION

A. OSHA Safety and Health Course Documentation Records: Chapter 306 of the Massachusetts Acts of 2004 requires that everyone employed at the jobsite must complete a minimum 10-hour long course in construction safety and health approved by the U.S. Occupational Safety and Health Administration (OSHA) prior to working at the jobsite. Compliance is required of General Contractors’ and Subcontractors’ on-site employees at all levels whether stationed in the trailer or working in the field. Unless the Massachusetts Attorney General’s office indicates otherwise, this requirement does not apply to home-office employees visiting the site or to suppliers’ employees who are making deliveries.

B. Documentation records shall be initially compiled by the General Contractor and Subcontractors as part of their certified payrolls, and the General Contractor shall create and maintain a copy of the documentation on site at all times. On-site documentation shall be filed in alphabetical order and immediately available to Owner’s Project Manager and OSHA

inspectors. Fines imposed for non-compliance shall be promptly paid by the General Contractor at no additional expense to the Owner. Delays in the progress of the Work caused by such non-compliance will not be acceptable as the basis for an extension of contract time or change order request.

1.21 DAMAGE RESPONSIBILITY

A. The General Contractor shall repair, at no cost to the Owner, any damage to building elements, site appurtenances, landscaping, utilities, etc. caused during demolition operation and work of this Contract.

1.22 OWNER FURNISHED PRODUCTS

A. Products indicated “N.I.C.” (Not in Contract), or “E. O.” (Equipment by Owner), or “O.F.O.I.” (Owner Furnished Owner Installed), or other similar acronyms as defined in the contract documents will be furnished and installed by the Owner. Coordination and provision of service lines for such products shall be included under these Construction Contract Documents, if indicated. Final connections from service lines to equipment will be by the Owner, unless otherwise indicated

1.23 OCCUPANCY

A. Beneficial Use and Occupancy: Refer to requirements in Section 01 77 00 - CONTRACT CLOSEOUT, Par. 1.6.

B. Use and Occupancy: When the project is Substantially Complete (with all work affecting health, safety, and function totally completed, and with less than one percent (<1%) of the contract value remaining) and ready for Use and Occupancy as determined by the Designer, the Owner will take control of their building area(s) and be responsible for operating costs and security.

1.24 ASBESTOS AND HAZARDOUS MATERIALS DISCOVERY

A. If unanticipated asbestos-containing materials or other Hazardous Materials not included in Contract are discovered at any time during the course of work, the General Contractor shall cease work in the affected areas only and continue work in other areas, at the same time notify the Owner and the Designer of such discovery. Do not proceed with work in such affected areas until written instructions are received. If removal is required, payment will be made in accordance with the contract unit prices bid for each respective material. In the absence of unit prices, costs shall be negotiated or otherwise established prior to commencement of removal, in accordance with provisions of the Contract.

1.25 SPECIAL REQUIREMENTS

A. The General Contractor shall prepare a Health and Safety Plan that addresses protection of employee and public health and safety. The minimum contents of the Plan are specified in Section 01 33 00 – SUBMITTAL REQUIREMENTS.

B. The General Contractor shall be solely responsible for implementing the procedures specified in the Plan.

C. The General Contractor shall make available complete sets of personal protective equipment and clothing to the Owner for use during site observations/inspections by the Owner's Project Manager and the Designer. These shall be supplied and maintained at no cost to the Owner, Owner's Project Manager, or the Designer, and shall be returned to the General Contractor upon the completion of work, except for disposable protective clothing.

1. The General Contractor shall provide a repository for collection and disposal of health and safety materials. Collection and disposal of contaminated disposable supplies shall be at no additional cost.

1.26 LIST OF DRAWING

	Cover sheet
S-101	ROOF PARTIAL PLAN
S-102	SECTION AND DETAILS
D-200	GENERAL PENTHOUSE DEMOLITION PLAN
M-000	MECHANICAL LEGEND, NOTES, & ABBREVIATIONS
MD-200	MECHANICAL PENTHOUSE DEMOLITION PLAN
M-200	MECHANICAL PENTHOUSE PLAN
M-600	MECHANICAL DETAILS
M-601	MECHANICAL DETAILS 2
M-700	MECHANICAL SCHEDULES
E-000	ELECTRICAL LEGEND, NOTES, & ABBREVIATIONS
ED-300	ELECTRICAL POWER PENTHOUSE DEMOLITION PLAN
E-300	ELECTRICAL POWER PENTHOUSE PLAN
E-301	ELECTRICAL POWER 10TH FLOOR PLAN
E-600	ELECTRICAL DETAILS 2
E-700	ELECTRICAL SCHEDULES

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Without limitations, coordination will include Critical Path Method Scheduling (CPM), coordination of submittals, coordination of all elements of the Work, and coordination of contract closeout.

B. Description:

1. Coordinate scheduling, submittals, and work of the various Subcontractors and elements of the Work to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.
2. Coordinate sequence of the Work to accommodate User Agency Partial (Beneficial) Occupancy.

C. Meetings:

1. In addition to progress meetings, hold coordination meetings and pre-installation conferences with personnel and Subcontractors to assure coordination of the Work. The coordination meetings are to be separate from the commissioning or commissioning meetings under Section 01 81 00 – COMMISSIONING.

D. Coordination of Submittals:

1. Schedule and coordinate submittals.
2. Coordinate work of various Subcontractors having interdependent responsibilities for installing, connecting to, and placing in service such equipment.
3. Coordinate requests for substitutions to assure compatibility of space, of operating elements, and effect on work of other Subcontractors,

E. Coordinate all activities associated with commissioning activities and the work of the Test Technician.

F. Commissioning:

1. A systematic process of ensuring that all building systems perform interactively according to the Designer's design intent and the User Agency's operational needs. This is to be achieved through actual verification of systems performance during the construction period by the Owner's consultant under Section 018100 - COMMISSIONING.
2. The commissioning process does not take away from, or reduce the responsibility of, the General Contractor and installing Subcontractors to provide a finished and fully functioning product.
3. The contractor shall provide all necessary documents and coordination required for the CX process to the Owner's Commissioning Agent (CA) to complete the commissioning process as outlined in Section 01 81 00 - COMMISSIONING.

1.3 COORDINATION DUTIES

A. Coordinate the work of the Mechanical and Electrical Subcontractors:

1. For temporary utilities.
2. Among the work of the mechanical and electrical Subcontractors.
3. Among the work of all other Subcontractors, including the mechanical and electrical Subcontractors.

B. Coordinate the schedule of Mechanical and Electrical Subcontractors:

1. Verify timely deliveries of products for installation by other Subcontractors.
2. Verify that labor and materials are adequate to maintain schedules.

C. Conduct conferences among Mechanical and Electrical Subcontractors and other concerned parties, as necessary to:

1. Maintain coordination and schedules.
2. Resolve matters in dispute.

D. Participate in all project meetings:

1. Report progress of all mechanical and electrical work.
2. Recommend needed changes in schedules.
3. Transmit minutes of meetings to mechanical and electrical Subcontractors, as appropriate.
4. Commissioning meetings.

E. Temporary Utilities:

1. Coordinate installation, operation, and maintenance, to verify compliance with project requirements and with Contract Documents.

F. Shop Drawings, Product Data and Samples:

1. Prior to submittal, review for compliance with Contract Documents.
    a. Check field dimensions and clearance dimensions.
    b. Check relation to available space.
    c. Review the effect of any changes on the work of other contracts or other Subcontractors.
    d. Check anchor bolt settings.
    e. Check compatibility with equipment and work of other Subcontractors.
    f. Check motor voltages and control characteristics.
    g. Coordinate controls and interlocks:
        1) Voltages.
        2) Wiring of pneumatic and control diagrams.
    h. Coordinate wiring and control diagrams.

G. Coordination Drawings:

1. In addition to the coordination drawings submitted by the Mechanical and Electrical Contractors, prepare additional drawings as required to assure coordination of the work, or affected by, mechanical and electrical work, or to resolve conflicts.
2. Reproduce and distribute approved copies to all concerned parties.

H. Verify that Subcontractors maintain accurate Record Documents.

I. Substitutions and Changes:

1. Review proposals and requests.
    a. Check for compliance with Contract Documents.
    b. Verify compatibility with work and equipment of other Subcontractors.
2. Recommend action to General Contractor.
3. Test materials, assemblies and/or fabrications that are submitted as substitutions, when necessary to assure that they meet contractual design standards.

J. Observe mechanical and electrical work for compliance with requirements of the Contract Documents:

1. Maintain list of observed deficiencies and discrepancies.
2. Promptly report deficiencies and discrepancies to General Contractor.

K. Assemble documentation for handling of claims or disputes involving mechanical and electrical Subcontractors.

L. Equipment Commissioning:

1. Coordinate all commissioning activities with the Owner’s commissioning agent.

M. Inspection and acceptance of equipment:

1. Prior to inspection, check that equipment is clean, repainted as required, tested and operational.
2. Assist inspector; prepare list of items to be completed or corrected.
3. Should acceptance and operation of equipment constitute the beginning of the guarantee period, prepare, and transmit written notice to the General Contractor, for his/her transmittal to the Designer and the Owner's Project Manager for concurrence.

N. Assemble As-built documents from Subcontractors, transfer Subcontractors' As-built documentation to electronic format, and transmit to Designer. All information shall be submitted on electronic media (CD). Drawings should be on AutoDesk AutoCAD ver. 2000 or later, word documents in .pdf format, baseline and subsequently approved schedules in Primavera format, schedule of values in Excel format, and approved shop drawing submittals scanned in showing model numbers, capacities, and all relevant information. (Refer to Section 01 77 00 – CONTRACT CLOSEOUT for additional formatting requirements).

1. As-built documents will be compiled on compact disks and will include, without limitation, the following:
   a. All Drawings, including title sheet, code analysis, geotechnical, civil, structural, architectural, fire protection, plumbing, mechanical, electrical, security, data/telecommunications.
   b. All Specifications in .pdf format with addenda.
   c. Shop drawings and product cuts, scanned in; approved sheets only.
   d. Project schedules, baseline and all updates.

O. Oversee and provide training for the systems to be commissioned under Section 01 81 00 – COMMISSIONING.

1. Verify that the User Agency's operating personnel are trained in each particular commissioned equipment's operation and maintenance.
2. Obtain a written sign-off, from the responsible User Agency's personnel, that certify they are capable to operate and maintain the particular commissioned equipment such that their health and safety are not compromised.
3. Verify that all training requirements meet the specified training within the particular specification divisions and the requirements of this specification section.
4. Verify that training is provided only from certified instructors. The instructors shall be certified and approved by the particular equipment manufacturer. In the absence of manufacturer's certification, the trainer shall have a minimum of ten years experience in the installation, operation, and repair of the particular equipment.
5. Verify that all training is videotaped by a professional who is regularly employed in video photography.

P. Verify that O & M documentation is complete and approved by the Designer and the Owner's Project Manager prior to transmittal to the User Agency.

1.4 COORDINATION DRAWINGS

A. Cause to be prepared and submit to the General Contractor, coordination drawings for site utilities and building(s), for Designer and the Owner's Project Manager's review.

B. Sequence of Coordination Drawings preparation shall be as follows:

1. Coordination Drawings: The General Contractor shall be fully responsible for coordinating all Subcontractors, coordinating construction sequences and schedules, and coordinating the actual installed location and interface of all work. Before materials are fabricated or the Work begun, the General Contractor shall supervise and direct the creation of one (1) complete set of Coordination Drawings showing the complete coordination and integration of all Work of this Project including, but not limited to, structural, architectural, mechanical, plumbing, fire protection, and electrical disciplines. Coordination Drawings are intended to assist the General Contractor during construction and shall not be used for "shop drawings", "record drawings", or any other required submittal.
    a. Base Sheets: The General Contractor shall prepare and provide one accurately scaled set of building coordination drawing "base sheets" on reproducible transparencies or electronic format showing all architectural and structural work. Base sheets shall be at 1/4-inch scale, except congested areas and sections through vertical shafts shall be at 3/8-inch scale.
    b. HVAC: The General Contractor shall circulate the coordination drawing base sheets to the HVAC Subcontractor and require the HVAC Subcontractor to accurately and neatly show the actual size and location of all HVAC equipment and work. Ductwork shall be drawn to scale with full dimensions indicated graphically. Single line diagrams are not acceptable. The HVAC Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the General Contractor.
    c. Plumbing: The General Contractor shall circulate the coordination drawings to the Plumbing Subcontractor and require the Plumbing Subcontractor to accurately and neatly show the actual size and location of all plumbing equipment and work. The Plumbing Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the General Contractor. Sloped plumbing lines have right of way.
    d. Electrical: The General Contractor shall circulate the coordination drawings to the Electrical Subcontractor and require the Electrical Subcontractor to accurately and neatly show the actual size and location of all electrical equipment and work. The Electrical Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the General Contractor.
    e. Fire Protection: The General Contractor shall circulate the coordination drawings to the Fire Protection Subcontractor and require the Fire Protection Subcontractor to accurately and neatly show the actual size and location of all electrical equipment and work. The Fire Protection Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the General Contractor.
    f. Other Subcontractors: The General Contractor shall circulate the coordination drawings to other Subcontractors whose work might conflict with other work and

require these Subcontractors to accurately and neatly show the actual size and location of all their equipment and work. These Subcontractors shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the General Contractor.

g. After each Subcontractor completes its drawings, a meeting will be held to resolve conflicts between the Subcontractors.
   1) Coordination drawings shall be prepared at not less than 1/4-inch scale, and electronic AutoCAD files of same.
   2) Submit drawings to the General Contractor for Designer's review prior to starting any installations.
   3) Items of impossibility or request for variance shall be called to the General Contractor's attention for the Designer's resolution.

h. General Contractor Review and Submission: The General Contractor shall carefully review, modify and approve coordination drawings in cooperation with the Subcontractors to assure that conflicts, if any, are resolved before work in the field is begun and to ensure that the location of work exposed to view is as indicated or as approved by the Designer and the Owner's Project Manager.
   1) Prior to submittal of the coordination drawings, the Subcontractors shall affix their signatures to the drawings.
   2) Clearly indicate conflicts requiring modification to the general appearance or the function of the project for Designer and Owner's Project Manager's reviews, and approvals.
   3) The General Contractor shall stamp, sign and submit the coordination drawing originals to the Designer for review and approval, with one (1) paper copy and one (1) additional electronic copy on compact disk to the Owner's Project Manager, following the specified procedures and policies outlined in Section 01 33 00 – SUBMITTAL REQUIREMENTS. In no case shall acceptance of coordination drawings be interpreted as a release of General Contractor of responsibility to fulfill all of the requirements of the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Procedures and requirements for submission and review of progress schedules and reports.

1.3 RELATED SECTIONS

A. CONTRACT AND GENERAL CONDITIONS

1. Failure to complete the Work on time - liquidated damages.

B. Section 01 10 00 – SUMMARY

1. Project meetings.

C. Section 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

1. Progress and coordination meetings.

D. Section 01 33 00 - SUBMITTAL REQUIREMENTS

1. Project reports.
2. Schedule of values.
3. Shop drawings, product data, and samples.

E. Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

1. Computer equipment hardware, software, and ancillary supplies.

1.4 CONSTRUCTION SCHEDULE

A. General Contractor shall prepare and submit for Designer and the Owner's information, a Critical Path Method (CPM) Progress Schedule for the work of the project. Said schedule will be coordinated with the Designer's Work Plan to include sequencing of the project work (both design and construction). In addition, a Project Scheduler will be required for this project.

1. General Schedule Requirements
2. Critical Path Method (CPM) Schedule Requirements
3. Critical Path Submission Requirements
4. Critical Path Progress Reporting and Changes
5. Progress Payments to General Contractor
6. Adjustment of Critical Path Contract Completion Time

B. Critical Path Method Scheduler.

C. Design of Project.

1.5 CRITICAL PATH METHOD SCHEDULING

A. General Contractor's Schedule Requirements are contained herein, and are to be provided to the Owner by the General Contractor.

1. General Schedule Requirements
   a. Upon the finalization of the agreement, signified by issuance of the Notice to Proceed with Construction, the General Contractor shall develop a network plan to demonstrate complete fulfillment of all Working Documents and Construction contract requirements. The General Contractor shall keep the network plan up to date in accordance with the progress and logic update requirements stated herein, and shall utilize the network plan in planning, coordinating and performing the work of this project (including all activities of Designer, Subcontractors, equipment vendors and suppliers). General Contractor's monthly payments will be made in direct relation to the activity items scheduled and by the progress completion of those activities. Upon authorized commencement of the construction phase of the contract, as signified by the Notice to Proceed with Construction, the General Contractor shall provide the microcomputer, associated hardware and software required for the project site as defined under Section 01 50 00 – TEMPORARY FACILITES AND CONTROLS, Par. Computers. Substitute software, approved in writing by DCAMM, will be considered provided that the promised substitution is totally compatible with PRIMAVERA and all DCAMM software.
   b. Within 20 calendar days of receipt of the Notice to Proceed with Construction, the General Contractor shall submit to the Owner and the Designer, an expanded Time Scaled Critical Path Method (CPM) Network Diagram for the first 90 calendar days of the Construction phase of the project. This preliminary 90-day schedule need not be resource loaded.

c. Within 60 calendar days after receipt of the DCAMM Notice to Proceed with Construction, the General Contractor shall submit for review by DCAMM and the Designer, a complete Time Scaled Critical Path Method (CPM) Network Diagram for the complete project, including all construction phases. All completion dates shall be within the period required by the contract for completion of the project. This complete duration project schedule must be fully resource loaded. The General Contractor shall provide a presentation where the schedule's activities and logic are fully explained.

d. Within 15 calendar days after receipt of the complete Critical Path Method Network Diagram, DCAMM and the General Contractor shall meet with the Designer and their consultant engineers and Subcontractors, and the Project Scheduler, for joint review(s), correction, or adjustment of the proposed plan and schedule(s). Within 10 calendar days after the joint review(s), the General Contractor shall revise the proposed CPM Network Diagram in accordance with agreements reached during the joint review(s) and shall furnish two copies of the Diagram as defined hereinafter (in Para. 1.5.3), to DCAMM and one copy to the Designer. This CPM Network Diagram, as revised at the joint review, is the Project Schedule (and shall be the Target Schedule to which all future changes are compared) until subsequently revised in accordance with the logic update requirements stated hereinafter (in Para. 1.5.4). All appropriate Subcontractors shall also be furnished copies of the Time Scaled Network Diagram.

e. Until the joint review(s) and subsequent issuance of the complete Project Schedule, as defined hereinbefore, the establishment of the PRIMAVERA database, all Payment Requisition Schedule of Values and General Contractor Payment Forms may be produced manually.

2. Critical Path Method (CPM) Scheduling Requirements

a. The Critical Path Method (CPM) schedule shall show the sequence and interdependence of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown on the Critical Path schedule must be at least equal and related to the number of items listed in the Schedule of Values, however the General Contractor must submit a detailed explanation that identifies what each activity includes. In preparing the Critical Path schedule, the General Contractor shall break up the work into activities not exceeding two calendar months each, except as to non-construction activities (i.e., design, procurement of materials and delivery of equipment) and any other activities for which DCAMM may approve the showing of longer duration. The schedule shall show not only the activities for actual design and construction work for each Subcontractor category of the project but also activities on which the work is dependent (i.e., such as the submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication, material delivery times, Designer/DCAMM review and approval of design documents and shop drawings, equipment schedules, samples and templates, and the delivery of Owner furnished equipment). In addition, the complete duration project schedule submission that is to be made 60 calendar days after receipt of the DCAMM Notice to Proceed with Construction shall be resource loaded with costs, manpower (labor by craft or Subcontractor), and equipment for all on-site construction activities shown on the schedule. All activities shall be logically tied to one common end date. The number of construction activities shown on the

Critical Path schedule shall be capable of being summarized to a level equivalent to the individual specification sections, for which any item of work is being performed (defined hereinafter in Para. 1.5.2.b). To the extent that the Critical Path schedule shows anything not jointly agreed upon, or fails to show anything jointly agreed upon, it shall not be deemed to have been accepted by DCAMM. Failure to include any element of work required for the performance of the contract shall not excuse the General Contractor from completing all work required within any applicable completion date, notwithstanding DCAMM acceptance of the Critical Path schedule.

b. The baseline data to be entered for each individual activity shall include the duration, activity type, activity codes, work breakdown structure, date constraints, cost, resources, custom data items, predecessor activity, and successor activity.
   1) Critical Path Method (CPM) Scheduling shall be carried as a specific pay item on the Schedule of Values.
   2) Each activity shall be assigned a Work Breakdown Structure (WBS) Code. The WBS is to be structured in levels of deliverable work elements beginning with the end result (Level 1), and then divided into identifiable deliverable work elements (Level 2, 3, 4, etc.). The DCAMM Project Manager, Designer and General Contractor will meet to establish a WBS specific to the project.
   3) Each activity shall be assigned Activity Codes. The Activity Codes shall identify specific groups such as responsibility, phase, system, location, CSI Division, specification section, and corresponding Schedule of Values ID. This is not a complete list. The DCAMM Project Manager, Designer and General Contractor will meet to establish Activity Codes specific to the project.

3. Critical Path Submission Requirements (CPM Network Diagram elements)
   a. As a minimum, the General Contractor shall furnish, monthly with each Critical Path Submission, and each revision thereof required in the logic update, three (3) copies of the following PRIMAVERA output reports (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Current Schedule Comparison to Target Schedule
      2) Network Logic: Detailed Precedence Analysis
      3) Activity Input Listing sorted by WBS or Activity Codes, per DCAMM Project Manager
      4) Schedule sort by Early Start and Total Float
      5) Actual Cash, Manpower and Equipment Flows (on schedule - Monthly; late schedule - Weekly)
   b. As a minimum, the following computer-produced PRIMAVERA graphic reports shall be supplied with each Critical Path Submission and revision thereto (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Gantt Chart sorted by Early Start date and WBS or Activity Codes, per DCAMM Project Manager
      2) Bar Chart - Two Week Look Ahead sorted by WBS or Activity Codes, per DCAMM Project Manager (and narrative format if requested by the DCAMM Project Manager, at no additional cost). A two-week look ahead schedule, generated from the Project Schedule, shall be submitted for review and discussion at the weekly project meeting.

3) Time Scaled Network Diagram (PERTVIEW) sorted by WBS or Activity Codes, per DCAMM Project Manager
4) Cash, Manpower and Equipment Flows (monthly and cumulative)

c. Payment requisition Schedule of Values (CSI formatted) and General Contractor Payment form, to be produced monthly through custom software which uses the PRIMAVERA database percentage complete to calculate payment owed to General Contractor.

d. PRIMAVERA Database: The complete PRIMAVERA database for the project shall be submitted monthly with each Critical Path Submission on a floppy disk or as otherwise requested by DCAMM.

e. Material/Supplies Schedule: As a minimum, a full list of all materials required for the project shall be listed. This list shall include coded sub-lists (per Para. 1.5.7) relating to the activity codes of the Critical Path Method schedule. The Material/Supplies Schedule sub-lists shall be required which list all materials required for critical activities, all items of long lead time nature (i.e., transformers, plantings, windows, doors and frames, electrical and mechanical equipment, etc.), all pre-purchase items and all Owner-furnished items. The schedule shall provide names, addresses, telephone numbers of suppliers, key suppliers' contact person, order placement data, order confirmation data, proposed arrival date, actual arrival date and all other pertinent information. This Critical Materials/Supplies Schedule and its associated sub-lists shall be updated as directed by the DCAMM and as a minimum at each Logic Update period.

f. Utilities Schedule: As a minimum, a full list of all utilities required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of utility, usage levels required, and timing of requirements.

g. Equipment Schedule: As a minimum, a full list of all equipment required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of equipment, usage levels required, and timing of requirements.

4. Critical Path Progress Reporting and Changes (Progress and Logic Update)

a. The General Contractor shall provide a complete progress and logic update monthly. The progress and logic update shall include complete updating of the schedule progress per activity --- both amount paid and amount remaining. Actual cost amount paid and amount remaining shall agree with the payment requisition forms required hereinbefore (in sub-paragraph 1.5.3.c.). The requirements for schedule progress reporting are further specified hereinafter. A full Critical Path Submission will be required at each progress and logic update.

b. In addition to the progress and logic update requirements, the General Contractor shall prepare and submit to DCAMM a revised Critical Path Submission showing all changes in network logic, including but not limited to changes in activity duration, and revised activity costs as a result of contract changes in activity sequence and any changes in contract completion dates which have been made pursuant to the provisions of the contract for adjustment of contract completion time, since the last revision of the critical path schedule. The contract completion date or dates shall be adjusted to reflect time extensions granted on the activities in accordance with the contract. The contract completion date or dates shall remain constant when data in regards to actual progress (activity start, activity completion,

percent completed, etc.) are entered and delay shows a negative float/slack. Where DCAMM has not yet made a final determination, as to the amount of time extension to be granted and the parties are unable to agree as to the amount of the extension to be reflected in the critical path schedule, the General Contractor shall reflect that amount of time extension in the critical path schedule as DCAMM may determine in their best judgment, to be appropriate for such interim purpose. It is understood and agreed that any such interim determination by DCAMM for the purposes of this paragraph shall not be binding upon either party for any other purpose and that, after DCAMM has made final determination as to any time extension, the General Contractor will revise the critical path schedule prepared thereafter in accordance with the final decision, in accordance with the contract.

c. Prior to the date specified by DCAMM for submission of the logic update (i.e., at each General Contractor pencil monthly payment requisition, one week prior to the approval of the General Contractor monthly payment requisition), the Project Scheduler, including input from General Contractor, Subcontractors, and the Designer, shall update the computer-produced schedule and diagrams. The update shall show actual progress and percent completed of activities in progress, identify those activities started and those completed during the previous logic update period, show the estimated time required to complete each activity started but not yet completed, and reflect any changes in the critical path schedule approved in accordance with the Critical Path Scheduling Requirements and Progress and Logic Update paragraphs of this Section (Para. 1.5.2 and 1.5.4). Actual progress to-date shall be entered by inputting actual start date and remaining duration (or early finish) for each activity which has either started during the monthly update period or is ongoing. In addition to entering remaining duration, the percent complete shall be entered for that activity. However, percent complete calculation shall be set to manual using the project default screen. After completion of the review and DCAMM approval of all entries, the General Contractor shall submit an updated Critical Path Submission, in the detail specified in the Critical Path Submission Requirements of this Section (Para. 1.5.3), to DCAMM, no later than the close of business on the date specified by DCAMM for submission of edited General Contractor monthly payment requisition (normally one week after pencil monthly payment requisition review).

d. The General Contractor shall assume that the full duration of the contract will be required to complete the work of the contract. Positive float/slack belongs to the project and must be used in the best interest of completing the project on time in the event departure from the network occurs. If negative float/slack is indicated on the schedule, recovery schedules shall be prepared by the General Contractor at no additional cost to the Commonwealth, indicating how the work will be expedited to meet current contract completion dates. The General Contractor's construction schedule shall begin with the date of issuance of the DCAMM Notice to Proceed and conclude with the contract date of Final Completion of the Project. Float or slack time within the construction schedule is not for the exclusive use or benefit of either the Commonwealth or the General Contractor, but is a jointly owned, expiring project resource available to both parties as needed to meet contract milestones and the contract completion date. Therefore, any existing float shall be used to the maximum extent possible to offset:

1) Unexpected delays which occur in connection with the General Contractor's work; and
2) Contract change actions initiated by the parties specified in the contract (i.e., Changes in the Work).

e. Where delays are incurred, the General Contractor shall provide through weekly and/or full logic CPM update how the work delay can be returned to the approved schedule. The General Contractor agrees that whenever it becomes apparent from the current weekly computer produced calendar-dated schedule that the contract completion date will not be met, he/she will take some or all of the following actions at no additional cost to the Commonwealth:
   1) Increase design review and/or construction manpower and/or equipment in such quantities and crafts as will substantially eliminate, in the judgment of DCAMM, the backlog of work and any impact on the construction activities.
   2) Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of DCAMM, the backlog of work.
   3) Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.

f. Float shall be used as it occurs (time extension granted or job delay). If a time extension and job delay occurs in the same logic update period (normally weekly), the delay will be entered in the network first.

g. In addition to the foregoing, the General Contractor shall submit a narrative report every other week (bi-weekly) and at the same time as the updated schedule required by the preceding paragraphs in a form agreed upon by DCAMM. The narrative report shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action taken or proposed.

h. DCAMM shall have the right to require the General Contractor to furnish additional printouts of logic updated schedules and time scaled network diagrams, reflecting actual or estimated time changes resulting from unexpected delays, change orders, strikes, etc., at no additional cost to the Commonwealth.

5. Progress Payments to General Contractor

a. The monthly Critical Path Submission shall be an integral part and basic element of the estimate upon which progress payments shall be made. The General Contractor shall be entitled to progress payment only upon approval of estimates as determined from the currently approved updated computer-produced Critical Path schedule. Payments will be made against activity items shown on the computer-produced schedule and as reflected on DCAMM approved format payment forms which shall be used in conjunction with PRIMAVERA. The General Contractor shall produce the Schedule of Values and the Standard Payment forms by following the guidelines of DCAMM staff. This shall include entering the Net Amount Paid to Subcontractors against the appropriate activities.

b. Whereas every schedule activity is cost loaded, as well as manpower and equipment loaded (i.e., the schedule of payment values lists all schedule activities, at the end of every month the General Contractor's payment application is a listing

of all schedule activities started and completed, the percentage of work accomplished, and a calculation of the value of the work performed), but the Commonwealth is required to pay for work performed within a mandated time frame, the submittal of the schedule update is not a "condition precedent" to monthly progress payments; however, in the event the General Contractor fails to submit a computer-produced calendar-dated schedule or the initial or revised time scaled network diagram on the date designated by DCAMM, DCAMM shall have the right, after giving written notice to the General Contractor, to have the computer-produced calendar-dated schedule or time scaled network diagram prepared or revised (as applicable) by separate computer contract award or otherwise and to deduct the cost thereof from the contract amount through the progress payment which becomes due upon completion thereof and upon approval of DCAMM of the payment request. If, however, the General Contractor fails or refuses to furnish the information and data which, in the judgment of the DCAMM Project Manager, are necessary for preparation or revision of the computer-produced calendar-dated schedule or time scaled network diagram by separate contract or otherwise, after seven [7] calendar days written notice, the schedule requirement terms of the contract may be considered to have been breached by the General Contractor, and DCAMM may take any or all of the following additional actions:

1) Impose lack-of-schedule damages (separate and distinct from liquidated damages), at a cost of $ 300 per day for every day the schedule submittal is late.
2) Terminate the contract with prejudice (per Article XVII of the Contract).

6. Adjustment of Critical Path Contract Completion Time

a. The contract completion time or contract cost will and in general be adjusted only for change orders approved by DCAMM as outlined in the contract. In the event the General Contractor requests an extension of any contract completion date or cost increase he/she shall furnish such justification and supporting evidence as DCAMM may deem necessary for the determinations to whether the General Contractor is entitled to an extension of time or contract cost adjustment under the provisions of this contract. DCAMM approval as to the total number of days extension and/or increase in contract value shall be based upon the currently accepted computer-produced Critical Path schedule and on all data relevant to the extension. A request for an extension of time, associated with the change orders will not be considered unless it is clearly proven that the critical path has been negatively effected (such as, but not limited to, time impact analysis using resource loaded fragmentary networks to demonstrate the effect of delays on the overall project schedule). Such data shall be included as an activity linked to the activity which is being impacted and will appear in the next monthly schedule and logic update. All extensions for related manpower/equipment increases shall be applied to the appropriate existing activity items.

1) Contract time can only be extended by authorized approved change order.

b. Whereas time is of the essence in the performance of work under the contract, each request for change in any contract completion date shall be submitted by the General Contractor to DCAMM at the time an alleged delay occurs. Failure to

notify DCAMM of any delay as provided in the contract shall preclude the General Contractor from subsequently claiming any damages due to said delay.

c. For purposes of scheduling, the project will be considered to be Substantially Complete when all work affecting health, safety and function is totally completed, and with less than one [1] percent of the base contract value remaining, and ready for complete Use and Occupancy as determined by the DCAMM Project Manager, the Operating Agencies (individually or collectively), and the Designer. Then the User Agencies (individually or collectively) will take control of their building area(s) and be responsible for operating costs and security. Final punch lists will be established and monetized at this time.
    1) DCAMM Certificate of Use and Occupancy must be issued for partial Use and Occupancy, contingent upon conditions set forth by the Building Official having jurisdiction. The Massachusetts Department of Public Safety Occupancy Certificate must be issued by the effective Substantial Completion date.
    2) The General Contractor shall have the number of calendar days stated in the contract, from the date of the DCAMM Notice to Proceed, to complete all the work before Substantial Completion is achieved. If the General Contractor fails to complete the work within the contract completion time frame so stated, the General Contractor shall be subject to the assessment of liquidated damages.

7. Additional Requirements:
    a. A list in EXCEL format and the associated database file, as prescribed by DCAMM, of every submittal of shop drawings, product data, samples and other submittals required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
    b. A list in EXCEL format and the associated database file, as prescribed by DCAMM, of every long lead item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
    c. A list in EXCEL format and the associated database file, as prescribed by DCAMM, of every pre-purchase item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual

Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

d. A list in EXCEL format and the associated database file, as prescribed by DCAMM, of every Owner-furnished item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the General Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date. The list of Owner-furnished items shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will actually be required on the site.
   1) Deliveries of Owner-furnished equipment or materials shall be shown on the schedule with time windows to be provided by the Commonwealth.
   2) Neither the Designer nor the Commonwealth will be responsible for acceptance of a list that calls for out-of-sequence delivery of Owner-furnished items.

1.6 CRITICAL PATH METHOD SCHEDULER

A. The General Conditions and General Requirements of the construction contract apply to the General Contractor with regards to responsibility for the scheduling of all Subcontractors. The Project Scheduler shall ensure the total and complete scheduling of all work of the project as such work relates to the General Contractor's work and all Subcontractors.

B. The purpose of the Project Scheduler shall be to accurately portray all relevant activities required to complete the work according to the contract documents, organized in a logical sequence and, generally, time scaled.

C. Preferential sequencing (i.e., whereby activities that could be performed concurrently and are established in the project schedule as sequential simply to consume float), and/or indicating artificial activity durations (i.e., inflating activities in the schedule to consume float and influence the critical path) are unacceptable. The Project Scheduler will provide monthly comparisons of the start and finish dates with field records of Owner's Project Manager inspection staff, job photos, weekly meeting minutes, monthly progress reports, General Contractor weekly bar charts or two-week look ahead schedules, and accurately update the schedule to reflect actual job progress.

1. Pursuant to the float-sharing requirements of the contract documents, the use of float suppression techniques (a.k.a., sequestering float) such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and the use of float time disclosed or implied by the use of alternate float suppression techniques shall be shared to the proportionate benefit of the Owner and the General Contractor.
2. Sequestering of float shall be cause for rejection of the General Contractor's schedule submittal. In the event that float sequestering is identified the General Contractor, through the Project Scheduler, shall have the computer-produced calendar-dated schedule

or time scaled network diagram revised appropriately, at no additional cost to the Commonwealth.

D. The General Contractor, through the Project Scheduler, shall require the Designer, all major Subcontractors (including, but not limited to, Masonry, Plumbing, Electrical, and all other Subcontractors with a subcontract equal to or in excess of five [5] percent of the contract value) to participate in and sign off on the baseline schedule and all schedule updates. The General Contractor must submit an as-built construction schedule (certified by the General Contractor's Project Manager and the Project Scheduler as representing the way the project was actually constructed) as a condition precedent to Final Acceptance.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 00

SUBMITTAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Shop drawings, products data, samples, submittal logs (shop drawings and samples, RFI, NOI, PCO, CO and SK drawings), weather protection (if applicable) and schedule of values.

1.3 SHOP DRAWINGS, PRODUCTS DATA, AND SAMPLES

A. General:

1. Review and submit to the Designer and where outlined below to the Owner's Project Manager, shop drawings, project data and samples required by Specifications Sections in hard and electronic copies.
2. No submissions made by FAX will be accepted.
3. The General Contractor, within the time frame stated in Section 01 32 00 – CONSTRUCTION PROGRESS DOCUMENTATION after the Pre-Construction Meeting, shall prepare and submit for the Designer and the Owner's Project Manager's approval, a Schedule of Shop Drawings, Product Data and Samples required to be submitted for the Work. The schedule shall indicate, by Subcontractor, the date by which final approval of each item must be obtained, and shall be revised as required by conditions of the Work, subject to the Owner's Project Manager's approval. The Schedule of Shop Drawings, Product Data and Samples shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will be required on the site. Neither the Designer nor the Owner's Project Manager will approve a schedule that calls for out-of-sequence submittals.

B. Shop Drawings:

1. Original drawings shall be prepared by General Contractor, Subcontractor, Supplier or Distributor, which illustrate some portion of the Work, showing fabrication, layout, setting, or erection of details.
   a. Shop drawings shall be prepared by a qualified detailer.

b. Details shall be identified by reference to sheet and detail numbers indicated on Contract Drawings.
c. Maximum sheet size shall be 30-inch by 42-inch.
d. Submit with the required number of opaque prints specified and electronic media herein.

C. Product Data:

1. Manufacturers' catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data. Provide manufacturer's catalogue sheet, specification for each product and other pertinent data as required under the individual specification.
   a. Modify product data submittals to delete information which is not applicable to the project.
   b. Supplement standard information to provide additional information applicable to the project.
   c. Clearly mark each copy to identify pertinent materials, products, or models.
   d. Show dimensions and clearances required.
   e. Show performance characteristics and capacities.
   f. Show wiring diagrams and controls.
2. All such data shall be specific and identification of material or equipment submitted shall be clearly made in ink. Data of general nature will not be accepted.
3. Product Data shall be accompanied by transmittal notice. The General Contractor's stamp of approval shall appear on the printed information itself.
4. Submit the information listed above in both hard and electronic format.

D. Samples:

1. Physical samples shall illustrate materials, equipment, or workmanship, and shall establish standards by which work is judged. After review and approval, samples may be used in construction of project if not retained for comparison
   a. Office samples of sufficient size and quantity shall clearly illustrate:
      1) Functional characteristics of product or material, with integrally related parts and attachment devices.
      2) Full range of color samples (including standard and premium ranges).
      3) After review and approval by Designer and the Owner’s Project Manager, samples may be used in construction of project if not retained for comparison.
   b. Field Samples and Mock-ups
      1) Erect at project site at locations acceptable to the Designer and the Owner’s Project Manager.
      2) Construct each sample of mock-up complete, including work of all Subcontractors required in finished work. Samples shall be incorporated into a larger mock-up with varied products and Subcontractors if required.
2. Unless otherwise specified in the individual Section, the General Contractor shall submit two labeled specimens of each Sample.
3. Samples shall be of adequate size to permit proper evaluation of material. Where variations in color or in other characteristics are to be expected, samples shall show the

maximum range of variation. Materials exceeding the variation of the approved samples will not be approved on the Work.

4. Samples which can be conveniently mailed shall be sent directly to the Designer, accompanied by transmittal notice. On the transmittal notice the General Contractor shall stamp his approval of Samples submitted.
5. All other Samples shall be delivered at the field office of the Owner's Project Manager with Sample identification tag attached and properly filled in. Transmittal notice of Samples so delivered with the General Contractor's stamp of approval, shall be mailed concurrently to the Designer and the Owner's Project Manager to confirm their receipt thereof.
6. If Sample is rejected by the Designer, a new Sample shall be resubmitted in the manner specified herein above. This procedure shall be repeated until the Sample is approved in writing by the Designer.
7. Samples will not be returned unless return is requested at the time of submission. The right is reserved to require submission of Samples whether or not specified in the Specifications, at no additional cost to the Commonwealth.

E. Mock-ups: Erect at project site at location acceptable to Designer and the Owner's Project Manager, a mock-up complete, including work of all Subcontractors required in finished work.

1.4 GENERAL CONTRACTOR'S RESPONSIBILITIES:

A. Review shop drawings, Product Data and Samples prior to submission. Verify:

1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance with Specifications.
5. Integration with adjoining work.
6. Delivery schedule.
7. Is the product an equal to the product specified or a substitution? If either of these occur a comparison sheet must be submitted comparing the proposed product to the product specified.

B. All shop drawings prepared by Subcontractors shall be processed through the General Contractor. The General Contractor shall check all the shop drawings for conformity with the Contract Documents and particularly for field measurements and proper fit with adjoining work prior to submitting same to the Designer for approval. Certification shall appear on each shop drawing stating that the General Contractor has made his/her check. Format and content of the General Contractor's certification stamp shall be subject to approval by the Owner's Project Manager and the Designer and shall include, but not be limited to:

1. The Term "By Others" shall not be used on shop drawings, the General Contractor shall state by whom related items are to be furnished and/or installed.
2. The Designer reserves the right to reject and return to the General Contractor, without examination, any shop drawings which have not been previously checked and certified as outlined above, which carry the term "by other" or such vague reference, which are

difficult to read, which have arrived by FAX or which in any way are obviously not in conformity with Contract Requirements.

3. Shop drawings shall show materials, design, dimensions, connections and other details necessary to ensure that they accurately interpret the Contract Documents and shall also show adjoining work in such detail as required to provide proper connection with same.
4. The Designer will check and approve shop drawings only for conformance with the design concept and for compliance with information given in the Contract Documents. Approval of shop drawings by the Designer will not release the General Contractor from his responsibility for furnishing same of proper dimensions, size quantity and quality to effectively perform the work and carry out the requirements and intent of Contract Documents.
5. Such approval will not relieve the General Contractor from responsibility for errors of any sort in the shop drawings, nor for the proper coordination of any submittal with all other work. If the shop drawings deviate, or are intended to deviate, from the Contract Documents, the General Contractor shall so advise the Designer in writing at the time the shop drawings are submitted, stating the difference in value between the Contract requirements and that denoted by said shop drawings.
6. The General Contractor shall assume full liability for delay attributed to insufficient time for delivery and/or installation of material or performance of the work when approval of pertinent shop drawing is withheld due to the failure of the General Contractor to submit, revise, or resubmit shop drawings in adequate time to allow the Designer and the Owner’s Project Manager a reasonable time, not to exceed twenty-one (21) calendar days, for normal checking and processing of each submission or resubmission.

C. Coordinate each submittal with requirements of Contract Documents.

D. The General Contractor's responsibility for errors and omissions in submittals is not relieved by the Designer’s review and approval of submittals, unless Designer gives tentative written acceptance of specific deviations identified as such by the General Contractor, subject to written concurrence by the Owner’s Project Manager.

E. Notify the Designer in writing at the time of submission, of deviations in submittals from requirements of Contract Documents or previous submissions.

F. Work that requires submittals shall not commence unless submitted with Designer’s stamp and initials or signature indicating review and approval, and Owner’s Project Manager’s initials or signature of concurrence indicate review and approval.

1. No work shall be started in the shop or on the job, or materials delivered to the site, until pertinent shop drawings have been approved by the Designer and the Owner’s Project Manager.

G. After aforesaid review and approval, distribute copies.

H. Maintain one (2) copies of each approved submittal at the project site. One for the General Contractor and one for the Owner’s Project Manager.

1.5 SUBMISSION REQUIREMENTS:

A. General: All submittals shall be made to the Designer's Office. The quantity and make-up of submittals shall be as established by the Designer; however, two (2) additional copies of all submittals shall be transmitted to the Owner's Project Manager at the same time that such submittals are transmitted to the Designer. The Designer will log and distribute submittals for review by his consultant engineers. The General Contractor shall distribute all Civil, Structural, and MEP shop drawings directly to the Designer. All submittals shall be in both hard and electronic copies.

B. Make submittals promptly in accordance with approved schedules, and in such sequence as to cause no delay in the work.

C. Submit number of samples specified in each Section of the Specifications.

D. Submittals shall include:

1. Date and revision dates.
2. Project title and number.
3. The names of:
    a. Designer;
    b. General Contractor;
    c. Subcontractor;
    d. Supplier;
    e. Manufacturer;
    f. Separate detailer when pertinent.
4. Identification of product or material.
5. Location of work and relation to adjacent structure or materials.
6. Field dimensions clearly identified as such.
7. Specification Section number and specific paragraph under which item is specified.
8. Submission number.
9. Applicable standards, such as ASTM number.
10. A blank space, five-inch by four-inch, for the Designer's stamp.
11. General Contractor's remarks. Identify exceptions or deviations from Contract Documents and reasons for them.
    a. If shop drawings submitted by the General Contractor indicate a departure from the Contract and the Designer deems it to be minor adjustment in the interest of the Owner (subject to concurrence by the General Contractor stating it does not involve a change in Contract Price or extension of time), the Designer may approve the submission, but the approval shall be subject to Owner review and acceptance of the Designer's recommendation.
    b. The approval of the Owner shall be inferred to contain in substance the following: The change is so ordered with the understanding that it does not involve any change in the Contract Price or Time, and that it is subject generally to all contract stipulations and covenants, and is without prejudice to any and all rights of the Owner under the Contract.
12. General Contractor's stamp, initialed or signed certifying review and approval of submittal.

13. Any other items as called for by the Designer, the Owner's Project Manager or required by the manufacturers.
14. The Designer reserves the right to ask for shop drawings for any or all items on the project, whether or not requested in individual specification sections, at no additional cost to the Commonwealth.

1.6 RESUBMISSION REQUIREMENTS:

A. Resubmission: Resubmission procedure shall follow the same procedures as the initial submittal with the following exceptions:

B. Shop Drawings:

1. Transmittal shall contain the same information as the first transmittal except that the submission number shall change sequentially. The drawing number/description shall be identical as the first transmittal but the date shall be the revised date for that submission.
2. No new material should be included on the same transmittal for the resubmission.
3. Indicate on drawings any changes which may have been made other than those requested by the Designer.

C. Product Data and Samples:

1. Submit any new data and samples as required from previous submittal.

1.7 THE OWNER'S PROJECT MANAGER'S AND DESIGNER'S REVIEWS AND DISTRIBUTION OF SUBMISSIONS

A. The Owner's Project Manager and/or his/her designees will review submittals concurrently with the Designer and his/her consultant engineers. The Designer and the Owner's Project Manager shall communicate within the aforesaid review period time frame (21 calendar days). The time frame for the Designer's review will not exceed fourteen (14) calendar days between her/his receipt of submittal and contacting the Owner's Project Manager. After the Designer's (and his/her consultant engineers) review, distribution shall be as stated herein.

1. If submittal is 'reviewed - no exceptions taken', or 'reviewed, make corrections noted', the Owner's Project Manager shall compose a transmittal indicating the status. The Owner's Project Manager will then return one (1) copy of the submittal together with the transmittal to the Designer, and shall retain one (1) copy for her/his records. The Designer shall copy and attach the Owner's Project Manager's transmittal to each submittal, stamp the submittals in concurrence with the status agreed to, and transmit back to the General Contractor. The General Contractor shall then distribute said submittals to appropriate Subcontractors.
2. If submittal is 'reviewed - revise and resubmit' or 'rejected', the Owner's Project Manager shall compose a transmittal indicating the status. The Owner's Project Manager will then return one (1) copy of the submittal together with the transmittal to the Designer, and shall retain one (1) copy for her/his records. The Designer shall copy and

attach the Owner's Project Manager's transmittal to each submittal, stamp the submittals in concurrence with the status agreed to, and transmit back to the General Contractor for resubmission. A copy of the transmittal, indicating that a submittal was disapproved and returned to the General Contractor, will be forwarded from the Designer to the Owner's Project Manager with an additional copy forwarded from the Designer to the Owner's Resident Engineer, for their records.

3. If a submittal is 'reviewed - no exceptions taken' or reviewed, make corrections noted' by the Designer, or approved as noted by the Designer, but the Owner's Project Manager does not concur, a meeting between the Designer and the Owner's Project Manager will immediately be established to resolve the impasse within the overall review period time frame (21 calendar days). The Owner's Project Manager will have final authority as to the disposition of the submission. The Designer's position of approval (or disapproval) must be based on the contractual criteria of design intent, function, structure, and durability. The Owner's Project Manager's contrary position must also be based on these criteria.
4. The combined review period, for the Designer and the Owner's Project Manager, will not exceed twenty-one (21) calendar days from the established date of each submission indicated on the Schedule of Shop Drawings, Product Data and Samples, plus the additional time, if any, for distribution by the General Contractor and receipt of submissions by the Designer and Owner's Project Manager. The General Contractor is required to anticipate review time, including time for possible rejection and resubmission, in establishing Schedule dates.
    a. The aforementioned time provided the Designer for checking shop drawings is from the date of receipt of shop drawings by the Designer to the mailing date of shop drawings returned to the General Contractor by the Designer.
5. The Designer will process the submission and indicate the appropriate action on the submission and the transmittal. Incomplete or erroneous transmittals will be returned without action.
6. The Designer will fill out transmittal in the following sequence:
    a. Date received from General Contractor.
    b. Date forwarded to Owner's Project Manager.
    c. Date received from Owner's Project Manager.
    d. Date returned to General Contractor.
    e. Action taken on submission.
    f. Distribution, including number of copies distributed and type of material distributed (i.e., print, brochure or sample, etc.).
    g. Designer's remarks (note major deviations from the Contract Documents).

B. Designer's Review Procedure:

1. Stamped REVIEWED, "NO EXCEPTIONS TAKEN":
    a. No corrections or resubmissions required, fabrication may proceed.
2. Stamped REVIEWED, "MAKE CORRECTIONS NOTED":
    a. If General Contractor complies with noted corrections, fabrication may proceed. Submit corrected print for final review.
    b. If, for any reason, the General Contractor cannot comply with the noted corrections, fabrication shall not proceed and General Contractor shall resubmit, following procedures outlined in this Section.

3. Stamped REVIEWED, “REVISE AND RESUBMIT” OR “REJECTED”:
   a. General Contractor shall revise and resubmit for review. Fabrication shall not proceed.

C. Manufacturer’s Instruction

1. When required in individual Specification Section, submit manufacturer’s printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, in quantities specified for product data., with two (2) additional copies submitted to the Owner’s Project Manager.

D. Certificates of Compliance: Submit certificates of compliance with the associated Shop Drawings, Product Data, and Samples required for the product in quantities specified for certificates of compliance, with two (2) additional copies submitted to the Owner’s Project Manager.

E. Field Samples: Provide field samples of finishes at the project as required by individual Specification Section. Install sample complete and finished.

F. Patterns and Colors: Submit accurate color charts and pattern charts to the Designer for review and selection whenever a choice of color or pattern is available in a specified product, unless the exact color and pattern of a product are indicated in the Contract Documents. Color and Pattern charts shall represent the manufacturer’s complete standard offerings, except where Specifications limit the offerings by defining a particular series or product type which is normally limited in color and pattern availability. Color and Pattern charts shall be submitted in quantities specified with two (2) additional copies submitted to the Owner’s Project Manager.

1.8 SCHEDULE OF VALUES

A. Prior to the first request for payment, the General Contractor shall submit to the Designer and the Owner’s Project Manager, a Schedule of Values of the various portions of the Work in sufficient detail to reflect various major components of each Subcontractor, including quantities when requested, aggregating the total contract sum, and divided so as to facilitate payments for work under each Section. The schedule shall be prepared in such form as specified or as the Designer or the Owner’s Project Manager may approve, and it shall include data to substantiate its accuracy. Each item in the Schedule of Values shall include its proper share of overhead and profit. This schedule, including breakdown and values, requires the approval of the Designer and the Owner’s Project Manager and shall be used only as a basis for the General Contractor's request for payment

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 35 44

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS that are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. Furnishing all labor, materials, and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operation under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires consideration of air, water, and land, and involves management of runoff, dust, noise, and solid waste, as well as other pollutants. Work shall include installing, maintaining, and removing sedimentation and erosion control components within the Limits of Work.

1.3 SECTION INCLUDES

A. Applicable Regulations

B. Notifications

C. Protection of Groundwater

D. Protection of Streams And Wetlands

E. Protection of Land Resources

F. Protection of Air Quality

G. Maintenance of Pollution Control Facilities During Construction

H. Noise Control

I. Diesel Equipment Emission Controls

J. Spill And Discharge Control

1.4 RELATED SECTIONS

A. Section 015000 - TEMPORARY FACILITIES AND CONTROLS:

B. Section 015716 - TEMPORARY PEST CONTROL:

C. Section 024100 - DEMOLITION:

1.5 APPLICABLE REGULATIONS

A. The General Contractor shall comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

B. Fines and related costs resulting from failure to provide adequate protection against any environmentally objectionable acts and corrective action to be taken are the obligations of the General Contractor.

1.6 NOTIFICATIONS

A. The OPM may notify the General Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements may notify the General Contractor in writing, through the OPM, of any non-compliance with State or local requirements. After receipt of such notice from the OPM or from the regulatory agency through the OPM, the General Contractor shall immediately take corrective action. Such notice, when delivered to the General Contractor or his/her authorized representative at the site of the Work, shall be deemed sufficient for the purpose. If the General Contractor fails or refuses to comply promptly, the OPM may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the General Contractor unless it is later determined that the General Contractor was in compliance.

PART 2 - PRODUCTS

2.1 WATER

A. Water used for dust control and equipment washes shall be clean and free of salt, oil, and other injurious materials. The General Contractor shall provide all necessary water.

2.2 ONSITE SPILL KIT

A. The General Contractor shall provide the following minimum equipment to be kept onsite at all times during site work activities for any unexpected spills or discharges:

1. Sand, clean fill and absorbent pillows,

2. Four drums (55 gallon, U.S. DOT 17-E or 17-H),
3. Shovels, and
4. Steam cleaner for decontamination of tools and equipment.

PART 3 - EXECUTION

3.1 PROTECTION OF GROUNDWATER

A. Care shall be taken to prevent, or reduce to a minimum, any discharges to the ground of liquids that may infiltrate to the underlying groundwater or enter on-site waterways. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the groundwater or waterway shall not be discharged from the Site. Such waters shall be collected and disposed of by the General Contractor in accordance with all applicable Federal, State and local regulations.

3.2 PROTECTION OF STREAMS AND WETLANDS

A. Care shall be taken to prevent, or reduce to a minimum, any damage to any wetland from pollution by debris, sediment, or other material. Manipulation of equipment and/or materials in delineated wetland areas is prohibited. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in downstream waters of the State, shall not be discharged from the Site. Such waters shall be collected and disposed of by the General Contractor in accordance with all applicable Federal, State and local regulations.

3.3 PROTECTION OF LAND RESOURCES

A. Land resources within the project boundaries and outside the limits of permanent work shall be restored to a condition, after completion of remediation activities that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to Limits of Work areas shown on the Drawing.

B. Outside of the Limits of Work as shown on the Drawing, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. Snow fence or other approved equal shall be erected at the “fall line” of the tree canopy, and no vehicles or storage will be permitted within, to prevent damage to trees.

C. The locations of storage and other facilities, required in the performance of the Work, shall not be within wetlands or resource areas.

3.4 PROTECTION OF AIR QUALITY

A. Burning – The use of burning at the project site for the disposal of refuse and debris will not be permitted.

B. Dust Control – Maintain all demolition excavations, stockpiles, waste areas, and all other work areas within or without the project boundaries free from dust which could cause the standards

for air pollution to be exceeded (MADEP 310 CMR 7.09.-7.10) and which would cause a hazard or nuisance to others.

C. The General Contractor shall provide adequate means for the purpose of preventing dust and odor caused by construction operations throughout the period of the construction contract. If DCAMM or the Designer indicates that the level of dust or odors is unacceptable, the General Contractor shall employ measures necessary to reduce dust or odors to an acceptable level.

D. The General Contractor shall implement engineering controls (e.g. watering, misting) to control dust whenever required by the Designer or DCAMM.

3.5 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. During the life of this Contract, maintain all facilities constructed for pollution, erosion, and sedimentation control as long as the operations creating the particular pollutant area being carried out.

3.6 NOISE CONTROL

A. The General Contractor shall develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum. Local noise ordinances shall govern.

B. The General Contractor shall execute construction work by methods and by use of equipment which will reduce excess noise.

C. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

D. The General Contractor shall manage vehicular traffic and scheduling to reduce noise.

3.7 DIESEL EQUIPMENT EMISSION CONTROLS

A. All motor vehicles and construction equipment shall comply with all pertinent local, state, and federal regulations covering exhaust emission controls and safety.

B. All General Contractor and Subcontractor diesel-powered non-road construction equipment with engine horsepower (HP) ratings of 50HP and above, which are used on the Project Site for a period in excess of 30 calendar days over the course of the construction period on the Project Site, shall be retrofitted with Emission Control Devices in order to reduce diesel emissions.

C. The reduction of emissions of volatile organic compounds (VOCs); carbon monoxide (CO) and particulate matter (PM) from diesel-powered equipment shall be accomplished by installing Retrofit Emission Control Devices.

D. Acceptable Retrofit Emission Control Devices for the Project shall consist of oxidation catalysts or other comparable technologies that are (1) included on the US Environmental Protection Agency (EPA) *Verified Retrofit Technology List* and/or the California Air Resources Board *Currently Verified Technologies List*; and (2) are verified by EPA or CARB, to provide a

minimum emissions reduction of 50 percent for VOCs, 40 percent for CO and 20 percent for PM. Attainment of the required reduction in PM emissions can also be accomplished by using less polluting Clean Fuels. Verified technologies can be identified on the following websites:

EPA: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm

CARB: http://www.arb.ca.gov/diesel/verdev/verifiedtechnologies/cvt.htm

E. The emission control equipment can be procured through the Statewide Contract #VEH71 that has fixed costs associated with retrofitting of diesel emission control devices.

F. Construction shall not proceed until the General Contractor has submitted a certified list of the non-road diesel-powered construction equipment subject to this specification which either are or will be retrofitted with emission control devices. The list shall include (1) the equipment number, type, make, and General Contractor/Subcontractor name; and the emission control device make, model, and EPA verification number. General Contractors shall also submit a receipt or other documentation from a manufacturer or installer that verifies that appropriate equipment has been installed. The General Contractor shall also identify any vehicles that will use Clean Fuels. Equipment that has been retrofitted with an emission control device shall be stenciled or otherwise clearly marked as "Low Emission Equipment".

G. The General Contractor shall submit monthly reports, updating the same information stated in Paragraph F above, including the quantity of Clean Fuel utilized. The addition or deletion of non-road diesel equipment shall be indicated in the report.

H. The General Contractor shall use methods to control nuisance odors associated with diesel emissions from construction equipment including but not limited to the following: (1) turning off diesel combustion engines on construction equipment not in active use and on trucks that are idling for five minutes or more; and (2) locating diesel equipment away from the general public and sensitive receptors.

I. All costs associated with implementation of the diesel equipment emissions control shall be borne by the respective General Contractor or Subcontractor and included in their cost for performing the work of the Contract.

3.8 SPILL AND DISCHARGE CONTROL

A. The General Contractor shall provide equipment and personnel to perform emergency measures required to contain any spillage and to remove spilled materials and soils or liquids that become contaminated due to spillage. The collected spill material shall be properly disposed of at the General Contractor's expense.

B. Costs to provide the above spill and discharge control materials shall be included in the contract base bid price.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. General Contractor's Quality Assurance.

B. General Contractor's Testing Responsibilities.

C. Owner's independent agencies.

D. Duties of the General Contractor's testing agencies.

E. Welding.

F. Field engineering.

G. Examination of substrate.

H. General Contractor's Quality Assurance and Quality Control Plan.

1.3 RELATED SECTIONS

A. Section 01 31 00 – PROJECT MANAGEMENT AND COORDINATION:

1. General project management and coordination.

B. Section 01 43 25 – TESTING AGENCY SERVICES:

1. Testing to be performed by the Owner's Independent Testing Laboratory, exclusive of testing to be performed by the General Contractor.

1.4 GENERAL CONTRACTOR'S QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing services agencies, including independent testing laboratories, which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

B. Each independent inspection and testing agency engaged on the project shall be authorized by authorities having jurisdiction to operate in the Commonwealth of Massachusetts.

1.5 GENERAL CONTRACTOR'S TESTING RESPONSIBILITIES

A. The General Contractor shall provide inspections, tests and quality control services specified in individual specification Sections and required by governing authorities, except where they are specifically indicated to be solely the responsibility of a Subcontractor in the respective specification section or solely the responsibility of Owner.

B. Engage and pay for the services of an independent agency acceptable to the Owner's Project Manager to perform the specified inspections, testing, and quality control. Submit qualifications to the Owner's Project Manager. General Contractor's testing agency/laboratory shall be licensed by the Commonwealth of Massachusetts Department of Public Safety.

C. Re-testing: The General Contractor is responsible for re-testing where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Documents requirements, regardless of whether the original test or service was the General Contractor's responsibility.

D. Substitutions, Suspicious Issues and Designer Initiated Testing: The General Contractor is responsible for inspections, tests and similar services for substitutions, suspicious issues identified by the General Contractor or Owner's Project Manager, and testing initiated by the Designer.

E. Associated Services: The General Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as required. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

1. Provide access to the work and furnish incidental labor and facilities necessary to facilitate inspections and tests.
2. Take adequate quantities or representative samples of materials that require testing or assist the agency in taking samples.
3. Provide facilities for storage and curing of test samples and delivery of samples to testing laboratories.
4. Provide the agency with a preliminary design mix proposed for use for material mixes that require control by the testing agency.
5. Provide security and protection of samples and test equipment at the project site.

F. The General Contractor shall prepare and submit to the Owner's Project Manager for approval a Quality Assurance and Quality Control Plan within 30 days from Notice to Proceed. A Quality Assurance and Quality Control (QA/QC) Plan shall promote completion of all work in accordance with the Contract Documents including Contract, Construction Drawings, Specifications, Project Procedures, Approved Submittals and Shop Drawings, Approved Changes, Applicable Codes and Regulations, Referenced Industry Standards, and similar items. The primary purpose of this quality plan is to ensure that all in place work by the General Contractor and all Subcontractors is performed correctly the first time and is turned over and represented as complete and defect free in accordance with the Contract Documents.

G. If required by the Contract, the General Contractor shall assign a dedicated Quality Assurance and Quality Control Manager for the duration of the project. If the Contract does not require a dedicated Quality Assurance and Quality Control Manager, the General Contractor shall prepare and submit to the Owner's Project Manager their QA/QC Plan as discussed in Par. E above. In addition, if this Contract does not require a dedicated QA/AC Manager, the duties of the QA/AC Manager as delineated in Par. 1.5F6 shall be carried out by another qualified member of the General Contractor's onsite staff.

1. The purpose of a QA/QC Manager shall be to prepare and submit the Quality Assurance and Quality Control Plan for approval and to be responsible for and to manage adherence to the plan throughout the construction process. The QA/QC Manager shall be designated for the project from the initial notice to proceed through system acceptances by both the designer and Owner's Project Manager. The QA/QC Manager shall at all times instill an expectation that all work will be completed correctly and in an expeditious manner and shall be responsible for enforcement of the General Contractor's Staff and all Subcontractors to this plan.
2. Have extensive experience in building construction, project controls, and previous QA/QC training and practical knowledge.
3. Have excellent communication and writing skills, be highly organized and be able to work with both management and Subcontractors.
4. Have a working knowledge of project scheduling.
5. The General Contractor shall submit substantiating documentation attesting to the proposed QA/QC Manager's capabilities to the Owner's Project Manager and the Designer for approval.
6. Duties of the QA/QC Manager:
    a. Prepare and submit QA/QC Plan for approval.
    b. Conduct and submit minutes for all requisite Quality Meetings.
    c. Coordinate and report on all daily quality activities.
    d. Verify accurate documentation by Subcontractors and Vendors.
    e. Work with Commissioning Agent.
    f. Oversee final project records pertaining to quality.
    g. Report, photograph and distribute evidence of deficient and/or defective construction conditions or materials that cannot be corrected within three work days of observation. When such conditions or materials are remedied report, photograph and distribute evidence of remedial work prior to concealing. Photographs shall be dated and defects and/or deficiencies shall be clearly labeled on the photographs.

1.6 OWNER'S INDEPENDENT TESTING AGENCIES

A. The Owner may choose to engage an independent testing agency at its own expense to perform certain tests and similar services as set forth in Section 014325. Information provided by the Owner's Independent Testing Agency shall be for the sole use of Owner's Project Manager, and shall not relieve the General Contractor of its responsibilities to provide its own quality control, to meet all requirements of the Contract and to provide a completed project free from construction defects.

B. It is the General Contractor's responsibility to provide and pay for its own inspection and testing to assure quality control. General Contractor shall be responsible for coordinating its work with requirements of the Owner's testing agencies, and shall provide reasonable services in support of facilitating work of Owner's testing agencies as required.

1.7 DUTIES OF THE GENERAL CONTRACTOR'S TESTING AGENCIES

A. The General Contractor's independent testing agency engaged to perform inspections, sampling and testing of materials and construction shall cooperate with the Designer and General Contractor in performing its duties, and shall provide qualified personnel to perform required inspections and tests.

B. The testing agency shall notify the Designer and General Contractor promptly of irregularities or deficiencies observed in the work during performance of its services.

C. The testing agency shall not perform any duties of the General Contractor.

D. The General Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.8 GENERAL CONTRACTOR'S QUALITY CONTROL REQUIREMENTS, GENERAL

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of the quality as specified.

B. Comply fully with manufacturer's instructions, including each step in sequence.

C. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

D. Perform work by persons qualified to produce workmanship of specified quality.

E. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortions, or disfigurement. Anchorage devices shall be labeled to allow for visual inspection and verification of type of anchorage device.

1.9 WELDING

A. Certified Welders:

1. Structural welds shall be made only by operators who have been qualified by tests, as prescribed in the "Standard Qualification Procedure" of the American Welders Society, to perform the type of work required. Operators shall be certified welders; certification must be shown to the Resident Engineer and must be current. Provide a copy of certification(s) to the Owner's Project Manager.
2. Pipe welds shall be made by operators who have been qualified by the National Certified Pipe Welding Bureau and each operator's qualification record shall be submitted to the Designer before any work is performed. Welders' certification card must be shown to the Owner's Project Manager. Provide a copy of certification(s) to the Owner's Project Manager.
3. Shop welding shall be in accordance with the "Code for Welding in Building Construction."
4. Welders shall provide their own portable generating equipment for electric welding. Use of the Commonwealth's electrical system for welding will not be permitted.

B. Welding and Cutting:

1. Where electric or gas welding or cutting work is done above or within ten (10) feet of combustible material or above a space that may be occupied by persons, use interposed shields of incombustible material to protect against fire damage or injury due to sparks and hot metal.
2. Place tanks supplying gases for gas welding or cutting at no greater distance from the work than is necessary for safety, securely fastened and maintained in an upright position in accordance with applicable codes. Store such tanks in a locked enclosure remote from any combustible material and free from exposure to the rays of the sun or high temperatures.
3. Maintain suitable fire extinguishing equipment near all welding and cutting operations. When operations cease for the noon hour or at the end of the day, thoroughly wet down the surroundings adjacent to welding and cutting operations.
4. Station a workman equipped with suitable fire extinguishing equipment near welding and cutting operations to see that sparks do not lodge in floor cracks or pass through floor or wall openings or lodge in any combustible material. Keep the workman at the source of work which offers special hazards for thirty (30) minutes after the job is completed to make sure that smoldering fires have not been started.
5. Place a qualified electrician in charge of installing and maintaining electric and arc welding equipment. Remove damaged electric, arc or gas welding equipment from the site.

1.10 MANUFACTURER'S REPRESENTATIVES

A. If required by specific Specification Sections, manufacturer's representative shall be present at the job site for supervision of work during installation of materials. Such representative shall be

present during all aspects of construction to ensure proper installation of all applicable items. Refer to other sections of these specifications for additional requirements.

1.11 FIELD ENGINEERING

A. Survey work through the course of all phases of construction shall conform to the following guidelines:

1. General Contractor shall employ a competent Civil Engineer or Land Surveyor, registered in the Commonwealth of Massachusetts, who will establish permanent benchmarks. Maintain all established bounds and benchmarks and replace as directed any which are destroyed or disturbed.
2. Prior to the installation of permanent construction (foundations, slab-on-grade, utilities, etc.) General Contractor shall provide a certification signed by Engineer/Surveyor warranting the principal lines, levels, and overall dimensions are accurately established in accordance with the Contract Documents.
3. Establish all lines and grades for the work, and verify all locations, property lines, work lines and other dimensioned points indicated on the Drawings for the project site.
4. Submit to the Designer a written confirmation of locations of all lines, and any discrepancies between conditions and locations as they actually exist and those indicated on the Drawings. General Contractor shall not commence any excavation or construction work until verification has been received and approved by the Designer. Upon receipt of approval from the Designer, provide one (1) copy of that approval to the Owner's Project Manager.
5. General Contractor shall be held responsible for any damage incurred thereby to the Owner, due to incorrect laying out of the work. In the event that errors or discrepancies are discovered on the Drawings, the General Contractor shall immediately notify the Designer and no further work shall be performed until the discrepancy has been corrected by the Designer.

1.12 EXAMINATION OF SUBSTRATE

A. Installers of materials, products or equipment shall:

1. Examine base surfaces upon which materials, products or equipment are to be installed.
2. Examine conditions upon which materials, products or equipment are to be installed.
3. Where there is any question as to the dryness of a surface, test with a modern moisture-indicating machine.
4. Notify the General Contractor, in writing, with a copy to the Designer, if conditions are detrimental to proper and timely construction and completion of the work.

B. Do not proceed with work until unsatisfactory substrate, or not acceptable conditions have been corrected. Commencement of installation constitutes acceptance of substrate or base surfaces, and the cost of any corrective work due shall be borne by the installer applying his/her materials, products or equipment thereon.

1.13 GENERAL CONTRACTOR'S QUALITY ASSURANCE AND QUALITY CONTROL PLAN

A. The General Contractor's Quality Assurance and Quality Control Plan shall instill an expectation that all work will be completed correctly and in an expeditious manner. In all instances the General Contractor shall be responsible for the adherence to and enforcement of the General Contractor's Staff and all Subcontractors to this plan.

1. Submit the General Contractor's Quality Assurance and Quality Control Plan to the Owner's Project Manager within 30 days from the Notice to Proceed. Submit in format acceptable to Owner's Project Manager. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out General Contractor's quality-assurance and quality-control responsibilities. Coordinate with General Contractor's construction schedule.

B. The Plan shall include specific procedures for conducting formalized inspections of predetermined selected work items at the time the General Contractor first starts new work. These inspections are performed by a designated QA/QC Inspection Team composed of authorized representatives from the Owner, the General Contractor, A/E, Subcontractor(s) (whose work is being inspected) and others as may be required.

C. The Quality Assurance and Quality Control Plan shall be created as a General Contractor Project Specific Quality Plan addressing at a minimum the following components:

1. Quality meetings.
   a. Pre-construction conference.
   b. Pre-installation review meetings.
   c. Coordination meetings.
2. Regular Daily Inspections.
3. Building Exterior Envelope Review.
4. First Delivery of Material / Equipment Inspections.
5. First Equipment in Place Inspections.
6. Mock-up Inspections.
7. Bench Mark Inspections.
8. Follow-Up Bench Mark Inspections.
9. Below Grade / In-Wall and Above Ceiling Inspections.
10. Utility Activation and Start-Up Inspection Procedures for Equipment/Systems Prior to Validation.

D. Quality Meetings:

1. Pre-construction Conference:
   a. A conference held to discuss all aspects of the construction project such as the schedule, payment procedures, change order procedures and much more. This meeting is held immediately after contract award.
   b. The Owner's Project Manager, Designer, Design Consultants, General Contractor and Subcontractors will attend these meetings.
2. Pre-Installation Review Meetings:

a. A review meeting shall be held for certain kinds of work requiring special coordination efforts between Subcontractors, a better understanding of how the work is to be performed by one or more Subcontractors, sequencing of work between the Subcontractors, or a review of special requirements pertaining to the work to be performed. This type of meeting is conducted just prior to starting the actual work. The meeting is scheduled and run by the General Contractor on an as needed basis.
b. The Owner's Project Manager, Designer, General Contractor and all applicable Subcontractors will attend these meetings.
c. The General Contractor's Staff and Subcontractor's actual supervisory people who will be performing the work in the field are to attend these meetings.
d. Safety precautions relating to the work to be performed are also to be discussed as part of this meeting.

3. Coordination Meetings:
   a. The General Contractor shall conduct project Coordination Meetings at regular intervals. Project Coordination Meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings. An example would be regularly scheduled MEP coordination meetings to monitor the progress of the MEP coordination process.
   b. General Contractor shall request representation by every party currently involved in coordination or planning for the construction activities involved.
   c. General Contractor shall record meeting results and distribute copies to everyone in attendance and others affected by decisions or actions resulting from each meeting. The Owner's Project Manager and the Designer are to be on the Distribution List.

E. Regular Daily Inspections:

1. The General Contractor will monitor the quality of the in-place construction work daily, to ensure that it complies with the requirements of the Contract Documents, Pre-Construction Meetings, Pre-Installation Meetings and Coordination Meetings.
2. The General Contractor shall log, record and distribute daily record of quality monitoring as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action
3. The QA/QC Inspection Team will inspect work periodically based on observations noted in General Contractor's reporting to verify completion and compliance.

F. First Delivery of Material/Equipment Inspection:

1. The General Contractor shall manage and keep current an anticipated delivery schedule for all materials and equipment to be delivered to the site and provide regular updates or upon request to the Owner's Project Manager and QA/QC Inspection Team.
2. The General Contractor shall log, record and distribute any account on the first delivery of each type of material or equipment as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action

3. First deliveries will be verified against the requirements of the design documents and the approved submittals. Nonconforming materials and/or equipment will not be allowed to be set into place and will be removed from the site.
4. This inspection establishes the basis for judging all future deliveries of like material/equipment.

G. First Equipment In Place Inspection:

1. The General Contractor shall manage and keep current an anticipated schedule for all materials and equipment to be inspected in place and provide regular updates or upon request to the Owner's Project Manager and QA/QC Inspection Team.
2. General Contractor and QA/QC Inspection Team will inspect and document the first setting of equipment to verify it is in conformance with the requirements of the Contract Documents.
3. The installation and assembly will be verified against the requirements of the design documents and the approved shop drawings.
4. The General Contractor shall log, record and distribute any account for each type of first in place equipment inspection as a component of daily reporting and provide notification on a regular basis during construction of currently observed items requiring corrective action or pending inspection.
5. Upon acceptance of the equipment in place, the General Contractor can proceed with permanently anchoring it into place by the means prescribed in the Contract Documents.
6. This inspection establishes the basis for judging all future setting of like equipment.

H. Mock-Up Inspections:

1. The General Contractor will note all Mock-Ups required by the Contract Documents and include the activity in their construction schedule and submit for review and approval of the Owner's Project Manager, the Designer and the QA/QC Inspection Team.
2. The General Contractor shall log, record and distribute any account of Mock-Up(s) as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up, and inspection.
3. General Contractor will benchmark each work type within the Mock-Up for conformance with the requirements and review with the QA/QC Inspection Team.
4. The QA/QC Inspection Team shall review, comment that the work appears in conformance to the requirements. Comments are documented and distributed by the General Contractor. Non-conforming work will be corrected at no additional cost to the Owner.
5. The approved Mock-Up establishes a basis for judgment for all later like construction.
6. The Mock-Up process and inspection(s) does not take away from the responsibility of the General Contractor and installing contractors to provide a finished and fully functioning product and to maintain the construction schedule.

I. Benchmark Inspections (In Sequence Work):

1. The General Contractor in consultation with the Owner's Project Manager, Designer and QA/QC Inspection Team will establish which work will be scheduled for benchmarking during the normal course of construction.
2. The General Contractor shall log, record and distribute any account of Benchmark(s) as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up, and that require inspection.
3. General Contractor shall note that the work to be inspected has been started and if found to be acceptable shall call for a benchmark inspection to be conducted by the QA/QC Inspection Team.
4. The QA/QC Inspection Team shall review, comment that the work appears in conformance to the requirements. Comments are documented and distributed by the General Contractor. Non-conforming work will be corrected at no additional cost to the Owner.
5. This inspection establishes the basis for judging all future work of a like type, none of which shall commence until the benchmark is approved.
6. The Benchmark process and inspection(s) does not take away from the responsibility of the General Contractor and installing contractors to provide a finished and fully functioning product and to maintain the construction schedule.

J. Follow-Up Benchmark Inspections:

1. The General Contractor shall ensure that all subsequent work being built of the same type of work that was previously benchmarked will be built in conformance to the Benchmarked work without deviation.
2. The General Contractor and QA/QC Inspection Team will randomly inspect subsequent work being built of the same type of work that was previously benchmarked to ensure the work is being built in conformance with the benchmarked work.
3. The General Contractor shall log, record and distribute any account of follow-up benchmark(s) as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up, and that require inspection.

K. Below Grade / In Wall and Above Ceiling Inspections:

1. It is the intent of this section to mandate inspection of as much of the work that is to be enclosed before it has been covered over to avoid having to reopen closed spaces to complete or correct work therein.
2. The General Contractor shall verify that all work is complete within the concealed space and is ready to be inspected before it is enclosed.
3. The General Contractor and all Subcontractors who have work installed within the work area shall sign a closure form stating that their work has been completed and has been inspected by all applicable code officials. General Contractor will be responsible for all costs to have the space reopened later to complete or correct any work within the space, and to have the space closed again, including all costs incurred for any schedule impacts due to this work.
4. Photographs of areas to be permanently enclosed will be taken by General Contractor and retained as a part of the project record.

5. The General Contractor shall log, record and distribute account of below grade, in wall or above ceiling inspections as a component of daily reporting and provide notification on a regular basis during construction of currently observed items in process, requiring corrective action, or follow up.
6. No closure or covering of work shall proceed until all requirements are met and approval given by the QA/QC Inspection Team where such inspections are to be conducted.

L. Utility Activation and Start-Up Inspection Procedures for Equipment/Systems Prior to Validation. Refer also to Section 01 81 00 - COMMISSIONING for additional requirements.

1. Activation Inspection:
   a. The Activation Inspection is required when the General Contractor has verified that system work meets the contract document requirements and has completed the static installation of equipment/systems, and is ready to place it into dynamic operation for the purposes of shakedown, debugging, check-out and similar activities.
   b. The General Contractor shall log, record and distribute any account of pending activations as a component of daily reporting and provide separate individual notification at a minimum of 48 hour notice prior to the scheduled time for placing specific equipment into dynamic operation.
   c. The General Contractor will notify the QA/QC Inspection Team who will inspect the work, the surroundings and provide comment that the installation is safe and appears meets the requirements for operation.
   d. Any deficiencies noted shall be corrected immediately
   e. The General Contractor will then place the equipment/systems into operation for his use, shakedown, debugging, check-out, and similar activities.
2. Start-Up Inspection:
   a. The General Contractor will coordinate with the Commissioning Agent to ensure that start-up procedures, O&M's, prefunctional checklists and testing, equipment manufacturer's representation are completed and/or in place according to the approved Commissioning Plan.
   b. The General Contractor shall log, record and distribute any account of pending startups as a component of daily reporting and provide separate individual notification at a minimum of 48 hour notice prior to the scheduled time for placing specific equipment into final operation.
   c. The General Contractor shall coordinate with the QA/QC Inspection Team and the Commissioning Agent to ensure that the installation operates as required.
   d. All non-conforming work will be corrected immediately.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract including, but not limited to, the following:

1. The Owner.
2. The Designer (the Architect-of-Record or Engineer-of-Record as applicable).
3. The Owner’s Project Manager.
4. The General Contractor.

B. "Reviewed": When used to convey Designer's action on General Contractor's submittals, applications, and requests, "reviewed" is limited to Designer's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Designer. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities subject to Owner approval. 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, and have available on site for reference.

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 Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

AA	Aluminum Association, Inc. (The)
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ABAA	Air Barrier Association of America
ACI	ACI International (American Concrete Institute)
AGC	Associated General Contractors of America (The)
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
APA	APA - The Engineered Wood Association
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers

ASME	ASME International (The American Society of Mechanical Engineers International)
ASTM	ASTM International (American Society for Testing and Materials International)
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
CDA	Copper Development Association
CISCA	Ceilings & Interior Systems Construction Association
CRI	Carpet & Rug Institute (The)
CSI	Construction Specifications Institute (The)
DHI	Door and Hardware Institute
EPA	Environmental Protection Agency (United States)
FM	Factory Mutual
FMRC	Factory Mutual Research (Now FM Global)
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GS	Green Seal
HPVA	Hardwood Plywood & Veneer Association
ICRI	International Concrete Repair Institute, Inc.
IESNA	Illuminating Engineering Society of North America
ILI	Indiana Limestone Institute of America, Inc.
ISO	International Organization for Standardization
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Service NA
LEED	Leadership in Energy & Environmental Design (USGBC)
MFMA	Maple Flooring Manufacturers Association, Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCMA	National Concrete Masonry Association
NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NRCA	National Roofing Contractors Association
NSF	NSF International (National Sanitation Foundation International)
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NWWDA	National Wood Window and Door Association (Now WDMA)

SDI	Steel Deck Institute
SDI	Steel Door Institute
SGCC	Safety Glazing Certification Council
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
TCA	Tile Council of America, Inc.
UL	Underwriters Laboratories Inc.
USGBC	U.S. Green Building Council
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WWPA	Western Wood Products Association

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of current edition of Codes in the Commonwealth of Massachusetts.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 43 25

TESTING AGENCY SERVICES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. The Owner may engage an independent testing agency at its own expense to perform certain testing, to confirm compliance with contract requirements and criteria described in the various Specification Sections and as the Owner's Project Manager deems appropriate. It is the General Contractor's responsibility to provide and pay for its own inspection and testing. See Section 01 40 00.

B. Refer also the list of testing below, and to individual Specification Sections for the types and frequency of testing to be performed by the Owner's independent testing laboratory.

1.3 RELATED SECTIONS

A. GENERAL CONDITIONS

1. Inspections and testing required by laws, ordinances, rules, regulations, or orders of public authorities.

B. Section 01 40 00 – QUALITY REQUIREMENTS

1. General Contractor's responsibility for testing services to maintain quality control.

1.4 Owner TESTING AGENCY SERVICES

A. Owner testing agency services may include, but not be limited to, the following:

1. Soils; in-place and fill.
2. Piles/Piers.
3. Paving.
4. Loam and seed.
5. Concrete.

6. Waterproofing.
7. Masonry and mortar.
8. Steel.
9. Fireproofing.
10. Firestopping.
11. Roofing.
12. Hangers and supports in Divisions 21-26.
13. Others as required to demonstrate compliance with Contract requirements.

B. Each independent inspection and testing agency engaged on the project shall be authorized by authorities having jurisdiction to operate in the Commonwealth of Massachusetts.

1.5 ENGAGEMENT OF INDEPENDENT TESTING LABORATORY

A. The Owner may engage and pay for the services of independent inspectors and an independent testing laboratory to perform the services specified under various Sections of the Specifications.

B. The services of a testing laboratory as specified in this Section is intended for the Owner's Project Manager's verification of the General Contractor's compliance with the requirements of the Contract Documents. This shall in no way relieve the General Contractor of its responsibilities to provide its own quality control, to meet all requirements of the Contract and to provide a completed project free from construction defects.

C. Services and quantities of testing as specified herein are approximate and may vary. Actual services and quantities of testing will be determined by the Owner's Project Manager and the Designer during the construction period.

D. Locations for taking sample specimens for testing shall be as directed by the Owner's Project Manager and the Designer-of-Record.

1.6 GENERAL CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel and provide access to the work and to fabricator's facilities as required for the performance of their testing.

B. Provide Casual Labor and Facilities:

1. To provide access to the work to be inspected or tested.
2. To obtain and handle specimens at the site.
3. To facilitate inspections and tests.
4. To construct a storage box, on the site, of sufficient size to store cylinders which will afford protection required by ASTM C31.

C. Shop Drawings: Provide a complete set of construction documents and shop and/or erection drawings for the items being inspected and tested.

D. Samples:

1. Provide the laboratory with preliminary representative samples of materials to be tested, in requested quantities.
2. When the source, quality, or characteristic of an approved source changes or indicates lack of compliance with contract requirements, submit additional samples of materials to testing laboratory.

E. Miscellaneous Reports, Lists: When requested by the Designer or testing laboratory, the General Contractor shall immediately provide copies of mill reports, cutting lists, shipping bills, material bills, time and place of shipment of materials to shop and field, and any relevant data on pressure testing and investigations of materials.

F. Notification:

1. To facilitate the timely sequence of inspection and testing, the General Contractor shall give advanced notification to the testing laboratory and the Designer that work has progressed to the point where inspection and testing may proceed.
2. Advanced notification shall be 48 business hours (minimum) prior to commencement of activity requiring testing and inspection.

1.7 GENERAL CONTRACTOR'S QUALITY CONTROL

A. Services of testing laboratory retained by the Owner is for verification of General Contractor's compliance and, if such tests or inspection indicates failure to comply with these Contract Documents, the General Contractor shall bear all costs associated with additional testing and inspection after the work has been corrected, to verify compliance.

B. Provide a Quality Control Program, to the Owner's Project Manager and the Designer for their approval that includes monitoring and enforcement of the quality programs of all Subcontractors. See Section 01 40 00 Quality Requirements.

1.8 PATCHING

A. Areas where samples are taken for purposes of testing shall be patched by the General Contractor to the satisfaction of the Owner's Project Manager and the Designer-of-Record.

1.9 REPORTING OF RESULTS

A. The testing laboratory shall document the values obtained in all tests, and shall indicate degree of compliance with the requirements of the Contract Documents. Test reports shall include the following information:

1. Designer's project name and number.
2. Type and location of test sample and time and date obtained.

3. Type of test, ASTM or other appropriate designation.
4. Result of test and degree of compliance with Contract Documents.

B. Testing laboratory shall, on a weekly basis, distribute results of all tests as follows:

1. Owner' Project Manager – 1 copy
2. Designer – 1 copy
3. Consulting Engineers (as designated by the Designer) – 1 copy
4. General Contractor – 1 copy
5. Subcontractor – 1 copy

C. Notify all parties immediately in the event that test results indicate that strengths, required by the Contract Documents, will not be attained.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITES AND CONTROLS

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Temporary Facilities and Controls including the following:
1. Temporary Water.
2. Weather Protection.
3. Heating During Construction.
4. Temporary Power.
5. Hoisting Equipment and Machinery.
6. Staging.
7. Maintenance of Access.
8. Dust Control.
9. Noise Control.
10. Indoor Air Quality (IAQ) Management.
11. Enclosures.
12. Cleaning During Construction.
13. Field Offices.
14. Telephone Service.
15. Sanitary Facilities.
16. Construction Barriers.
17. Parking.
18. Debris Control and Removal.
19. Safety Protection.
20. Vehicle and Equipment Protection.
21. Shoring.
22. Construction Fence.
23. Project Identification Sign.

1.3 TEMPORARY WATER

A. Water will be furnished by the General Contractor up to the point indicated on the Drawings for the permanent connection to the water supply system.

B. Water shall be distributed by means of connections to the permanent service lines that are to be installed at the expense of the General Contractor.

C. Any temporary hoses and pipe lines and connections from the permanent service lines either outside or within the building, necessary for the use of the General Contractor and his Subcontractors shall be installed, protected, and maintained at the expense of the Plumbing Subcontractor.

D. Temporary hoses and temporary pipe lines used for transporting water shall not be run unattended or unprotected across parking areas, parking area entrance, walkways, plazas, or steps. Temporary hoses and temporary pipelines shall not be permitted to be installed along, through or across corridor and occupied rooms or spaces.

E. The General Contractor shall provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for his employees and those of his Subcontractors.

F. Use of the water may be discontinued by the Commonwealth if, in the opinion of the Owner's Project Manager, it is wastefully used.

1.4 WEATHER PROTECTION

A. It is the intent of these Specifications to require that the General Contractor shall provide temporary enclosures and heat to permit construction work to be carried on during the months of November through March in compliance with M.G.L. Chapter 149, Section 44D(G). Under no circumstances shall the General Contractor suspend any work during the months of November through March because of their reluctance to provide and pay for temporary weather protection. These Specifications are not to be construed as requiring enclosures or heat for operations that are not economically feasible to protect in the judgment of the Designer. Included in the preceding category, without limitation, are such items as site work, excavation, steel erection, erection of certain "exterior" wall panels, roofing, and similar operations.

B. "WEATHER PROTECTION" shall mean the temporary protection of that work adversely affected by moisture, wind, and cold, by covering, enclosing and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by the Designer and consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations. The General Contractor shall furnish and install all "weather protection" material and be responsible for all costs, including heating required to maintain a minimum temperature of 50 degrees F. at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the General Contractor.

C. Within 30 calendar days after his award of contract, the General Contractor shall submit in writing to the Designer for approval, three copies of his proposed methods for "Weather Protection."

D. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices. Heating devices which may cause damage to finish surfaces shall not be used.

E. The General Contractor shall furnish and install one accurate Fahrenheit thermometer at each work area as designated by the Designer. However, one additional accurate Fahrenheit thermometer shall be provided for every 2,000 square feet of floor space where the work areas exceed 2,000 square feet.

1.5 HEATING DURING CONSTRUCTION

A. Within 30 calendar days after the commencement of work under this Contract, the General Contractor shall submit in writing to the Designer for approval, three copies of his method and time schedule for heating during construction which shall concur with his general progress schedule hereto before submitted as required under Article V of the CONTRACT AND GENERAL CONDITIONS.

B. After the building or portion thereof is completely enclosed by either permanent construction or substantial temporary materials having a comparable resistance as the specified permanent construction. The General Contractor shall pay and provide heat therein of not less than 50 degrees F., nor more than 75 degrees F., which shall be continuously maintained in the enclosed area to the extent necessary to properly progress and protect the work until the project is accepted.

C. The General Contractor shall furnish and install one accurate recording Fahrenheit thermometer at a place designated by the Designer, and one additional accurate thermometer for every 2,000 square feet of floor space, located as directed by the Designer in order to determine if the specified temperatures are maintained. The General Contractor or his authorized agent shall furnish daily to the Owner's Project Manager three copies of a signed statement of temperatures recorded every three hours.

D. The General Contractor, with the approval of the Designer and the Owner, may use the permanent heating system as specified for the project once it has been tested, flushed out and chemically treated, thoroughly cleaned of all construction dust and dirt, and is ready to operate. The General Contractor shall pay all energy costs for heating during construction and provide meters if required. The General Contractor and the HVAC and/or Electrical Subcontractor shall coordinate their work so that the permanent heating system for the building will be available and ready to provide heat as soon as the building is closed in. In case the Contract includes more than one building, the heating shall be provided for each building in accordance with the above provision.

E. Operating labor shall be provided for continuous direct attendance, for frequent inspection of the system, emergency repairs, and keeping of temperature records. Continuous direct attendance shall mean direct attendance for twenty-four hours each day, seven days per week, Saturdays, Sundays and holidays included, throughout the progress of the work.

F. It shall be the sole responsibility of the General Contractor to arrange for and pay the HVAC and/or Electrical General Contractor to operate and to put in first-class condition all portions of the permanent heating system used for Heating During Construction. The Commonwealth will require the discharge of inexperienced or unsatisfactory operating labor.

G. If the system is electric heat, the foregoing requirements shall equally apply to all the comparable components thereof.

H. The installation and operation of heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection. Heating devices which may cause damage to finish surfaces shall not be used.

1.6 TEMPORARY POWER

A. The utility company will provide electrical energy required for temporary light and power. The Electrical Subcontractor is required under Section 26 00 01 - ELECTRICAL WORK, to provide temporary feeders of sufficient capacity from the local utility company, or from the institution power lines, at the point designated on the drawings, to provide for the electric light and power requirements of the Project while under construction and until the permanent feeders have been installed and are in operation. it is not the intent of the above statement to relieve the General Contractor of the responsibility of payment for energy consumed during construction, but rather to afford him use of permanent feeder, etc. for electric distribution during construction. Payment for energy consumed during construction shall be the responsibility of the General Contractor until either Use and Occupancy or Final Acceptance has occurred.

B. The General Contractor shall pay for the cost of electric energy consumed by himself and by all of his Subcontractors. Any temporary wiring of a special nature, other than that specified in Section 26 00 01 - ELECTRICAL WORK, shall be paid for by the Subcontractor requiring it, such as:

1. Special circuits required by electric welders, elevators, lifts or other special equipment requiring high-amperage and/or special voltage service, etc.
2. Exterior lighting circuits for protection against vandalism, public warning lights, lights for advertising, and similar items.

C. The General Contractor and all Subcontractors, individually, shall furnish all extension cords, sockets, motors, and accessories required for their work. They shall also pay for all temporary wiring of construction offices and buildings used by them. The General Contractor shall pay for the offices of the General Contractor and the Owner’s Project Manager specified in the Contract Form.

D. All temporary wiring installed by the Electrical Subcontractor shall be removed after it has served its purpose. Use copper wire only.

E. All relocations of temporary service to meet construction and/or phasing requirements shall be performed at no additional cost to the Commonwealth.

1.7 HOISTING EQUIPMENT AND MACHINERY

A. All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work shall be furnished, installed, operated and maintained in safe condition by the individual Subcontractors and is so stated in each appropriately related Section of the Specifications. All costs for hoisting operating services shall be borne by the Subcontractors unless specifically excepted in the Contract Documents.

1. A licensed equipment manufacturer's representative shall be present at all times, to witness the erection and dismantling of all hoisting equipment and machinery, whenever such equipment is being erected or dismantled. No such work will be performed without the presence of such representative.
2. Hoisting equipment and machinery erection and dismantling shall be performed only by trained, certified, and experienced riggers qualified to perform such work.
3. Copies of such licenses and/or certifications, clearly indicating qualifications, shall be provided to the Owner's Project Manager prior to commencement of such erecting and dismantling work.

B. Review Drawings for hoisting requirements and openness of traffic access routes to installed destinations of specified equipment and furnishings.

1.8 STAGING

A. All staging, planking and scaffolding, exterior and interior, required for the proper execution of the work and over eight feet in height, shall be furnished, installed, and maintained by the General Contractor.

1. Erection and dismantling of staging shall be performed only by trained, certified, and experienced staging personnel qualified to perform such work.
2. Copies of such certifications, clearly indicating qualifications, shall be provided to the Owner's Project Manager prior to commencement of such erecting and dismantling work.

B. All staging up to eight feet in height shall be provided by the individual Subcontractors as applicable to their work.

1.9 MAINTENANCE OF ACCESS

A. The General Contractor shall provide and maintain for the duration of his contract, a means of access to, around and within the site, as indicated on the Contract Drawings, for vehicular traffic and authorized personnel. This means of access shall be construed to sustain the weight of equipment customarily engaged for use in construction projects of this type and magnitude. The General Contractor shall, without additional compensation from the Commonwealth, furnish labor and materials as may be required from time to time to maintain this means of access in an acceptable condition as determined by the Designer. Pedestrian access shall provide adequate protection against falling debris, slippage, adequate lighting, warning and directional signs, and protection against construction activities.

1.10 DUST CONTROL

A. The General Contractor shall have all Subcontractors provide adequate means for the purpose of preventing dust caused by construction operations from creating a hazard, nuisance, and from entering adjacent occupied areas throughout the period of the construction contract.

B. This provision does not supersede any specific requirements for methods of construction or applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the General Contractor.

1.11 NOISE CONTROL

A. Comply with requirements of authorities having jurisdiction. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.

B. Execute construction work by methods and by use of equipment which will reduce excess noise.

1. Equip air compressors with silencers, and power equipment with mufflers.
2. Manage vehicular traffic and scheduling to reduce noise.
3. No heavy equipment may be started or idled before 7A.M.

1.12 INDOOR AIR QUALITY (IAQ) MANAGEMENT

A. Minimize exposure of building occupants, indoor surfaces, and ventilation air distribution systems to environmental tobacco smoke. At a minimum, take the following measures:

1. Prohibit smoking in the building.
2. Locate exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes, and operable windows.

B. During Construction:

1. During construction meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, Chapter 3, November 2007.
2. Protect stored on-site and installed absorptive materials from moisture damage.
3. If the Owner’s Project Manager authorizes the use of permanent heating, cooling, and ventilating systems during construction, install filter media having a Minimum Efficiency Reporting Value (MERV) of 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction. Replace air filters immediately prior to occupancy. Replacement air filters shall have a MERV 13 according to ASHRAE 52.2.

C. Construction Indoor Air Quality Management Plan Submittal:

1. Within 21 calendar days after receipt of Notice to Proceed, the General Contractor shall submit to the Owner’s Project Manager a finalized Construction IAQ Management Plan.

2. The proposed Plan shall include, but not be limited to, the following:
   a. Protection of ventilation system components during construction.
   b. Cleaning and replacing contaminated ventilation system components after construction, including filtration media.
   c. Temporary ventilation.
   d. Protection of absorptive materials from moisture damage when stored on-site and after installation, including exterior wall rain protection.
   e. Sequence of finish installation plan.
   f. Selection of cleaning products and procedures to be used during construction and final cleaning.
   g. Schedule of emission test data recorded by General Contractor's testing laboratory.

D. Take special care to prevent accumulation of moisture on materials and within packaging during delivery, storage, and handling to prevent development of mold and mildew inside packaging and on products.

E. Immediately remove from site and properly dispose of materials showing signs of mold and mildew, including materials with moisture stains.

F. IAQ Plan Implementation:

1. IAQ Manager: The General Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Construction IAQ Management Plan for the Project.
2. Distribution: The General Contractor shall distribute copies of the Construction IAQ Management Plan to the jobsite foreman, each Subcontractor, Owner's Project Manager, and the Designer.
3. Instruction: The General Contractor shall provide on-site instruction of appropriate procedures and methods to be used by all parties at the appropriate stages of the Project.
4. Preconditioning: Allow products, which have odors and significant VOC emissions, to off-gas in a dry, well-ventilated space for sufficient period to dissipate odors and emissions prior to delivery to Project.
5. Remove containers and packaging from materials prior to conditioning to maximize off-gassing of VOCs.
6. Condition products in ventilated warehouse or other building.
7. Coordinate Construction IAQ Management Plan with final cleaning.

1.13 ENCLOSURES

A. Provide temporary, insulated, weather tight closures of openings in exterior surfaces for providing acceptable working conditions and protection for materials, allowing for heating during construction, and preventing entry of unauthorized persons. Provide doors with self-closing hardware and locks.

B. All utilities including electric ducts, conduits, telephone lines, sprinklers, and other utilities shall be protected against damage from construction activity. The General Contractor shall be

responsible for all damage to the utilities from construction and shall repair all such damage at no additional cost to the Owner.

1.14 CLEANING DURING CONSTRUCTION

A. Unless otherwise specified under the various Sections of the Specifications, the General Contractor shall perform clean-up operations during construction as herein specified.

1. Refer to Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for additional requirements.

B. Control accumulation of waste materials and rubbish; periodically dispose of off-site in a legal manner. The General Contractor shall bear all costs, including fees resulting from such disposal.

C. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finish operations.

D. Maintain project in accordance with all local, Commonwealth of Massachusetts, and Federal Regulatory Requirements.

E. Store volatile wastes in covered metal containers, and remove from premises.

F. Prevent accumulation of wastes which create hazardous conditions.

G. Provide adequate ventilation during use of volatile or noxious substances.

H. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on site.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.
4. Identify potential sources of cleaning water runoff and propose abatement procedures.

I. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

J. Use only those cleaning materials and methods recommended by manufacturer of surface materials to be cleaned.

K. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.

L. Provide on-site containers for collection of waste materials, debris, and rubbish.

M. Remove waste materials, debris and rubbish form the site periodically and dispose of at legal disposal dump site (DEP approved).

N. Handle material in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.

O. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.

1.15 FIELD OFFICES

A. The General Contractor must provide and maintain a field office for their and their sub-contractors' use. The cost of such facilities shall be borne by the General Contractor.
   1. Locate field offices as directed by the Owner.
   2. Maintain field offices in a clean and orderly manner.
   3. Remove field offices prior to the first day of school.
   4. Field office at shall be large enough to hold weekly job meetings. This field office shall also contain a scanner/copier/printer and wireless internet.

1.16 SANITARY FACILITIES

A. The General Contractor shall provide suitable toilet facilities for its staff, including workers on the job and personnel of Subcontractors.

B. Provide chemical toilets where work is in progress and in quantity required by OSHA Code.

C. Chemical toilets and their maintenance shall meet requirements of state and local health regulations and ordinances and shall be subject to the approval the Owner's Project Manager.

D. Upon completion of new toilet facilities, the Owner's Project Manager may designate a specific toilet area to be used for the General Contractor and Subcontractors engaged in the Work. However, General Contractor shall take responsibility for maintenance and cleaning of such areas and shall leave them in first class condition equal to the accepted conditions of toilet facilities not used for construction personnel.

1.17 CONSTRUCTION BARRIERS

A. Proper construction barriers shall be provided around the contract work areas as defined by the Contract Drawings or as directed by the Owner's Project Manager.

B. Construction barriers shall consist of traffic cones, ribbons, tapes, secure fencing, trench covers, wood barriers, warning signs, directional signs, and other traffic materials to keep traffic and people from area of construction and maintain ongoing operations.

C. Barriers shall be erected at such approved locations as are necessary, sufficiently cross-braced and supported adequately from floors and ceilings as required.

1.18 PARKING

A. Only during contract working hours and to the extent available, existing parking facilities located at the construction area will be available for use by the General Contractor, Subcontractors and their employees. Such parking areas shall be designated by the Owner. The Commonwealth shall not be responsible for cars, trucks, etc. or their contents and the General Contractor and his Subcontractors and material suppliers will use the designated area with this understanding.

1.19 DEBRIS CONTROL AND REMOVAL

A. Debris shall not be permitted to accumulate or migrate and the work shall at all times be kept satisfactorily clean. Facility trash receptors shall not be used for the disposal of debris. Dumpster shall be provided by the General Contractor for removal of debris for all Subcontractors.

B. Remove debris from the work site on a daily basis and dispose of same at any (private or public) DEP approved dump that the General Contractor may choose providing that the General Contractor shall make all arrangements and obtain all approvals and permits necessary from the owner or officials in charge of such dumps. Proposed dump site shall be submitted to be approved by the Owner's Project Manager prior to start of demolition. During disposal process, copies of daily receipts from dumpsite shall be submitted on a regular basis.

1.20 SAFETY PROTECTION

A. At no time shall the work be left unattended without proper safety protection and shall not be left unprotected to the weather and accessible to the public. It is the responsibility of the General Contractor to maintain proper safety protection for the public while work is in progress or unattended.

1.21 VEHICLE AND EQUIPMENT PROTECTION

A. All construction activities shall be performed in such a manner so as not to dust, stain or damage any building elements, equipment, vehicles, etc. within general vicinity of the construction work area. Any damage to these items shall be cleaned and repaired at the expense of the General Contractor.

1. All construction vehicles and equipment on site shall be effectively disabled and secured when not in use.

1.22 SHORING

A. The Subcontractors shall provide all temporary shoring and bracing as required for the proposed work. Comply with all applicable codes and standards.

1.23 CONSTRUCTION FENCE

A. A construction fence shall be provided along the entire perimeter of the contract limit lines, and shall be kept in good repair at all times, and shall be arranged to maintain ongoing operation's access and egress.

B. Construction fences shall be six feet high and of chain link, or approved equal, erected in a substantial manner, straight, plumb and true as approved by the Designer.

C. Gates shall be built into fence at such approved locations as are necessary, well cross-braced and hung on heavy strap hinges with proper post and hook for double gates. Provide heavy hasps and padlocks for each gate. Provide a set of three keys for each lock to Owner's Project Manager to facilitate emergency access.

D. Fencing shall be removed by the General Contractor at no cost to the Commonwealth at such time before final completion as the Designer directs. Restore site to acceptable condition after removing fence.

1.24 PROJECT IDENTIFICATION

A. Request sketch of sign language and graphics from the Owner's Project Manager in sufficient time that sign can be fabricated and erected at start of construction.

B. The Contractor shall provide one 6 foot high by 8 foot wide project sign as indicated and specified following, conforming to OPM requirements. Sign shall be fabricated from 1-inch thick MDO exterior grade plywood laminated with waterproof glue. Edges of sign shall be banded with 1 inch by 1/2 inch pressure treated pine banding. Contact the Owner's Project Manager for wording for this specific project.

C. Sign shall be supported by two 4 by 4 inch post supports set in 12 inch diameter concrete footings to a depth of four feet, such that sign bottom is raised 4 feet above grade. Nails, bolts, and connecting hardware shall be galvanized. Provide alternative method of support if required by site conditions and approved by the Owner's Project Manager.

D. Sign shall be lettered by a professional sign painter, in accordance with the general layouts attached. Lettering shall be gloss vinyl, size, and color as indicated as attached. Surfaces and edges of sign shall receive two coats of exterior primer and two coats of exterior gloss enamel.

E. Submit a shop drawing indicated sign construction and lettering for approval by the Owner's Project Manager. The official project title and an electronic file of the attached sketches in

Autocad drawing format can be provided to the Contractor by the Owner's Project Manager upon request.

F. Locate and install the sign at location directed by the Owner's Project Manager. At the completion of the Project, remove the sign and supports completely and restore surface to original condition.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REQUIREMENTS INCLUDED

A. Products include material, equipment, and systems.

B. Comply with Specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.

D. Do not use materials and equipment removed from existing structures, except as specifically required, or allowed, by the Contract Documents.

E. In the case of an inconsistency between Drawings and the Project Manual, or within either document which is not clarified by addendum, the product of greater quality or greater quantity of work shall be provided in accordance with the Designer’s interpretation.

1.3 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.4 MANUFACTURERS' INSTRUCTIONS

A. When work is specified to comply with manufacturers' instructions, submit copies as specified in Section 01 33 00 - SUBMITTAL REQUIREMENTS, distribute copies to persons involved, and maintain one set in field office.

B. Perform work in accordance with details of instructions and specified requirements.

1.5 TRANSPORTATION AND HANDLING

A. Refer to the Contract and General Conditions and Specifications Sections for requirements pertaining to transportation and handling of materials and equipment.

B. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturers' labeled and unopened containers or packaging, dry

C. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct, and products are undamaged.

1.6 STORAGE AND PROTECTION

A. Refer to the Contract and General Conditions and Specifications Sections for requirements pertaining to storage and protection of materials and equipment.

B. Store products in accordance with manufacturers' instruction, with seals and labels intact and legible. Store sensitive products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturers' instructions.

C. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

D. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

E. Arrange storage to provide access for inspection. Periodically inspect to assure that products are undamaged, and are maintained under required conditions.

F. Protect masonry and stone products from damage and staining.

G. Protect finished materials, including window frames and doors, with protection acceptable to the Owner’s Project Manager.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 74 18

DEMOLITION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for recycling and disposing of demolition waste.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 01 35 43 - ENVIRONMENTAL PROTECTION PROCEDURES:
   a. Environmental-protection measures during construction.
2. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
   a. Additional requirements for addressing existing materials in renovation and/or remodeling projects; not applicable to new construction.

1.3 DEFINITIONS

A. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waster or debris.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 75 percent by weight of total waste generated by the Work.

B. Salvage/Recycle Requirements: Salvage and recycle as much non-hazardous demolition and construction waste as possible including the following materials:

1. Asphaltic concrete paving.
2. Concrete and concrete reinforcing steel.
3. Brick and concrete masonry units.
4. Coated brick, concrete, and concrete masonry units. Coatings shall include, but not be limited to: paint, stucco applications, plaster, etc.
5. Wood studs, wood joists, plywood, oriented strand board, paneling and trim.
6. Casework and cabinetry.
7. Structural steel, miscellaneous steel and rough hardware.
8. Roofing.
9. Insulation.
10. Doors, door frames and door hardware.
11. Windows, glass, plastic and glazing.
12. Metal studs.
13. Gypsum board.
14. Acoustical tile and panels.
15. Carpet and carpet pad.
16. Demountable partitions.
17. Equipment.
18. Plumbing fixtures, piping, supports, hangers, valves, and sprinklers.
19. Mechanical equipment and refrigerants.
20. Electrical conduit, copper wiring, lighting fixtures, lamps, and ballasts.
21. Electrical devices, switchgear, panelboards and transformers.

C. In the event the General Contractor encounters previously unidentified material that is reasonably believed to be hazardous, asbestos containing, coated with lead-based paint, or oily debris, the General Contractor shall immediately stop work in the affected area and report the condition to the Designer and the Owner. At no time shall such material be handled or disposed of by the General Contractor. The General Contractor agrees to cooperate with the Owner and any consultants engaged by the Owner to perform services with respect to the analysis, detection, removal, containment, treatment, and disposal of such regulated materials.

1.5 SUBMITTALS

A. Waste Management Plan (WMP): Submit three copies of plan within 30 days of date established for the Notice to Proceed, in a format acceptable to the Owner’s Project Manager.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before submitting a request for Substantial Completion, submit three copies of calculated final rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Facility Permitting Information: For disposal and incinerator facilities provide a copy of the facility's current solid waste management facility permit in accordance with 310 CMR 19.000.

E. Facility Permitting Information: For off-site ABC rubble crushing and/or recycling facilities, provide a statement from the facility that references its specific exemption from the solid waste regulations (per 310 CMR 16.05 (3) (e)) or provide a copy of the facility's current solid waste management facility permit in accordance with 310 CMR 19.000.

F. Record Keeping for Recycling and Landfill and/or Incinerator Disposal: Documentation to be submitted by the Contractor shall include the following as a condition of each payment:

1. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
2. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.

G. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

H. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

I. Qualification Data: The Refrigerant Recovery Technician shall be certified by EPA-approved certification program and shall provide a copy of current certification to the Designer prior to starting work.

J. Statement of Refrigerant Recovery: The Refrigerant Recovery Technician responsible for recovering refrigerant shall prepare and sign a document stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations and using equipment that has a current EPA Registration. The document shall include the name and address of technician, date refrigerant was recovered, amount of refrigerant recovered and shipped, and date of receipt of shipment by the reclaimer.

1.6 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: The Refrigerant Recovery Technician will use recycling/recovery equipment that has a current EPA Registration.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction, including but not limited to, Massachusetts solid waste regulations contained in 310 CMR 16.00 and 310 CMR 19.000.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, and waste reduction, handling, transportation and recycling/disposal procedures. Include separate sections in plan for recycling and disposal of demolition waste. Indicate quantities by weight throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition and site-clearing waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Program: List each type of waste and whether it will be recycled or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
3. Donated Materials: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt. Include names, addresses, and telephone numbers.
4. Sold Materials: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt. Include names, addresses, and telephone numbers.

D. Handling and Transportation Procedures: Include methods that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location(s) on Project site where materials separation will be located.

E. Waste Management Coordinator: Identify General Contractor employee who will be the Waste Management Coordinator for the project. The Waste Management Coordinator will be responsible for implementing, monitoring, and reporting status of waste management work plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement Waste Management Plan as approved by the Designer. Provide containers, storage, signage, transportation, and other items as required to implement WMP for the entire duration of the Contract.

B. The General Contractor shall conduct a Waste Management Meeting at the Site. The General Contractor shall review methods and procedures related to waste management including, but not limited to, the following:

1. Distribute approved WMP to everyone concerned within three days of approved submittal return.
2. Clearly identify the Waste Management Coordinator and explain the Coordinator's responsibilities.
3. Review WMP with each subcontractor when they first begin work on-site. Review plan procedures and locations established for recycling and disposal.
4. Review and finalize procedures for material separation and verify availability of containers and bins needed to maintain production.
5. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
6. Provide recycling educational literature for all workers, Subcontractors, and suppliers engaged in on-site activities.
7. Provide appropriate recycling signage for containers and workspaces.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, sold, and disposed.
2. Comply with project requirements for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Sale and Donation: Sale activities are not permitted on Project site. Labor for loading donated items acceptable to local trade practices; union labor if applicable

3.3 RECYCLING DEMOLITION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: Available recycling receivers and processors include, but are not limited to, those listed in the Massachusetts Recycling Directory, available from the Massachusetts State Bookstore (617-727-2834) located in the Massachusetts State House, for recycling operations within the Commonwealth of Massachusetts.

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. For waste which cannot be separated at Project site, co-mingle only with waste which is to be separated later at a recycling facility. Contamination of recycling containers with trash or other contaminants will be addressed by the General Contractor and who will be solely responsible for payment of all fines and penalties.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off User Agency's property and transport to recycling receiver or processor.

D. On-site crushing of non-coated asphalt pavement, brick, and concrete (ABC) rubble as described in 310 CMR 16.05, is allowed, provided performed in accordance with 310 CMR 16.05. All coated ABC waste must be transported off-site to an asphalt batching plant or to an ABC crushing or recycling operation that is either conditionally exempt from 310 CMR 16.00 or has been sited and permitted in accordance with 310 CMR 16.00 and 310 CMR 19.000, respectively.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Deposit all debris in designated container to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for fill or sub-base.

C. Masonry: Deposit all masonry debris in designated container to be transported to approved aggregate recycling facility to be. crushed and screened for use as satisfactory soil for general fill or satisfactory soil for fill or sub-base. Clean and stack undamaged whole masonry units on wood pallets for reuse.

D. Wood Materials: Sort and stack salvageable members according to size, type, and length. Separate lumber waste and deposit into appropriate container. Separate engineered wood products, panel products, and treated wood materials into designated containers.

E. Metals: Separate metals by material type if practical. Stack salvageable structural steel members according to size, type of member, and length.

F. Asphalt Shingle Roofing: Organic and glass-fiber asphalt shingles and felts shall be disposed of at a facility permitted by Massachusetts Department of Environmental Protection (DEP) to process post-consumer (used) asphalt shingles. Recycle nails, staples acceptable, flashing trim and accessories as metals.

1. Asbestos containing shingles shall be pre-abated and properly disposed of by a Massachusetts licensed asbestos abatement General Contractor, in accordance with all applicable regulations. Asbestos abatement work, including disposal of asbestos contain materials, is not included in the scope of the Work and will be performed by others.

G. Glass: Deposit glass debris into designated containers to be transported to approved glass-recycling facility.

H. Plastics: Deposit plastic containers and debris into designated containers to be transported to approved plastic recycling facility.

I. Gypsum Board: Deposit scraps of gypsum board into designated container protected from weather and transport to appropriate gypsum-recycling facility to be processed into soil amendment.

J. Acoustical Ceiling Panels and Tile: Deposit pulp able mineral fiber panels into designated container protected from weather and prepare for transport, as directed by manufacturer, to appropriate recycling facility to be processed into new acoustic ceiling panels. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

K. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

L. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

M. Plumbing Fixtures: Separate by type and size fixtures suitable for reuse. Deposit all other fixtures into designated containers by material type to be transported to approved recycling facility.

N. Piping: Separate piping materials by material composition. Deposit in designated containers. Separate supports, hangers, valves, sprinklers, and other components by material type and deposit in designated containers for transport to approved recycling facility.

O. Lighting Fixtures: Separate lamps by type and protect from breakage.

P. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

Q. Conduit: Deposit conduit and fittings into designated container.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. For solid waste disposal facilities located in the Commonwealth of Massachusetts, dispose of materials only in facilities which currently comply with applicable state regulations, including requirements of 310 CMR 16.00 {Site Assignment for Solid Waste Facilities} and 310 CMR 19.000 {Solid Waste Management}, and local bylaws.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off the Owner's property and legally dispose of them.

3.6 ITEMS TO BE SALVAGED AND TURNED OVER TO THE OWNER.

A. Refer to Drawings for items to be salvaged and turned over to the Owner.

B. The contractor shall notify the Owner of demolition activities and give at least seven (7) days' notice for when items to be salvaged are scheduled for removal.

C. The contractor shall coordinate with the Owner for temporary storage of salvaged items.

D. Items to be salvaged shall be removed and stored with care so as not to cause damage to these items.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for recycling and disposing of construction waste.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 01 35 43 - ENVIRONMENTAL PROTECTION PROCEDURES:
   a. Environmental-protection measures during construction.
2. Section 01 74 18 - DEMOLITION WASTE MANAGEMENT AND DISPOSAL
   a. Additional requirements for addressing existing materials in renovation and/or remodeling projects; not applicable to new construction.

1.3 DEFINITIONS

A. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waste or debris.

B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, and/or installation of new materials as part of remodeling, renovation, or repair operations. Construction waste includes packaging.

1. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations prior to renovations or remodeling.

C. Disposal: Removal off-site of construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Develop a Waste Management Plan that states as its objective to attain at project completion a recycling rate of 75 percent or more by weight of the total waste generated by the Work.

B. Recycling Requirements:

1. Maximize recycling of non-hazardous construction waste including the following materials:
   a. Site-clearing waste.
   b. Masonry and CMU.
   c. Lumber, wood sheet materials, and wood trim.
   d. Metals.
   e. Roofing.
   f. Insulation.
   g. Glass.
   h. Plastics.
   i. Gypsum board, refer to paragraph below.
   j. Acoustical ceiling panels.
   k. Carpet and pad.
   l. Piping.
   m. Wire and cable.
   n. Electrical conduit.
   o. Packaging: 100 percent of the following uncontaminated packaging materials: Paper, cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates, plastic pails.
2. Clean Gypsum Board Waste: For new construction and renovation projects involving 20,000 square feet or greater, divert clean (virgin material) gypsum board waste from disposal to recycling and/or reuse outlets.
   a. For new construction and renovation projects involving less than 20,000 square feet, contractors are encouraged to divert clean gypsum board waste from disposal to recycling and/or reuse outlets.
   b. Clean (virgin material) gypsum board is defined as material without any existing attached material, including but not limited to adhesives, mastics, and paints.

1.5 SUBMITTALS

A. Waste Management Plan (WMP): Submit 3 copies of Plan within 30 days of date established for the Notice to Proceed, in a format acceptable to the Owner’s Project Manager.

B. Waste Management Progress Reports: Concurrent with each Application for Payment, submit three copies of report. The following information shall be included:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste recycled, both estimated and actual in tons.
5. Total quantity, of waste recovered (recycled) as a percentage of total waste.

C. Waste Management Calculations: Before submitting a request for Substantial Completion, submit three copies of calculated final rates for recycling and disposal as a percentage of total waste generated by the Work.

D. Facility Permitting Information: For landfill and/or incinerator facilities, provide a copy of the facility's current solid waste management facility permit in accordance with 310 CMR 19.000.

E. Record Keeping for Recycling and Landfill and/or Incinerator Disposal: Documentation to be submitted by the General Contractor shall include the following:

1. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
2. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.

F. Facility Permitting Information: For ABC rubble crushing and/or recycling facilities, provide a statement from the facility that references its specific exemption from the solid waste regulations (per 310 CMR 16.05 (3) (e)) or provide a copy of the facility's current solid waste management facility permit in accordance with 310 CMR 19.000.

G. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

H. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction, including but not limited to, Massachusetts solid waste regulations contained in 310 CMR 16.00 and 310 CMR 19.000.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, and waste reduction, handling, transportation, and recycling/disposal procedures. Include separate sections in plan for

recycling and disposal of construction waste. Indicate quantities by weight throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Program: List each type of waste and whether it will be recycled or disposed in a landfill or incinerator. Include points of waste generation, total quantity by weight of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
3. Donated Materials: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt. Include names, addresses, and telephone numbers.
4. Sold Materials: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt. Include names, addresses, and telephone numbers.

D. Handling and Transportation Procedures: Include methods that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location(s) on Project site where separated materials will be stockpiled.

E. Waste Management Coordinator: Identify General Contractor employee who will be the Waste Management Coordinator for the project. The Waste Management Coordinator will be responsible for implementing, monitoring, and reporting status of waste management activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement Waste Management Plan as approved by the Designer. Provide containers, storage, signage, transportation, and other items as required to implement WMP for the entire duration of the Contract.

B. The General Contractor shall conduct a Waste Management Meeting at the Site. The General Contractor shall review methods and procedures related to waste management including, but not limited to, the following:

1. Distribute approved WMP to everyone concerned within three days of approved submittal return.

2. Clearly identify the Waste Management Coordinator and explain the Coordinator's responsibilities.
3. Review WMP with each subcontractor when they first begin work on-site. Review plan procedures and locations established for recycling and disposal.
4. Review and finalize procedures for material separation and verify availability of containers and bins needed to maintain production.
5. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
6. Provide recycling educational literature for all workers, Subcontractors and suppliers engaged in on-site activities.
7. Provide appropriate recycling signage for containers and workspaces.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walkways, and other adjacent occupied facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be recycled, reused, donated, sold, and disposed.
2. Comply with project requirements for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

A. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical. For waste, which cannot be separated at Project site, co-mingle only with waste, which is to be separated later at a recycling facility. The General Contractor will address contamination of recycling containers with trash or other contaminants and who will be solely responsible for payment of all fines and penalties.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off User Agency's property and transport to recycling receiver or processor.

B. On-site crushing of asphalt pavement, brick, and concrete (ABC) rubble as described in 310 CMR 16.05, is not allowed. All ABC waste must be transported off-site to an asphalt batching plant or to an ABC crushing or recycling operation facility that is either conditionally exempt from 310 CMR 16.00 or has been sited and permitted in accordance with 310 CMR 16.00 and 310 CMR 19.000, respectively.

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: To the extent feasible, require shippers 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. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

C. Concrete: Deposit all debris in designated containers to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for fill or sub-base.

D. Masonry: Deposit all masonry debris in designated containers to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for general fill or satisfactory soil for fill or sub-base. Clean and stack undamaged whole masonry units on wood pallets.

E. Wood Materials:

1. Clean Cut-Offs of Lumber: Deposit into designated clean wood container to be transported to designated recycling facility for use as mulch or bio-fuel.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

F. Metals: Separate metals by material type if practical. Stack salvageable structural steel members according to size, type of member, and length.

G. Asphalt Shingle Roofing: Deposit asphalt shingles in designated containers for off-site reuse. Nails, staples acceptable, flashing trim and accessories shall be recycled as metals.

H. Glass: Deposit glass debris into designated containers to be transported to approved glass-recycling facility.

I. Plastics: Deposit plastic containers and debris into designated containers to be transported to approved plastic recycling facility.

J. Clean Gypsum Board: Deposit scraps of clean gypsum board into designated container protected from weather and transport to an appropriate gypsum board recycling outlet or permitted construction and demolition debris processing facility that will divert clean gypsum board to an appropriate gypsum board recycling outlet.

K. Acoustic Ceiling Panels: Deposit pulp able mineral fiber panels into designated container protected from weather and prepare for transport, as directed by manufacturer, to appropriate

recycling facility to be processed into new acoustic ceiling panels. Separate suspension system, trim, and other metals from panels and sort with other metals.

L. Carpet: Deposit carpet into designated container protected from weather and prepare for transport, as directed by manufacturer, to appropriate recycling facility to be processed into new products.

M. General: Recycle paper and beverage containers used by on-site workers.

3.4 DISPOSAL OF WASTE

A. Except for items or materials to be recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. For solid waste disposal facilities located in the Commonwealth of Massachusetts, dispose of materials only in facilities which currently comply with applicable state regulations, including requirements of 310 CMR 16.00 {Site Assignment for Solid Waste Facilities} and 310 CMR 19.000 {Solid Waste Management}, and local bylaws.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 FINAL CLEANING

A. Unless otherwise specified under the various Sections of the Specifications, the General Contractor shall perform final cleaning operations as herein specified prior to final inspection.

B. Maintain project site free from accumulations of waste, debris, and rubbish, caused by operations. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

C. Cleaning shall include all surfaces, interior and exterior in which the General Contractor has had access whether existing or new.

D. Refer to Sections of the Specifications for cleaning of specific products or work.

E. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

F. Use only those cleaning materials and methods that are recommended by the manufacturer of surface material to be cleaned.

G. Employ experienced workmen, or professional cleaners, for final cleaning operations.

H. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

I. Wash and polish mirrors.

J. All new and existing glass and plastic surfaces throughout the building shall be thoroughly cleaned and washed by qualified window cleaners at the expense of the General Contractor just prior to acceptance of the Work.

K. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces as acceptable to the Owner’s Project Manager.

L. Polish glossy surfaces to a clear shine and provide wax where necessary.

M. Ventilating Systems: Clean permanent filters and replace disposable filters if units were operated during construction. Units should not be operated without filters at all. Throw away filters should be used when operating units prior to Substantial Completion. Submit report of ventilation system cleanliness including ductwork to the Owner's Project Manager.

N. Broom clean exterior paved surfaces and rake clean other surfaces of the grounds.

O. Leave all architectural metals, hardware, and fixtures in undamaged polished conditions.

P. Leave pipe and duct spaces, plenums, furred spaces and the like clean of debris and decayable materials.

Q. At the end of the project, General Contractor and each Subcontractor shall remove all his tools, equipment, machinery, and surplus materials from the job site. The General Contractor shall remove all waste materials and rubbish from the project at this time. All temporary structures shall be removed and the project shall be left clean.

R. Subsequent to installation of User Agency furniture, telephones, and equipment, and prior to issue of Certificate of Use and Occupancy, provide additional cleaning to remove any soil resulting from installations of such furniture and equipment. Such additional cleaning may include, but not be limited to dusting of horizontal surfaces, vacuuming, and washing of hard or resilient floor surfaces and re-waxing where required.

1.3 AS-BUILT DRAWINGS

A. As-built Drawings shall consist of all the Contract Drawings. As-built Drawings shall be kept up-to-date. Information from on-going Work shall be recorded on As-built Drawings within 48 hours of Work being performed.

B. The General Contractor and each Subcontractor shall be required to maintain one set of As-built Drawings, as the work relates to their Sections of the Specifications, at the site.

C. The As-built Drawings shall be stored and maintained in the General Contractor's field office apart from other documents used for construction. The As-built Drawings shall be maintained in a clean, dry, and legible condition and shall not be used for construction purposes.

D. As-built Drawings, as submitted by the General Contractor shall be verified in the field by the Designer or his Consultants. Verification by the Designer shall occur during the construction process and prior to the related work being completed and covered up.

E. The As-built Drawings shall be available at all time for inspection by the Owner's Project Manager or Designer. All deficiencies noted shall be promptly corrected.

F. The following information shall be indicated on the As-Built Drawings:

1. Record all changes, including change orders, in the location, size, number and type both horizontally and vertically of all elements of the project which deviate from those indicated on all the Contract Drawings.
2. The tolerance for the actual location of utilities and appurtenances within the building to be marked on the As-built Drawings shall be plus or minus two (2) inches.
3. The location of all underground utilities and appurtenances referenced to permanent surface improvements, both horizontally and vertically at ten (10) ft. intervals and at all changes of direction.
4. The location of all internal utilities and appurtenances, concealed by finish materials, including but not limited to valves, coils, dampers, vents, cleanouts, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, traps and maintenance devices. The location of these internal utilities, appurtenances, and devices shall be shown by offsets to the column grid lines on the Drawings.
5. Each of the utilities and appurtenances shall be referenced by showing a tag number, area served and function on the As-built Drawings.

G. At the end of each month and before payment for materials installed, the General Contractor, each Subcontractor, and agents of the Commonwealth shall review As-built Drawings for purpose of payment.

1. If the changes in location of all installed elements are not shown on the As-Built Drawings and verified in the field, then the material shall not be considered as installed and payment will be withheld.

H. Prior to the installation of all finish materials, a review of the As-built Drawings shall be made to confirm that all changes have been recorded. All costs to investigate such conditions shall be borne by the applicable party as determined by the Designer.

I. At the completion of the contract, each Subcontractor shall submit to the General Contractor a complete set of his respective As-built Drawings indicating all changes. After checking the above drawings, the General Contractor shall certify in writing on the title sheet of the drawings that they are complete and correct and shall submit the As-built Drawings to the Designer.

1. As-Built Drawings shall be submitted electronically to the Designer, in a format which can be added to the complete plans as constructed.

J. The Designer shall review the drawings and shall verify by letter to the Owner’s Project Manager that the work is accurate. The Designer shall incorporate all changes on the original drawings; thus creating Record Drawings. The Designer shall submit to the Owner’s Project Manager, electronic files in Autocad 2000 (or later version) format with two (2) sets of prints to be used for the final inspection of the project. Inaccuracies in As-built Drawings, as determined by the Designer and the Owner’s Project Manager, may be grounds for postponement of the final inspection or delay the processing of final payment until such inaccuracies are corrected by the General Contractor.

1.4 OPERATING AND MAINTENANCE REQUIREMENTS

A. At least two weeks prior to the time of turning over this contract to the Operating Agency for Use and Occupancy, or Final Acceptance, the General Contractor shall secure and deliver to the Operating Agency via the Designer, three (3) complete, indexed files and three (3) CD or DVD copies, containing approved operating and maintenance manuals, shop drawings, record of paint colors, floor and ceiling materials and other data as follows.

1. Operating manuals and operating instructions for each model and type of equipment in each of the various systems. Include operating instructions for systems integrating several pieces of equipment.
2. Catalog data sheets for each item of mechanical or electrical or equipment actually installed including performance curves, rating data and parts lists.
3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical or electrical equipment controls and fixtures with all details clearly indicated, including size of lamps and other maintenance supplies.
4. Names, addresses and telephone numbers of all Subcontractors and suppliers, together with repair and service companies for each of the major systems installed under this contract.
5. Provide a steel cabinet for storage of manuals and operating instructions.

B. Non-Availability of operating and maintenance manuals or inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by the Owner's Project Manager until such time as the discrepancy has been corrected.

1.5 CLOSEOUT REQUIREMENTS AND SUBMITTALS

A. Procedural Requirements Prior to Use and Occupancy: Punch List:

1. During the finishing stages of the project, the General Contractor shall make frequent inspections with Subcontractors, the Designer, and the Owner's Project Manager, so as to progressively check for and correct faulty work.
2. During the course of construction of the project, the General Contractor shall procure and maintain test records and certificates that will be required prior to issuance of the Department of Public Safety (DPS) Certificate of Occupancy and the Certificate of Agency Use and Occupancy.
3. When the General Contractor determines that he/she is Substantially Complete*, he/she shall prepare for submission to the Designer a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the General Contractor to complete all work in accordance with contract Documents. The General Contractor's list shall be accompanied with certificates that will be required as prerequisites for applying for a DPS inspection
   a. *NOTE: Substantially Complete means that less than one percent (1%) of all contract work, including change orders, remains to be done, and that none of the remaining work will affect health, safety, or function.
4. Upon receipt of the General Contractor's list of items to be completed or corrected, the Designer will promptly make a thorough inspection, together with representatives of the

Owner and the Operating Agency, and prepare a "punch list", setting forth in accurate detail any items on the General Contractor's list and additional items that are not acceptable. Concurrently, the General Contractor will arrange for a DPS inspection.

5. When the punch list has been prepared, and any DPS Inspector comments* have been included, the Designer will arrange a meeting with the General Contractor and Subcontractors, and the Owner's Project Manager, to identify and explain all punch list items and answer questions on the Work that must be done before Final Acceptance.
   a. If a DPS inspector (including, but not limited to AABA, boiler, elevator or any other authorized inspector) requires modifications and/or additions that were not included in the construction documents, the Designer should review the applicable code(s) and provide written interpretation to the Owner's Project Manager together with his/her recommendations.
6. The General Contractor shall immediately correct all punch list items that affect health, safety or function (as determined by the Designer, completion of which is required before issuance of a Certificate of Agency Use and Occupancy).
7. Upon receipt of the Certificate of Agency Use and Occupancy, and its adjunct monetized punch list, the General Contractor shall cause the completion of all of the other punch list items within the timeframe required by said certificate, but not more than 45 calendar days if the timeframe is not indicated on the said certificate.
8. There is a history of specific items that are essential to the Use and Occupancy, but are frequently overlooked. Some things to watch for are:
   a. Provide properly colored and positioned exit signs.
   b. Properly located emergency lighting fixtures.
   c. Complete or, by agreement, schedule personnel training.
   d. Final cleaning.
   e. Ventilating systems:
      1) Clean permanent filters and replace disposable filters if units were operated during construction.
      2) Clean ducts, blowers, and coils if units were operated without filters during construction.
      3) Leave pipe and duct spaces, plenums, furred spaces and the like clean of debris and materials subject to decay.
   f. Provide a properly working lock for the medical environmental closets (if applicable).
   g. Assure that exterior and interior fire rated and egress doors are operating properly and have the proper hardware.
   h. Assure that fire-rating labels are on doors and frames that are supposed to have them.
   i. Assure that smoke barriers are properly installed and located.
   j. Assure that the spare set of each type of sprinkler head and a head removal tool have been provided.
   k. Assure that floors drain properly.
   l. Assure that proper hot water temperatures are provided. Unless otherwise specified or required by a User Agency, the temperature set on building master controllers of hot water shall apply:
      1) HW to individual tubs or showers shall be controlled, in addition to the master controller above, with thermostatic valves set to furnish HW at a temperature not exceeding 110°F and equipped with anti-scald feature.

m. Assure that proper water pressure is provided for the sprinkler system.
n. Assure that low-consumption (LC) toilets have been installed (1.6 gpf or less).
o. Re-lamp if permanent lighting system was used during construction.
p. As-built marked-up drawings should be completed and transferred over to the Designer.

B. Prerequisites for Department of Public Safety (DPS) Certificate of Inspection and/or Certificate of Occupancy: Prior to requesting a Department of Public Safety (DPS) inspection, the General Contractor shall provide the following "closeout submittals:"

1. Project record documents and as-built marked-up drawings.
2. Approved operating and maintenance (O & M) data.
3. Extended guarantees and warranties.
   a. General Contractor's General Guarantee shall effectively include:
      1) A written guarantee, for one (1) year from date of Substantial Completion of the project, against defective workmanship, material, installation and equipment for all work of the project. Repair or replacement of defective workmanship, material, installation or equipment that develop within this period shall be accomplished promptly upon notification to the General Contractor, to the satisfaction of the Operating Agency, at no cost.
      2) Replace or repair material or equipment that requires excessive service during the guarantee period.
      3) Guarantee shall include 24-hour service of complete system(s) during guarantee period at no additional cost.
      4) Provide manufacturer's engineering and technical staff at site promptly to analyze and rectify problems that develop during guarantee period. If problems cannot be rectified promptly, to the satisfaction of the User Agency, advise the Designer in writing; describe efforts to rectify situation and provide analysis of cause of problem.
   b. Manufacturer's Guarantee or Warranty
      1) In addition to guarantee requirements above, obtain manufacturers' written installation, equipment, and material warranties for time periods indicated in the various Specification Sections of the Contract Documents. Such manufacturers' warranties contained within the Specification Sections, together with any other warranties offered in manufacturers' published data, are to be transferred to the User Agency.
   c. Keys and keying schedule.
   d. Spare parts and maintenance materials ("attic stock"),
   e. Evidence of compliance with requirements of governing authorities including, without limitations, the following:
      1) Certificate of Inspection, in form of signed permits from the electrical, plumbing, gas, fire department, boiler, and any other required inspectors.
      2) Certification from the local fire department to the effect that all detection, alarm and suppression systems, and other equipment or systems under fire department jurisdiction are approved.
      3) When carpeting and/or draperies are provided, a flame, smoke and fuel-rating certificate provided by the supplying General Contractors.

4) Elevator certification(s) from the elevator inspector obtained through the General Contractor's Elevator Subcontractor.
5) A letter from the Plumbing Subcontractor. that the potable water supply has been sanitized.
6) Septic system certification obtained from the town by the General Contractor (when applicable).
7) Pressurized vessel certifications from the boiler inspector obtained through the Mechanical Subcontractor.
8) When air balancing is required, the air balancing report prepared by the Mechanical Subcontractor (or commissioning agent, when applicable), and accepted by the design Registered Professional Engineer.
9) When smoke control/fire emergency ventilation system is required, the test report prepared by the Mechanical Subcontractor (or commissioning agent, when applicable), and accepted by the design Registered Professional Engineer.
10) Evidence of test and approval for Department of Environmental Protection (DEP) and Department of Public Health (DPH), when applicable.

C. Prerequisites for Department of Public Safety (DPS) Certificate of Inspection and/or Certificate of Occupancy: Prior to requesting a Department of Public Safety (DPS) inspection, the Designer shall provide the following "closeout submittals:"

1. Certification, from the design Registered Professional Engineer, stating that the fire protection systems have been installed in accordance with the approved fire protection construction documents and meet the requirements of 780 CMR 903.1.
2. Structural Engineer-of-Record (SER) final report as required by 780 CMR 1705.3.
3. Certification, from the design Registered Professional Engineer, stating that the emergency lighting and power systems have been installed in accordance with the approved electrical construction documents.

D. Upon completion of the Work for which a permit has been issued, the DPS building official shall conduct a final inspection pursuant to 780 CMR 115.5.

E. Beneficial and Temporary Occupancy:

1. Beneficial (partial) Occupancy:
   a. The Owner may allow beneficial (partial) occupancy of portions of a building in order to allow a User Agency to set up and test their own operational equipment in select building areas. It does not allow for use and/or occupancy of the general public when, in fact, the building cannot function for the use(s) it is intended to accommodate, nor when there are outstanding items that effect health, safety and/or function.
   b. It is the Owner's policy to disallow beneficial occupancy if the fire alarm and suppression systems are inoperative.
   c. Beneficial occupancy of building areas shall not constitute Substantial Completion, or Final Acceptance of work by the Owner, and shall not institute the guarantee period for any work.

d. A punch list will be developed for building areas to receive beneficial occupancy and the building areas will be photographed prior to such occupancy of said portion or portions of the work.

2. Temporary Occupancy:
   a. When, according to 780 CMR 120.3 – Temporary Occupancy upon the request of the holder of a permit, a Temporary Certificate of Occupancy (TCO) may be issued before the completion of the entire work covered by the permit, provided that such portion or portions shall be occupied safely prior to full completion of the building or structure without endangering life or public welfare. The Building Official may consult with all Subcontractor Inspectors for issues pertaining to life safety and shall consult with the Fire Official pertaining to issues of adequacy of fire protection systems prior to the issuance of a Temporary Certificate.
   b. The Building Official may issue a Temporary Certificate of Occupancy (TCO) that can allow public use and occupancy of said portion or portions of the work, subject to punch list(s) being established prior to such occupancy.
   c. Issuance of a Department of Public Safety (DPS) Temporary Certificate of Occupancy (TCO) does not relieve the General Contractor of the Owner requirements of the contract and does not constitute Substantial Completion of the project.
   d. Temporary Occupancy of building areas will institute the guarantee period for completed work of all Divisions except 21 through 28 of the Specifications for those building areas so used and occupied, exclusive of remaining work indicated on associated punch lists. Use of systems provided under Divisions 21 through 28 of the Contract Documents for temporary services and facilities shall not constitute Substantial Completion, or Final Acceptance of work by the Owner, and shall not institute the guarantee period.
      (1) If it is determined that there are no items on the punch list that affect health, safety or function and it is agreed by the Building Official, the Designer and the Owner's Project Manager that the entire building can be granted a Temporary Certificate of Occupancy (TCO), the work of all Divisions including 21 through 28 of the Specifications for the entire building so used and occupied, exclusive of remaining work indicated on associated punch lists, will institute the guarantee period for completed work of all Divisions including the systems provided under Divisions 21 through 28.
      (2) Whereas a User Agency cannot properly maintain building systems without operating and maintenance documentation, subcontractors for Divisions 21 through 28 will be responsible for maintaining their respective building systems at no additional cost to the contract until the project is substantially complete and Operating and Maintenance (O & M) manuals, reviewed and approved by the Designer, are provided to the Owner's Project Manager.
      (3) Issuance of a Temporary Certificate of Occupancy (TCO) may require remaining punch list work to be completed during irregular work hours. Such work will be performed at no additional cost to the contract.
   e. The following Owner's criteria, and any other criteria that may be imposed by the Building Official, are required for a DPS Temporary Certificate of Occupancy (TCO):

(1) Upon receipt of the General Contractor's list of items to be completed or corrected, the Designer will promptly make a thorough inspection, together with representatives of the Owner, and prepare a "punch list", setting forth in accurate detail any items on the General Contractor's list and additional items that are not acceptable. The Designer and Owner's Project Manager will identify and tag (by asterisk) all items that, in their opinion, affect health, safety or function. The Building Official may include additional items that, in her/his opinion, affect items that endanger life or public welfare.

(2) When the punch list has been prepared, and all DPS Inspector comments* have been included, the General Contractor shall immediately correct all punch list items that affect health, safety or function (all asterisked items). This work must be completed before the issuance of a DPS Temporary Certificate of Occupancy (TCO).

* NOTE: If a DPS inspector (including, but not limited to AABA, boiler, elevator or any other authorized inspector) requires modifications and/or additions that were not included in the construction documents, the Designer should review the applicable code(s) and provide written interpretation to the Owner's Project Manager together with their recommendations.

f. Exclusive of other items that the DPS inspector may impose, there is a history of specific items that are essential for, temporary occupancy. These items include, but are not limited to the following:

(1) Properly colored and positioned exit signs.
(2) Properly located emergency lighting fixtures.
(3) Clean ducts, blowers, and coils if units were operated without filters during construction.
(4) Install permanent filters and replace disposable filters if units were operated during construction.
(5) Properly working lock for the medical environmental closets (if applicable).
(6) Assure that exterior and interior fire rated and egress doors are operating properly and have the proper hardware.
(7) Assure that smoke barriers are properly installed and located.
(8) Assure that proper water pressure is provided for the sprinkler system.
(9) Assure that proper hot water temperatures are provided. Unless otherwise specified or required by a User Agency, the temperature set on building master controllers of hot water shall apply:
  (a) HW to toilet rooms and janitors closets shall be 140˚ F.
  (b) HW to individual tubs or showers shall be controlled, in addition to the master controller above, with thermostatic valves set to furnish HW at a temperature not exceeding 110˚ F and equipped with anti-scald feature.
  (c) HW rinse water to dishwashers shall be controlled at 180˚ F.
(10) Emergency eyewash equipment must be hard-plumbed and employ tempered water.

g. Evidence of compliance with requirements of governing authorities including, without limitations, the following:

1) Certificate of Inspection, in form of signed permits from the electrical, plumbing, gas, fire department, boiler, and any other required inspectors.

2) Certification from the local fire department to the effect that all detection, alarm and suppression systems, and other equipment or systems under fire department jurisdiction are approved.
3) When carpeting and/or draperies are provided, a flame, smoke and fuel-rating certificate provided by the supplying General Contractor.
4) Elevator certification(s) from the elevator inspector obtained through the General Contractor's elevator subcontractor.
5) A letter from the Plumbing Subcontractor that the potable water supply has been sanitized.
6) Septic system certification obtained from the town by the General Contractor (when applicable).
7) Pressurized vessel certifications from the boiler inspector obtained through the Mechanical Subcontractor.
8) When air balancing is required, the air balancing report prepared by the Mechanical Subcontractor (or commissioning agent, when applicable).
9) When smoke control/fire emergency ventilation system is required, the test report prepared by the Mechanical Subcontractor (or commissioning agent, when applicable).
10) Evidence of test and approval for Department of Environmental Protection (DEP) and Department of Public Health (DPH), when applicable.

F. Prerequisites for Owner's Certificate of Agency Use and Occupancy: Certificate of Agency Use and Occupancy. Prior to requesting a Certificate of Agency Use and Occupancy, the Owner's Project Manager will procure and have ready and available the following approved items (referred to as Closeout Submittals):

1. Operating and maintenance (O & M) manuals and written operating instructions for the various systems.
2. Catalog data sheets for each item of mechanical or electrical equipment actually installed including performance curves, rating data and parts lists.
3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical and electrical equipment controls and fixtures with all details clearly indicated, including size of lamps.
4. Balancing report.
5. Names, addresses, and telephone numbers of repair and service companies for each of the major systems installed under the construction contract.
6. Signed Department of Public Safety (DPS) Certificate of Occupancy per 780 CMR 120.0
7. Licensed Builder Final Affidavit/Report.
8. Designer Affidavit of Compliance.
9. Subcontractor Affidavits that specified equipment and installed items have been seismically braced in accordance with code requirements.
10. Monetized punch list of the remaining Work that must be done before Final Acceptance.
11. As-built documents should be completed (both electronic files and transparencies) and ready to transfer over to the Owner's Project Manager. As-built documents shall consist of, but not be limited to, the following:
    a. Drawings (in AutoCAD ver. 2000 or later format)
        1) Contract drawings, for all disciplines, marked-up to clearly indicate as-built conditions.

2) All clarification and/or changed conditions sketches (SK's).

b. Specifications (in .pdf format)
   1) All construction specifications.
   2) All addenda.

c. Shop drawings, submittals, etc. (scanned format)*
   1) All approved shop drawings, submittals, etc.

12. Approved documents submitted to the Owner or the Designer shall be electronically scanned (including the associated transmittals and, where applicable, the Designer-of-Record's and Owner's comments) as a .pdf document. All scanned approved submittals shall be included on a CD.
13. The electronic file names, for each approved submittal, shall contain the following information:
    a. For APPROVED or APPROVED AS NOTED Shop Drawings:
       1) Project Number Submittal's Date, APPROVED, Submittal Name, Submittal's Specification Section Name and Number, and Submittal's Revision Number.
       2) As an example, the file name of an approved submittal for Concrete
          a) Design Mix: DFS991DC1 030106 APPROVED Concrete Design Mix Cast In Place Concrete 033000 Rev0.PDF
    b. For Shop Drawings submitted for information only, e.g. welders certificate, the electronic file name shall contain the following information:
       1) Project Number Submittal's Date, FOR INFO, Submittal Name, Submittal's Specification Section Name and Number, and Submittal's Revision Number.
       2) As an example the file name of a for information only submittal for a welder's certificate:
          a) DFS991DC1 030106 FOR INFO Welders Certificate Quality Requirements 014000 Rev0.PDF
    c. Unless otherwise stated all submitted documents shall include an electronic scanned image as noted above.
    d. The electronic file name shall be printed on every shop-drawing page.
14. The Owner's Project Manager will attach the monetized punch list to the Certificate of Agency Use and Occupancy, indicate the official date of Use and Occupancy, establish the date upon which all remaining punch list items must be completed (normally 30-45 calendar days), and procure appropriate signatures on the original and seven (7) copies.
15. After receipt of signatures, the Owner's Project Manager will distribute the signed copies.
16. Project schedules (in Primavera format, unless otherwise authorized), baseline, and all updates.
17. Notification to Operating Agency and/Or User Agency of Proposed Use and Occupancy Date: The Owner's Project Manager is to notify the Operating Agency and/or User Agency of the project Use and Occupancy date at least seven (7) calendar days in advance.

G. Prerequisites for Certificate of Final Inspection, Release, and Acceptance: Final Certificate of Final Inspection, Release, and Acceptance. Upon receipt of the Certificate of Agency Use and Occupancy, and its adjunct monetized punch list, the General Contractor shall cause the completion of all of the other punch list items within timeframe required by said certificate, but not more than 45 calendars days if the timeframe is not indicated on the said certificate.

1. If the General Contractor fails to pursue completion of the remaining monetized punch list work, on a continual basis, within the timeframe required by the certificate, the Owner may, after seven (7) calendar days written notice, elect to complete the work with separate forces and charge the work against the General Contractor.
2. At the end of the General Contractor's one (1) year guarantee period, the General Contractor shall transfer manufacturers' equipment and material warranties that are still in force to the Operating Agency.

1.6 GUARANTEES AND WARRANTIES

A. Submit to the Designer all extended guarantees and warranties that have been specified in various, individual Sections of the Specifications. Guarantees shall be assembled by Specification No. and Section in accordance with Specifications Table of Contents.

1. Guarantees and warranties shall be enforceable in the Commonwealth of Massachusetts and subject to interpretation in accordance with the laws of the Commonwealth of Massachusetts.
2. Guarantees and warranties shall begin at the date of Substantial Completion of the Project. Guarantees and warranties which start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable.

B. Unless more stringent requirements are otherwise specified, guarantee all work against defects of materials, equipment and workmanship for one year from the date of Substantial Completion or the date of issue of Certificate of Use and Occupancy for the building or portion thereof, whichever occurs first.

C. If, within any guarantee period, repairs or changes are required in connection with guaranteed work, General Contractor shall promptly upon receipt of notice from the Owner, and without additional expense to the Owner, within ten business days:

1. Place in satisfactory condition in every particular all guaranteed work and correct all defects.
2. Make good all damage to building, site equipment, or contents thereof, including redecoration which, in the opinion of the Designer, results from the use of material, equipment or workmanship which are inferior, defective or not in accord with the terms of the Contract.

D. If General Contractor, after such notice, fails to proceed immediately to comply with terms of guarantee, the Owner may correct defects and hold General Contractor liable for all expenses incurred.

E. Promptly after completion of the work, obtain from each Subcontractor where a guarantee is required, a warranty addressed to and in favor of the Owner.

F. Delivery of any warranty required does not relieve the General Contractor from any obligation assumed under other provisions of the Contract.

G. Deliver guarantees and warrantees to the Designer before or with the application for Final Payment.

H. The general warranty set forth in the General Conditions is in addition to, exclusive of, and not in substitution of such guarantees as may be required in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 81 00

COMMISSIONING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Commissioning: Commissioning is a planned, collaborative process of witnessing and testing that confirms that a new building and its systems meet the Owner's Project Requirements (OPR) and the project's Basis of Design (BOD). The OPR is a written document that details the ideas, concepts and criteria that are defined by the owner to be important to the success of the project. The BOD includes design information necessary to accomplish the OPR, including system descriptions, indoor environmental quality criteria, design assumptions, and references to applicable codes, standards, regulations and guidelines. Achievement of these goals begins in the Pre-Design phase, continues through the Design, Construction and Acceptance Phases and concludes in the Post-Acceptance Phase with actual verification of performance. Commissioning shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. The commissioning process will be directed by an independent, third-party Commissioning Authority (CA) whose services will be provided by the Owner.

1. In addition to collaborating in the development of the project's BOD and OPR, during the Pre-Design Phase the Commissioning Authority shall review the size and skill levels of the Owner's maintenance staff in relation to the requirements of the new building in order to fill any deficiencies.
2. In the Design Phase the Commissioning Authority shall complete the following tasks:
    a. Write commissioning specifications that define contractor responsibilities and provide samples of required commissioning documentation (based on the most recent industry-accepted format) to the Designer for integration into the project specifications.
    b. Develop the Commissioning Plan, detailing commissioning team organization, schedule, training and documentation requirements. Include all related testing, verification and quality control procedures.
    c. Establish the schedule for all commissioning activities, including periodic design reviews. Insure that commissioning activities do not interfere with any phase of the project.

d. Review the design calculations and performance criteria for the project, identifying operation and maintenance problems. Provide written comments and a checklist of required actions to be completed by the Designer prior to phase approval and recommend alternatives where appropriate.
e. Check and confirm that the BOD includes all of the elements defined in the OPR at the end of the Design Phase.

3. In the Construction Phase the Commissioning Authority shall complete the following tasks:
   a. Update the Commissioning Plan to reflect any changes in the BOD.
   b. Coordinate the commissioning process with the Project Team through project planning and scheduled meetings.
   c. Review contractor submittals in collaboration with the Project Team for conformance to project specifications and operation and maintenance requirements and report findings.
   d. Observe and document system verification checks.
   e. Observe and document equipment and system start-ups.
   f. Document testing and balancing work.
4. In the Acceptance Phase the Commissioning Authority shall complete the following tasks:
   a. Monitor and document functional performance tests on all building systems in collaboration with the Project Team.
   b. Review O&M documentation and develop O&M training plans and videos. Ensure that the Owner's staff is able to operate and maintain all building systems.
   c. Review all as-built documents and warranty information in collaboration with the Project Team. Submit warranty information and preventive maintenance schedules for all building systems in a comprehensive, five-year preventive maintenance plan. The format for this submittal shall be approved jointly by the Designer and the Owner. This submittal shall also include list(s) of recommended spare parts, bench stock and special tools/equipment required for the first year of building operation.
   d. Convene and chair a comprehensive final debriefing with the entire Project Team (including the owner's maintenance staff) to coordinate correction of any required re-testing and identification of any training deficiencies prior to building turnover.
   e. In collaboration with the Designer, Contractor(s) and General Contractor populate all operational information, including equipment data, for each building system in the digital format specified by the Owner.
5. In the Post-Acceptance Phase the Commissioning Authority shall complete the following tasks:
   a. Coordinate with the project team to ensure that any required "off-season" tests are completed.
   b. Ensure that any required changes are provided as written updates in the project documentation.
   c. Confirm that all equipment continues to perform as designed and alert the Owner to any warranty claims by providing a review of all system warranties prior to their one-year expiration date.
   d. Document the estimated savings generated by the commissioning process through specific examples of avoided costs collected during all project phases. The

required format will be provided by the Owner. Compare the actual tested performance of the building's completed systems with established standards.

6. The commissioning process does not eliminate or reduce the responsibility of the system designers and installing contractors to provide a finished and fully functioning product.

B. Commissioning Authority: The Commissioning Authority directs and approves the commissioning work.

C. Responsibility of Disciplines: The parties listed below are part of the commissioning team and will be required to participate in the commissioning process. The responsibilities relative to commissioning for each of these parties is defined in this section.

1. Designer
2. Engineer
3. Owner
4. Commissioning Authority
5. General Contractor
6. Mechanical/Electrical Coordinator
7. Test Technician
8. Mechanical Contractor
9. Plumbing Contractor
10. Fire Protection Contractor
11. Electrical Contractor
12. Controls Contractor
13. Testing, Adjusting and Balancing Contractor
14. All Subcontractors and equipment suppliers/manufacturers that are associated with the above disciplines.

D. Abbreviations:

1. The following are common abbreviations used in the Specifications and in the commissioning process. Definitions are found in Section 1.11.

A/E-	Designer and Design Engineers	EC-	Electrical Contractor
CA-	Commissioning Authority	FM-	Facility Manager
CC	Controls Contractor	FT-	Functional Performance Test
MC-	Mechanical Contractor	GC-	General Contractor (prime)
PC-	Prefunctional Checklist	Subs-	Subcontractors
Cx-	Commissioning	TAB-	Test and Balance Contractor
MEC	Mechanical/Electrical Coordinator	TT	Test Technician

1.3 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning authority (CA), Facility Manager (FM), the designated representative of the General Contractor (GC), the Designer and design engineers (A/E), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), Mechanical/Electrical

Coordinator (MEC), Test Technician (TT) and any other installing Subcontractors or suppliers of equipment. The Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management: The CA is hired by the Owner, directs and coordinates all commissioning activities and reports to the Owner. All Project Team members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling: The CA will work with the General Contractor according to established protocols to schedule commissioning activities. The CA will provide sufficient notice to the General Contractor and/or MEC for scheduling commissioning activities. The General Contractor will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1. The CA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. As construction progresses more detailed schedules are developed by the CA and are incorporated into the project schedule by the General Contractor.

1.4 COMMISSIONING PROCESS

A. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CA wherein the commissioning process is reviewed with the commissioning team members.
2. Additional meetings scheduled by the CA will be required throughout construction, to plan, scope, coordinate, and schedule future activities and resolve problems.
3. Equipment documentation is submitted to the Engineer during normal submittals, including detailed start-up procedures. The CA will review and comment on applicable items.
4. The Subcontractors develop startup plans and startup documentation formats and provide to the CA. The CA uses this information to supplement prefunctional checklists to be completed, during the startup process.
5. The Subcontractors execute and document the prefunctional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing start-up and prefunctional tests of selected equipment.
6. The CA develops specific equipment and system Functional Performance Test procedures. The Subcontractors review the procedures.
7. The procedures are executed by the Subcontractors, and witnessed and documented by the CA. The Owner's FM is also invited to witness testing.
8. Items of non-compliance in material, installation, or setup are corrected at the Sub's expense and the system in question is retested.
9. The CA reviews the O&M documentation for completeness.
10. The CA approves the training plan and audits training.

11. The CA assembles all project documentation into Systems Manuals
12. Deferred testing is conducted, as specified or required.

1.5 RELATED WORK

A. All of the following sections apply to the Work of this section. This list does not limit the work that may be required by the General Contractor under additional specification section for the completion of the Commissioning process.

1. Section 017700 - CONTRACT CLOSEOUT
2. Section 013100 - PROJECT MANAGEMENT AND COORDINATION
3. Section 220001 - PLUMBING
4. Section 230000 - HEATING, VENTILATING AND AIR CONDITIONING
5. Section 260001 - ELECTRICAL WORK

1.6 COMMISSIONING COMPLETION

A. Prerequisites to functional completion

1. All TAB work and commissioning activities must be complete prior to Functional Completion, unless approved in writing by the CA. Exceptions to this are the planned control system training performed after occupancy and any required seasonal or approved deferred testing. This requirement covers all systems, but is not limited to:
   a. Completed and signed start-up and prefunctional checklist documentation
   b. Requested trend log data
   c. Submission of final approved TAB report
   d. Completion of all functional testing
   e. Required training of Owner maintenance personnel
   f. Submission of the approved O&M manuals
   g. All identified deficiencies have been corrected or are approved by the Owner's Project Manager to be excepted from this milestone.

B. The General Contractor will determine the date of Functional Completion after reviewing the Commissioning Agent's recommendation for Functional Completion.

C. Commissioning activities are non-compensable and cannot be a cause for delay claims.

1.7 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. Testing requirements are part of this section. Each member of the commissioning team shall review all test procedures in this section to determine if his/her presence is required for each test (for example, certain tests of mechanical equipment may require the support of electrical personnel and vice versa)

Equipment and System	Functional Test Requirements Specified In:
Plumbing System	
Plumbing Water System	3.10
HVAC System	
Cooling System (Cooling Tower, Heat Exchanger, Pumps, Distribution)	3.11
Building Automation System (BAS)	3.12
Test and Balance Work (TAB)	3.13

1.8 RESPONSIBILITIES

A. The responsibilities of all parties in the commissioning process are provided in this section.

B. All Parties:

1. Attend commissioning scoping meeting and additional meetings, as necessary.

C. Designer (of A/E):

1. Construction Phase
   a. Attend the commissioning scoping meeting and selected commissioning team meetings.
   b. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
   c. Provide any design narrative documentation requested by the CA.
   d. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
   e. Prepare and submit design intent documentation clarifications for inclusion in the O&M manuals. Review and approve the O&M manuals.
2. Post Construction Phase
   a. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.

D. Design Engineer:

1. Construction Phase
   a. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. One site observation should be completed just prior to system startup.

b. Provide any design narrative and sequences documentation requested by the CA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation are not sufficient for writing detailed testing procedures.
c. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.

E. Commissioning Authority (CA): The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving, non-conformance or the resolution of deficiencies, but the ultimate responsibility resides with the General Contractor and the A/E. The primary role of the CA is to observe and document performance and confirm that systems are functioning in accordance with the Owner's Project Requirements (OPR), documented design intent (BOD) and the Contract Documents. Contractors will provide all tools and equipment to start and functionally test building equipment and systems.

1. Construction Phase
   a. Coordinate and direct the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
   b. Submit commissioning schedule to GC, MEC, TT, and A/E to ensure that commissioning activities are being scheduled into the master schedule.
   c. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
   d. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
   e. Before startup review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
   f. Review systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
   g. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress.
   h. Verify systems startup by reviewing start-up reports and by selected site observation.
   i. Review TAB execution plan.
   j. Verify air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
   k. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone data logger monitoring or manual functional testing.
   l. Analyze any functional performance trend logs and monitoring data to verify performance.

m. Coordinate, witness, and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
n. Maintain a master deficiency and resolution log and a separate testing record. Provide the GC, MEC, TT, and A/E with written progress reports and test results with recommended actions.
o. Witness performance testing of all other owner contracted tests or tests by manufacturer's personnel over which the CA may not have direct control (a smoke control system, for example). Document these tests and include results in Systems manuals.
p. Compile and maintain a commissioning record.
q. Review O&M manuals submitted by contractors.
r. Provide a final commissioning report (as described in this section).

2. Post Construction Phase
   a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
   b. Execute commissioning Certificate of Completion after certifying that functional performance tests for each subsystem and system as established by the commissioning plan have been executed and satisfactory performance has been achieved.

F. General Contractor (GC), Mechanical/Electrical Coordinator (MEC), and or Test Technician (TT):

1. Construction Phase
   a. Facilitate the coordination of the commissioning work by the CA. The GC, TT, and MEC will ensure that commissioning activities are being entered into the master schedule.
   b. Attend a commissioning scoping meeting and other commissioning team meetings.
   c. Perform the normal review of Contractor submittals and completed commissioning test results.
   d. When necessary, observe and witness prefunctional checklists, startup, and functional testing of selected equipment.
   e. Review commissioning progress and deficiency reports.
   f. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
   g. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training.
   h. Prepare and submit As-built documentation for inclusion in the O&M manuals.
   i. Provide written notice for the completion of the commissioning testing.
2. Post Construction Phase
   a. Assist the CA and User Agency as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
   b. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

G. Mechanical, Controls, and TAB Contractors: The commissioning responsibilities applicable to each of the mechanical, controls, and TAB contractors under 1.05 RELATED WORK A. above is as follows (all references apply to commissioned equipment only):

1. Construction Phases
   a. Attend a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
   b. Subcontractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment.
   c. Provide additional requested documentation (prior to normal O&M manual submittals) to the CA for development of start-up and functional testing procedures.
      1) Typically this documentation will clearly identify detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures. It will also include full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force. In addition, the installation, start-up, and checkout materials that are shipped with the equipment and the field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
      2) The Commissioning Agent may request further documentation necessary for the commissioning process.
      3) This data request may be made prior to normal submittals.
   d. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA and A/E for review and approval.
   e. Subcontractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
   f. Provide assistance to the CA in preparing the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety, and equipment protection and provide necessary written alarm limits to be used during the tests.
   g. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA for all commissioned equipment. Submit to CA and A/E for review and approval prior to startup.
   h. During the startup and initial checkout process, execute the mechanical-related portions of the prefunctional checklists for all commissioned equipment.
   i. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA and A/E.
   j. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
   k. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.

l. Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data, as necessary.
m. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA and A/E and retest the equipment.
n. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
o. During construction, maintain as-built drawings.
p. Provide training of the Owner's operating staff using expert qualified personnel, as specified. Maintain sign-in sheets and provide copies to CA.
q. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

2. Post Construction Phase
   a. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
   b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

H. Mechanical Contractor: The responsibilities of the HVAC mechanical contractor, during Construction Phases in addition to those listed in (A) are:

1. Provide startup for all HVAC equipment, except for the building automation control system.
2. Assist and cooperate with the TAB contractor and CA by:
   a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.
   b. Including cost of sheaves and belts that may be required by TAB.
   c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.
   d. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.
3. Install a P/T plug at each water sensor, which is an input point to the control system.
4. List and clearly identify on the as-built drawings the locations of all airflow stations.
5. Prepare a preliminary schedule for Division 15501 pipe and duct system testing, flushing, and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.
6. Notify the CA 48 hours prior to pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the General Contractor and CA ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

I. Controls Contractor: The commissioning responsibilities of the controls contractor, during Construction Phases in addition to those listed in (A) are:

1. Sequences of Operation Submittals:

a. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:
   1) An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components, and function.
   2) All interactions and interlocks with other systems.
   3) Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.
   4) Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).
   5) Start-up sequences.
   6) Warm-up mode sequences.
   7) Normal operating mode sequences.
   8) Unoccupied mode sequences.
   9) Shutdown sequences.
   10) Capacity control sequences and equipment staging.
   11) Temperature and pressure control: setbacks, setups, resets, etc.
   12) Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
   13) Effects of power or equipment failure with all standby component functions.
   14) Sequences for all alarms and emergency shut downs.
   15) Seasonal operational differences and recommendations.
   16) Initial and recommended values for all adjustable settings, set points and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
   17) Schedules, if known.
   18) To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.

2. Control Drawings Submittal:
   a. The control drawings shall have a key to all abbreviations.
   b. The control drawings shall contain graphic schematic depictions of the systems and each component.
   c. The schematics will include the system and component layout of any equipment that the control system monitors, enables, or controls, even if the equipment is primarily controlled by packaged or integral controls.
   d. Provide a full points list with at least the following included for each point:
      1) Controlled system
      2) Point abbreviation
      3) Point description
      4) Display unit
      5) Control point or set point (Yes / No)
      6) Monitoring point (Yes / No)

7) Intermediate point (Yes / No)
8) Calculated point (Yes / No)

e. Key:
f. Point Description: DB temp, airflow, etc.
g. Control or Set point: Point that controls equipment and can have its set point changed (OSA, SAT, etc.)
h. Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).
i. Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
j. Calculated Point: "Virtual" point generated from calculations of other point values.

3. The Controls Contractor shall keep the CA and A/E informed of all changes to this list during programming and setup.
4. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.
5. Assist and cooperate with the TAB contractor in the following manner:
   a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
   b. For a given area, have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CA prior to TAB.
   c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
6. Assist and cooperate with the CA in the following manner:
   a. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system as specified for the controls contractor. Assist in the functional testing of all equipment specified. Provide two-way radios during the testing.
   b. Execute all control system trend logs specified.
7. The controls contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance testing. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:
   a. System name.
   b. List of devices.
   c. Step-by-step procedures for testing each controller after installation, including:
      1) Process of verifying proper hardware and wiring installation.
      2) Process of downloading programs to local controllers and verifying that they are addressed correctly.
      3) Process of performing operational checks of each controlled component.
      4) Plan and process for calibrating valve and damper actuators and all sensors.

5) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.

d. A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has "passed" and is operating within the contract parameters.

e. A description of the instrumentation required for testing.

f. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CA and TAB contractor for this determination.

8. Provide a signed and dated certification to the CA and A/E upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.

9. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as requested by the CA to demonstrate system operation.

10. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

J. TAB Contractor: The duties of the TAB contractor, in addition to those listed:

1. Six weeks prior to starting TAB, submit to the CA and A/E the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead.

2. Submit the outline of the TAB plan and approach for each system and component to the CA, A/E, and the controls contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.

3. The submitted plan will include:

a. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.

b. An explanation of the intended use of the building control system. The controls contractor will comment on feasibility of the plan.

c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

e. Final test report forms to be used.

f. Detailed step-by-step procedures for TAB work for each system and issue: terminal flow calibration (for each terminal type), diffuser proportioning, branch / submain proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using air flow straighteners or relocating flow stations and sensors will be discussed. Provide the analogous explanations for the waterside.

g. List of all airflow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
h. Details of how total flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).
i. The identification and types of measurement instruments to be used and their most recent calibration date.
j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.
k. Confirmation that TAB understands the outside air ventilation criteria under all conditions.
l. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).
m. Details of how building static and exhaust fan / relief damper capacity will be checked.
n. Proposed selection points for sound measurements and sound measurement methods.
o. Details of methods for making any specified coil or other system plant capacity measurements.
p. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.
q. Details regarding specified deferred or seasonal TAB work.
r. Details of any specified false loading of systems to complete TAB work.
s. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.
t. Details of any required interstitial cavity differential pressure measurements and calculations.
u. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
v. Plan for formal progress reports (scope and frequency).
w. Plan for formal deficiency reports (scope, frequency and distribution).

4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA and General Contractor at least twice a week.
5. Communicate in writing to the controls contractor all set point and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.
6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CA and A/E. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.
7. Provide the CA and A/E with any requested data, gathered, but not shown on the draft reports.

8. Provide a final TAB report for the CA and A/E with details, as in the draft.
9. Conduct functional performance tests and checks on the original TAB as specified.

K. Electrical Contractors: The commissioning responsibilities applicable to the electrical contractor are as follows (all references apply to commissioned equipment only):

1. Construction Phases
   a. Include the cost of commissioning in the contract price, if not yet let.
   b. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
   c. Attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Commissioning process.
   d. Contractors shall provide normal cut sheets and shop drawing submittals to the CA of commissioned equipment.
   e. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
      1) Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
      2) The Commissioning Agent may request further documentation necessary for the commissioning process.
      3) This data request may be made prior to normal submittals.
   f. Provide a copy of the O&M manuals submittals of commissioned equipment, through normal channels, to the CA for review and approval.
   g. Subcontractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
   h. Provide assistance to the CA in preparation of the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
   i. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA. Submit manufacturer's detailed start-up procedures and the full start-up plan and procedures and other requested equipment documentation to CA for review.
   j. During the startup and initial checkout process, execute and document the electrical-related portions of the prefunctional checklists provided by the CA for all commissioned equipment.
   k. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA and A/E.

l. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
m. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
n. Perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data, as necessary.
o. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, and A/E and retest the equipment.
p. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
q. During construction, maintain as-built drawings and prepare final as-built drawings at project completion.
r. Provide training of the Owner's operating personnel as specified.
s. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

2. Post Construction Phase
   a. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
   b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.9 TESTING REQUIREMENTS

A. Specific functional testing requirements are listed for each system in Part 3 of this section. From these requirements, the Commissioning Authority (CA) shall develop step-by-step procedures to be executed by the Subs as directed by the Commissioning Authority. The test requirements for each piece of equipment or system contain the following:

1. The contractors responsible to execute the tests, under the direction of the CA.
2. A list of the integral components being tested.
3. Prefunctional checklists associated with the components.
4. Functions and modes to be tested.
5. Required conditions of the test for each mode.
6. Special procedures.
7. Required methods of testing.
8. Required monitoring.
9. Acceptance criteria.
10. Sampling strategies allowed.

1.10 TESTING PREREQUISITES

A. The following applicable generic prerequisite checklist items are required to be listed on each written functional test form and be completed and checked off by CA prior to functional testing.

1. All related equipment has been started up and start-up reports and prefunctional checklists submitted and approved ready for functional testing:
2. All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final set points and schedules with debugging, loop tuning and sensor calibrations completed. Controls contractor to sign and date when ready.
3. Test and balance (TAB) complete and approved for the HVAC air and water systems.
4. All A/E punch list items for this equipment corrected.
5. These functional test procedures reviewed and approved by installing contractor.
6. Safeties and operating ranges reviewed by the CA.
7. Test requirements and sequences of operation attached.
8. Schedules and set points attached.
9. False loading equipment, system and procedures ready.
10. Sufficient clearance around equipment for servicing.

1.11 MONITORING

A. Monitoring is a method of testing as a stand-alone method or to augment manual testing.

B. All points listed in the required monitoring section of the test requirements which are control system monitored points shall be trended by the controls contractor. At the CA's request, the controls contractor shall trend up to 20% more points than listed herein at no extra charge.

C. Provide data electronically (Microsoft Excel) in 15 minute intervals for all analog hardware and software points.

1.12 DEFINITIONS

A. Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

B. Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent.

C. Control system - the central building energy management control system.

D. Data logging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone data loggers separate from the control system.

E. Deferred Functional Tests - FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

F. Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

G. Design Intent - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

H. Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.

I. Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure set point). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.

J. Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

K. Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

L. Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.

M. Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

N. Owner-Contracted Tests - tests paid for by the Owner outside the GC's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

O. Prefunctional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, by the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three

phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional check listing, except for larger or more critical pieces of equipment.

P. Sampling - functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

Q. Seasonal Performance Tests - FT that are deferred until the system(s) will experience conditions closer to their design conditions.

R. Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

S. Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

T. Startup - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.

U. Subs - the Subcontractors to the General Contractor who provide and install building components and systems.

V. Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CA.

W. Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures.

X. Trending - monitoring using the building control system.

Y. Post Construction Phase - Post Construction Phase for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 15 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided by the Division Controller.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting: Within 30 days of commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CA.

B. Miscellaneous Meetings: Other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CA will plan these meetings and will minimize unnecessary time being spent by Subs.

3.2 REPORTING

A. The CA will provide regular reports to the Owner and A/E, with increasing frequency as construction and commissioning progresses.

B. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

3.3 SUBMITTALS

A. The Commissioning authority will review approved CM/GC submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures.

B. The CA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned,

B. General:

1. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan:

1. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements for each system.
2. The Subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
3. The full start-up plan could consist of something as simple as:
   a. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
   b. The manufacturer's normally used field checkout sheets.
4. The Subcontractors shall submit the full startup plan to the General Contractor who will be responsible for reviewing and stamping the submittal. The General Contractor shall be responsible for transmitting the full submittal to the CA and A/E for approval.

D. Sensor and Actuator Calibration:

1. All field-installed temperature, relative humidity, CO, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
2. All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results. All sensors shall be calibrated to the tolerances for the specific product.

E. Valve and Damper Stroke Setup and Check:

1. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.

F. Execution of Prefunctional Checklists and Startup:

1. The CA shall observe, at minimum, the procedures for each type of equipment to be commissioned.
2. The Subs and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
3. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

G. Deficiencies, Non-Conformance and Approval in Checklists and Startup:

1. The Sub Contractors shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CA within two days of test completion.
2. The CA reviews the report and submits either a non-compliance report or an approval form to the A/E and GC. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system to the A/E using a standard form.

3.5 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in this section.

C. The parties responsible to execute each test are listed with each test.

D. Objectives and Scope:

1. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
2. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in Sections.

E. Development of Test Procedures:

1. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters.
2. The CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection.
3. The CA shall review owner-contracted, factory testing or required owner acceptance tests which the CA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the Specifications. Redundancy of testing shall be minimized.
4. The test procedure forms developed shall include (but not be limited to) the following information:
    a. System and equipment or component name(s)
    b. Equipment location and ID number
    c. Date
    d. Project name
    e. Participating parties
    f. A copy of the specification section describing the test requirements
    g. A copy of the specific sequence of operations or other specified parameters being verified
    h. Formulas used in any calculations
    i. Required pre-test field measurements
    j. Instructions for setting up the test.
    k. Special cautions, alarm limits, etc.
    l. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
    m. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
    n. A section for comments
    o. Signatures and date block for the CA
5. Sampling:
    a. The recommended sampling rates are specified with each type of equipment in the testing sections of this specification. It is noted that no sampling by Subs is allowed in prefunctional checklist execution. The following is an example of how multiple pieces of equipment that are identical may be tested.
        1) Randomly test at least 20% of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the “first sample.”
        2) If 10% of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
        3) If 10% of the units in the second sample fail, test all remaining units in the whole group.

b. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

F. Coordination and Scheduling:

1. The Subs shall provide sufficient notice to the CA and General Contractor regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CA will schedule functional tests through the General Contractor and affected Subs. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.
2. In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems.

G. Problem Solving:

1. The CA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the GC, Subs and A/E.

3.6 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation:

1. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the General Contractor for review and approval and to the Subs for review. The CA will include the filled out forms in the Systems manuals.

B. Non-Conformance:

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the General Contractor and A/E on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Cost of Retesting:
   a. The cost for the Sub to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs.
   b. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CA will direct the retesting of the equipment once at no “charge” to the Subs for their time.
   c. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the General Contractor.

C. Approval:

1. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA and by the A/E. The CA recommends acceptance of each test to the A/E using a standard form. The CA gives final approval on each test using the same form, providing a signed copy to the General Contractor.

3.7 DEFERRED TESTING

A. Unforeseen Deferred Tests:

1. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the CA. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing:

1. During the Post Construction Phase, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be noted by the GC.

3.8 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals:

1. The specific content and format requirements for the standard O&M manuals are detailed in the specific Sections.
2. CA Review:
   a. Prior to substantial completion, the CA shall review the O&M manuals, documentation to verify compliance with the Specifications. The CA will communicate deficiencies in the manuals to the A/E and GC. Upon a successful review of the corrections, the CA recommends approval and acceptance of these sections of the O&M manuals to the A/E and GC.
3. Final Report Details:
   a. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment and documentation in the following areas: 1) Equipment meeting the equipment

specifications, 2) Equipment installation, 3) Functional performance and efficiency, 4) Equipment documentation and design intent. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

3.9 TRAINING OF OWNER PERSONNEL

A. The General Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

B. The CA shall be responsible for approving the content and adequacy of the training of Owner personnel for commissioned equipment.
   1. The CA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CA shall decide how rigorous the training should be for each piece of commissioned equipment. The CA shall communicate the results to the Subs and vendors who have training responsibilities.
   2. In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors is specified in the specific Sections.
   3. Each Sub and vendor responsible for training will submit a written training plan to the CA for review and approval prior to training. The plan will cover the following elements:
      a. Equipment (included in training)
      b. Intended audience
      c. Location of training
      d. Objectives
      e. Subjects covered (description, duration of discussion, special methods, etc.)
      f. Duration of training on each subject
      g. Instructor for each subject
      h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
      i. Instructor and qualifications
   4. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
   5. The CA develops an overall training plan and coordinates and schedules, with the GC. The CA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CA recommends approval of the training to the A/E and General Contractor using a standard form.
   6. The design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall be 8 hours in length and include a review of all systems using the simplified system schematics (one-line drawings) including boiler water systems, AHU systems, heating

systems, fuel gas supply systems, supply air systems, exhaust system and outside air strategies, dust collection and BAS system.

PLUMBING

3.10 PLUMBING WATER SYSTEM

A. Parties Responsible to Execute Functional Test

1. CA: witness and document testing.
2. Plumbing Contractor to make all adjustments.

B. Integral Components or Related Equipment Being Tested

1. This procedure applies to the following systems:
   a. Hot and Cold Domestic Water Systems
   b. Hot and Cold Non-Potable Water Systems
2. Hot water heaters (heaters, mixing valves)
3. Recirculating pumps

C. Prerequisites: The applicable prerequisite checklist items shall be checked off prior to functional testing. The commissioning agent may also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

Function/Mode	Test Method
1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual
2. Verify schedules and set points to be reasonable and appropriate	
3. Mixing valve operation and temperature control	Either
4. Sensor calibration checks on hot water temperature	Manual

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. None

F. Required Monitoring

1. None

G. Acceptance Criteria (Referenced by function or mode ID)

1. For the conditions, sequences and modes tested, equipment responds to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

H. Sampling Strategy for Identical Units

1. No sampling. Test all units.

END OF PLUMBING WATER SYSTEM

MECHANICAL

3.11 COOLING SYSTEMS (COOLING TOWER, FREE COOLING HEAT EXCHANGER, PUMPS, DISTRIBUTION)

A. Parties Responsible to Execute Functional Test:

1. Vendor Support Representative
2. Controls Contractor: Operate the controls, as needed
3. HVAC mechanical contractor or vendor: Assist in testing sequences
4. CA: To witness and document testing

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Cooling Tower
2. Free cooling heat exchanger
3. Chilled water and condenser water pumps
4. Tower and pump VFDs
5. Water treatment and water makeup systems

C. Prerequisites:

1. The applicable prerequisite checklist items listed in Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions/Modes Required To Be Tested, Test Methods and Seasonal Test Requirements.

1. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Function / Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Supply pump staging, bypass valve operation, if no VFD and temperature reset. VFD operation: modulation to minimum, control system PID, proportional band of speed vs controlling parameter, verification of program settings,, alarms, etc.	Both	Cooling
3. Check all alarms and safeties (high and low pressure and temperature, etc.), PRV and flow switch functions	Manual	
4. Test each possible lead tower section as lead, and each pump as lead pump. Test pump lockouts.	Manual	
5. Verify cooling tower and heat exchanger inlet/outlet pressures with startup report and manufacturer's recommendations.	Manual	
6. Sensor and actuator calibration checks on: CWST, CWRT, pressure sensor controlling pump speed, mixing valve and other random checks (EMS readout against hand-held calibrated instrument must be within 0.5°F for temps. or within a tolerance equal to 10% of the pressure set point, with a test gage).	Manual	
7. Constancy of differential pressure (pump control parameter)	Monitoring	Cooling
8. Trend all temperature, pressure, speed and control points from the start of functional performance testing until Post Construction Phase is complete.	Monitoring	Both
9. Water treatment, water levels, pressure and temperature safeties and alarms.		
10. Verify schedules and set points to be reasonable and appropriate		

E. Special Procedures (other equipment to test with, etc.; reference to function ID):

1. False load chiller, if necessary.
2. Testing of safety valves.

F. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences, and modes tested, the cooling tower, pumps, heat exchanger, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

2. Cooling Tower shall maintain the supply water set point to within +/- 3.0F of set point dead band without excessive hunting.
3. Pumping system and controls shall maintain the current desired pressure set point to within an amount equal to 10% of the set point value either side of the dead band without excessive hunting.
4. Max sound: per manufacturer's requirements.
5. Max pressure: per manufacturer's requirements.

G. Sampling Strategy for Identical Units: No sampling, test all.

END OF COOLING SYSTEMS

3.12 BUILDING AUTOMATION SYSTEM (BAS)

A. Parties Responsible to Execute Functional Test:

1. Controls Contractor: Operate the controls to activate the equipment.
2. CA: To witness and document testing.

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. Building Automation System
2. All prefunctional checklists of controlled equipment

C. Prerequisites:

1. The applicable prerequisite checklist items listed in the Part 1 of this section and paragraph B above shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. A significant part of the BAS functional testing requirements is the successful completion of the functional tests of equipment the BAS controls or interlocks with. Uncompleted equipment functional tests or outstanding deficiencies in those tests lend the required BAS functional testing incomplete.

E. Integral or stand-alone controls are functionally tested with the equipment they are attached to, including any interlocks with other equipment or systems and thus are not covered under the BAS testing requirements, except for any integrated functions or interlocks listed below.

F. In addition to the controlled equipment testing, the following tests are required for the BAS, where features have been specified. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in the specifications.

Function/Mode	Test Method Manual (demonstration), Monitoring, Either or Both
MISC. FUNCTIONS	
1. All specified functions and features are set up, debugged and fully operable	Verbal discussion of features
2. Power failure and battery backup and power-up restart functions	Demonstration
3. Specified trending and graphing features demonstration	See equipment trends
4. Global commands features	Demonstration
5. Security and access codes	Demonstration
6. Occupant over-rides (manual, telephone, key, keypad, etc.)	Demonstration
7. O&M schedules and alarms	Demonstration
8. Scheduling features fully functional and setup, including holidays	Observation in terminal screens or printouts
9. Included features not specified to be setup are installed (list)	Demonstration
10. Demonstrate functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad	Demonstration of 100% of panels and 10% of ports
11. All graphic screens and value readouts completed	Demonstration
12. Set point changing features and functions	Done during equipment testing
13. Communications to remote sites	Demonstration
14. Sensor calibrations	Sampled during equipment tests
15. Final as-builts or redlines (per spec) control drawings, final points list, program code, set points, schedules, warranties, etc. per specs, submitted for O&Ms.	Observation
16. Verify that points that are monitored only, having no control function, are checked for proper reporting to BAS.	Observation
17. Optional Start/Stop Routine.	
18. Final room numbers programmed into system.	
19. Worcester standard point naming conventions used.	
INTEGRATED TESTS	
20. Fire alarm interlocks and response	Demonstration
21. Demand limiting (including over-ride of limiting)	Monitoring
22. Sequential staging ON of equipment	Either
23. All control strategies and sequences not tested during controlled equipment testing	Either
24. Other integrated tests specified in the contract documents	
25. Emergency power operation and return to normal power.	
26. Fire protection and suppression systems	Demonstration

G. Special Procedures (other equipment to test with, etc.; reference to function ID): None

H. Acceptance Criteria (referenced by function or mode ID):

1. For the conditions, sequences and modes tested, the BAS, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

END OF BUILDING AUTOMATION SYSTEM (BAS)

3.13 TEST AND BALANCE WORK (TAB)

A. Parties Responsible to Execute Functional Test:

1. TAB Contractor: Perform checks using test instruments.
2. Controls Contractor: Operate the controls to activate the equipment.
3. CA: To witness and document testing.

B. Integral Components or Related Equipment Being Tested: Prefunctional tests must be complete for all of the components listed below prior to performing this functional test.

1. TAB water-side
2. TAB air-side
3. TAB equipment and systems
4. TAB electrical

C. Prerequisites

1. The applicable prerequisite checklist items listed in the beginning of this Section shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Purpose:

1. The purpose of this test is to spot check the TAB work to verify that it was done in accordance with the contract documents and acceptable practice and that the TAB report is accurate.

E. The following tests and checks will be conducted. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Specification.

Test or Check	Test Method	Required Seasonal Test[3]
1. A random sample of up to 5 % the TAB report data shall be selected for verification (air velocity, air or water flow rate, pressure differential, electrical or sound measurement, etc.). The original TAB contractor will execute the checks, witnessed by the commissioning	Demonstration	

Test or Check	Test Method	Required Seasonal Test[3]
authority. The TAB contractor will use the same test instruments as used in the original TAB work. A failure[1] of more than 10% of the selected items of a given system[2] shall result in the failure of acceptance of the system TAB report and the TAB contractor shall be responsible to rebalance the system, provide a new system TAB report and repeat random verifications of the new TAB report. The random testing will include the verification of minimum outdoor air intake flows at minimum, maximum and intermediate total airflow rates for 100% of the air handlers. Other selected data to be verified will be made known upon day of testing.		
2. Verify that final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked by the TAB Contractor.	Demonstration	
3. Verification that the air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control set points established by TAB and a physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all TUs taking off downstream of the static pressure sensor, the TU on the critical leg has its damper 90% or more open.	Demonstration	
4. Verification that the water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control set points established by TAB and a physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90% or more open.	Demonstration	

[1]Failure of an item is defined as follows:
For airflow of supply and return: a deviation of more than 10% of instrument reading
For minimum outside airflow: 20% of instrument reading (30% for reading at intermediate supply flow for inlet vane or VFD OSA compensation system using linear proportional control)
For temperatures: a deviation of more than 1°F
For air and water pressures: a deviation of more than 10% of full scale of test instrument reading

For sound pressures: a deviation of more than 3 decibels. (Variations in background noise must be considered)

[2]Examples of a "system" are: the air distribution system served by one air handler or the hydronic hot water supply system served by a boiler. Systems can be defined smaller if inaccuracies in TAB work within the smaller defined system will have little or no impact on connected systems.

[3]Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.

F. Special Procedures (other equipment to test with, etc.; reference to function ID): None

G. Required Monitoring: None

H. Acceptance Criteria (referenced by function or mode ID): Provided in footnote to test table above.

I. Sampling Strategy for Identical Units: Described in test table above.

END OF TEST AND BALANCE WORK (TAB)

END OF SECTION

SECTION 024100

DEMOLITION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included:

1. Demolition and removal of selected portions of buildings and structures and as required for new work. Refer to the Drawings for additional requirements.
2. Demolition and removal of selected site elements and as required for new work. Refer to the Drawings for additional requirements.
3. Salvage of existing items to be reused or turned over to the facility.
4. Removal and legal disposal of demolished materials off site. Except those items specifically designated to be relocated, reused, or turned over to the facility, all existing removed materials, items, trash and debris shall become property of the Contractor and shall be completely removed from the site and legally disposed of at her/his expense. Salvage value belongs to the Contractor. On-site sale of materials is not permitted.
5. Maintenance, watering and care of trees designated to remain by a certified arborist during the construction period.
6. Demolition and removal work shall properly prepare for alteration work and new construction to be provided under the Contract.
7. Blasting requirements.
8. Scheduling and sequencing operations without interrupting utilities serving occupied areas. If interruption is required, obtain written permission from the utility company and the Owner’s Project Manager. Schedule interruption when the least amount of inconvenience will result.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 015000 - TEMPORARY FACILITIES AND CONTROLS:
   a. Maintenance of access, cleaning during construction, dust and noise control.
2. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL:
   a. Waste management and recycling.
3. Section 220001 - PLUMBING:
   a. Disconnecting, capping and otherwise making inactive existing plumbing services in areas where demolition and removal work is required.
   b. Disconnection and reinstallation of plumbing equipment temporarily interrupted during construction.
4. Section 230000 - HEATING, VENTILATING AND AIR CONDITIONING:
   a. Disconnecting, capping and otherwise making inactive existing HVAC services in areas where demolition and removal work is required.
   b. Disconnect and reinstallation of HVAC equipment temporarily interrupted during construction.
5. Section 260001 - ELECTRICAL WORK:
   a. Disconnecting, capping and otherwise making inactive existing electrical services in areas where demolition and removal work is required.
   b. Disconnect and reinstallation of electrical equipment temporarily interrupted during construction.

1.3 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction and deliver them to the User Agency ready for reuse, at a location designated by the User Agency. Protect from weather until accepted by User Agency.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated. Protect from weather until reinstallation.

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

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques, antiques, and other items of interest or value to DCAMM that may be encountered during selective demolition remain property of the Commonwealth or user Agency as applicable. Carefully remove each item or object in a manner to prevent damage and deliver promptly to a location acceptable to the DCAMM Project Manger.

1.5 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with early and late starting and finishing dates for each activity. Ensure User Agency's on-site operations are uninterrupted if applicable.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other occupants affected by selective demolition operations.
6. Coordination of User Agency's continuing occupancy of portions of existing building and of User Agency's partial occupancy of completed Work.
7. Means of protection for items to remain and items in path of waste removal from building.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged, and turned over to the User Agency.

C. Predemolition Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01. Submit before Work begins.

D. Landfill Records: Provide trip tickets (receipts) indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1. Comply with submittal requirements in Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

1.6 QUALITY ASSURANCE

A. Examination of Existing Conditions: The Contractor shall examine the Contract Drawings for demolition and removal requirements and provisions for new work. Verify all existing conditions and dimensions before commencing work. The Contractor shall visit the site and examine the existing conditions as he finds them and shall inform herself/himself of the character, extent and type of demolition and removal work to be performed. Submit any questions regarding the extent and character of the demolition and removal work in the manner and within the time period established for receipt of such questions during the bidding period.

B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

C. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

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

E. Standards: Comply with ANSI A10.6 and NFPA 241.

F. Predemolition Conference: Conduct conference at Project site to comply with requirements in Section 013100 - PROJECT MANAGEMENT AND COORDINATION. Review methods and procedures related to selective demolition including, but not limited to, the following:

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

1.7 WARRANTY

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

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

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Designer.

E. Engage a professional engineer registered in the Commonwealth of Massachusetts to survey condition of building to determine whether removing any element might result in structural

deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction videotapes.

1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

1. Arrange to shut off indicated utilities with utility companies and User Agency.
2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.
4. Prior to commencing cutting work in existing surfaces, take all precautionary measures to assure that mechanical and electrical services to the particular area have been made inactive. Coordinate with Fire Protection, Plumbing, HVAC, and Electrical subcontractors. Only licensed tradesmen of that particular trade shall disconnect and cap existing mechanical and electrical items that are to be removed, abandoned and/or relocated.
5. If, during the process of cutting work, existing utility lines are encountered which are not indicated on the Drawings, regardless of their condition, immediately report such items to the Designer. Do not proceed with work in such areas until instructions are issued by the Designer. Continue work in other areas.

3.3 PREPARATION

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

1. Comply with requirements for access and protection specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.

2. Maintain adequate passage to and from all exits at all times. Before any work is done which significantly alters access or egress patterns, consult with the Designer and obtain approval of code required egress. Under no condition block or interfere with the free flow of people at legally required exits, or in any way alter the required condition of such exits.

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

1. Strengthen or add new supports when required during progress of selective demolition.
2. Remove temporary shoring, bracing and structural supports when no longer required.
3. Post warning signs and place barricades as applicable during placement and removal of temporary shoring.

C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area(s).

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction. Provide temporary barricades as required to limit access to demolition areas.
2. Protect existing site improvements, appurtenances, and landscaping to remain.

D. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

3.4 SELECTIVE DEMOLITION, GENERAL

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

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during and after flame-cutting operations.

5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to User Agency.
4. Transport items to storage area designated by the DCAMM Project Manager.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

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

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Designer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

E. Items for Re-use and Preservation of Existing Surfaces to Remain:

1. The Contractor shall inspect closely each item specifically designated to be relocated, re-used, or turned over to the Owner prior to its removal, and immediately report damages and defects to the Designer and DCAMM Project Manager. The Contractor shall be responsible for any subsequent damage to the same other than latent defects not readily apparent from close inspection, and shall bear responsibility for its repair or same replacement as directed by the Designer, to the satisfaction of the DCAMM Project Manager.
2. Unless special surface preparation is specified under other Specification Sections, leave existing surfaces that are to remain in a condition suitable to receive new materials and/or finishes.

3.5 PROTECTION OF PUBLIC AND PROPERTY

A. Provide all measures required by federal, state and municipal laws, regulations, and ordinances for the protection of surrounding property, the public, workmen, and Commonwealth's employees during all demolition and removal operations. Measures are to be taken, but not limited to installation of sidewalks, sheds, barricades, fences, warning lights and signs, trash chutes and temporary lighting.

B. Protect all walks, roads, streets, curbs, pavements, trees and plantings, on and off premises, and bear all costs for correcting such damage as directed by the Designer, and to the satisfaction of the DCAMM Project Manager.

C. Demolition shall be performed in such a manner that will insure the safety of adjacent property. Protect adjacent property from damage and protect persons occupying adjacent property from injuries which might occur from falling debris or other cause and so as not to cause interference with the use of other portions of the building, of adjacent buildings or the free access and safe passage to and from the same.

D. Every precaution shall be taken to protect against movement or settlement of the building, of adjacent buildings, structures, sidewalks, roads, streets, curbs and pavements. Provide and place at the Contractor's own expense, all necessary bracing and shoring in connection with demolition and removal work.

E. Remove portions of structures with care by using tools and methods that will not transfer heavy shocks to existing and adjacent building structures, both internal and external of the particular work area.

F. Provide and maintain in proper condition, suitable fire resistive dust barriers around areas where interior demolition and removal work is in progress. Dust barriers shall prevent the dust migration to adjacent areas. Remove dust barriers upon completion of major demolition and removal in the particular work area.

G. Protect unaltered portions of existing construction, including finishes, furnishings and equipment

H. Provide secure weather protection where demolition has removed a portion of the exterior envelope.

3.6 DISCOVERY OF HAZARDOUS MATERIALS

A. If hazardous materials, such as chemicals, asbestos-containing materials, or other hazardous materials are discovered during the course of the work, cease work in affected area only and immediately notify the Designer and the DCAMM Project Manager of such discovery. Do not proceed with work in such areas until instructions are issued by the Designer. Continue work in other areas.

B. If unmarked containers are discovered during the course of the work, cease work in the affected area only and immediately notify the Designer and the DCAMM Project Manager of such discovery. Do not proceed with work in such areas until instructions are issued by the Designer. Take immediate precautions to prohibit endangering the containers integrity. Continue work in other areas.

3.7 CUTTING

A. Perform all cutting of existing surfaces in a manner which will ensure a minimal difference between the cut area and new materials when patched. Use extreme care when cutting existing surfaces containing concealed utility lines which are indicated to remain and bear full responsibility for repairing or replacement of all such utilities that are accidentally damaged.

B. Provide a flush saw cut edge where pavement, curb and concrete removals abut new construction work or existing surfaces to remain undisturbed.

3.8 BLASTING

A. Blasting shall not be allowed.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Comply with requirements of Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL and the following.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.10 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Premises shall be left in a clean condition and ready to accept alteration work and new construction.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 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. Cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following applications:
   a. Concrete piers.
   b. Coordination with and cutting and patching of mechanical and electrical penetrations through cast-in-place concrete.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. Section 051200 - STRUCTURAL STEEL FRAMING:
   a. Sleeves, anchors, inserts, and similar items for structural steel framing.
2. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING:
   a. Sleeves, anchors, inserts, and similar items for heating, ventilating, and air conditioning systems.
   b. Pipe and duct sleeves for placement into cast-in-place concrete openings.
3. Section 260001 - ELECTRICAL WORK:
   a. Sleeves, anchors, inserts, floor boxes, and similar items for electrical systems.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections: Not Applicable.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.
2. Indicate amount of fly ash in the mix.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1. Indicate coordination requirements for reinforcement locations with requirements of structural steel, steel joints, and steel deck.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer licensed in the Commonwealth of Massachusetts detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
2. Blockouts for Architectural Joint Systems: Indicate blockouts and coordination with architectural joint systems

E. Formwork Inspection: Indicate compliance with approved shop drawings.

F. Anchor Bolt Location: Indicate compliance with approved shop drawings.

G. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates.

H. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.

4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semi-rigid joint filler.
13. Joint-filler strips.
14. Repair materials.

I. Floor surface flatness and levelness measurements to determine compliance with specified tolerances and requirements for applied finishes and materials, except as noted for slope to drains.

J. Field quality-control test and inspection reports.

K. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

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

D. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete."

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

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

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: shall be American-made Portland Cement, free from water soluble salts or alkalis which will cause efflorescence on exposed surfaces. Portland Cement shall be Type II, ASTM C150. Use only one brand of cement for each type of cement throughout project. The Contractor shall be responsible for whatever steps are necessary to insure that no visual variations in color will result in exposed concrete and shall place on order and secure in advance a sufficient quantity of this (these) cement(s) to complete concrete work specified herein.

1. Fly Ash: ASTM C 618
2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal Weight Fine Aggregate: shall be washed, inert, natural sand conforming to ASTM C33 and following additional requirements:

Sieve	Retained Percent
#4	0 - 5
#16	25 - 40
#50	70 - 87
#100	93 - 97

Fineness Modulus	2.80 (Plus/Minus 0.20)
Organic	Plate 2 maximum
Silt	2.0 percent maximum
Mortar Strength	100 percent minimum compression ratio
Soundness	5 percent maximum loss, magnesium sulfate, five cycles

C. Normal Weight Coarse Aggregate: shall be well graded crushed stone or washed gravel conforming to ASTM C33 and the following additional requirements:

Designated Size (inches)	3	2	1-1/2	1	3/4	1/2	3/8
F.M.(+/-0.20)	7.95	7.45	7.20	6.95	6.70	6.10	4.50
Organic	Plate 1 maximum						
Silt	1.0 percent maximum						
Soundness	5 percent maximum loss, magnesium sulfate, five cycles						

Maximum designated sizes for normal weight coarse aggregate to be used in concrete sections shall be as noted below, except that sizes shall also be chosen in conjunction with required clearances.

1. One and one-half inches for sections over ten inches in thickness.
2. One inch for sections more than eight and up to ten inches in thickness.
3. Three-quarter inch for sections more than three and up to eight inches in thickness.

D. Concrete Fill for Steel Stair and Landing Pans: shall be composed of 1:2:2 mix with three-eighths inch maximum size normalweight aggregate and shall be placed with a 0 inches to 1 inch slump.

E. Water: shall be from approved source, potable, clean and free from oils, acids, alkali, organic matter and other deleterious material.

F. Admixtures:

1. Water-reducing agent:
   a. WRDA, GCPAT.
   b. Plastocrete 100, Sika Corp.
   c. Master Pozzolith 322, BASF.
   d. Or equal.
   e. Note: Water-reducing agent shall be by same manufacturer as air-entraining agent.
2. Air-entraining agent:

a. Darex AEA, GCPAT.
b. Sika Air 260, Sika Corp.
c. MasterAir VR 10, BASF.
d. Or equal.

3. Superplasticizer: High-range water-reducer conforming to ASTM C494, Type F or Type G.
4. Admixtures retarding setting of cement in concrete shall not be used without written approval of Designer.
5. Admixtures causing accelerated setting of cement in concrete shall not be used without written approval of Designer.

2.2 CONCRETE MIXTURES

A. The Contractor shall recommend, on the basis of trial mixes and strength curves specified below, design mixes for each type and strength of concrete. The Testing Agency will verify that the proposed mix designs conform to all specification requirements.

B. Sufficient materials for concrete mix design shall be furnished by the Contractor not less than five weeks before use. Duplicate small samples plainly and neatly labeled with source, where proposed to be used, date, and name of collector shall be provided and presented to Testing Agency for permanent reference.

C. Mixes shall be designed in accordance with "Method 1" of ACI 301, and the requirements of this Section. All concrete is normalweight unless specifically designated otherwise; air-dry weight not to exceed 150 lbs. per cubic foot.

D. Limiting values shown below apply for specific strengths of concrete with coarse aggregates less than one and one-half inches unless noted otherwise in TABLE A below.

TABLE A

Minimum Allowable Compressive Strength at 28 day (psi)	Max. Allowable Net Water Content Gallons/Sack*	Minimum Permissible Cement Factor Sacks/Cubic Yard**
4000	5.75	6.00
3000	6.50	5.00

* Maximum; decrease if possible. This represents total water in mix at time of mixing, including free water on aggregate.
** Minimum; increase as necessary to meet other requirements.

E. In all slabs and walls exposed to weather, all concrete shall contain the approved air-entraining admixture as per manufacturer's written instructions, to provide entrained air, by volume, in the cured concrete within 4.5 to 6.5 percent.

F. Water-Reducing Admixture - The approved water-reducing admixture shall be used in all concrete, in accordance with manufacturer's written instructions.

G. Concrete slabs, including slabs on grade, shall have a maximum water cement ratio of 0.40.

H. The approved superplasticizer shall be used in all concrete slabs, including slabs on grade.

I. Water content and cement content of concrete to be used in work shall be based on curve showing relation between water content, cement content, and 7 and 28 day compressive strengths of concrete made using proposed materials. Curves shall be determined by four or more points, each representing an average of at least three test specimens at each age, and shall have range of values sufficient to yield desired data, including all compressive strengths required by Contract Documents, without extrapolation. Design mix of concrete to be used in work, as determined from curve, shall correspond to following test strengths (TABLE B) obtained in laboratory trial mixtures, but in no case shall resulting mix conflict with limiting values as specified in TABLE A.

TABLE B
Minimum Strength of Lab Trial Mixes (psi)

Design Strength	Trial Mix Strength 7-days	28-days
4000	3800	5000
3000	2700	3750

J. Any deviation from approved mix design, which the Contractor deems desirable under certain project conditions, will not be allowed without written approval of Designer. Cost of any additional testing by Testing Agency associated therewith shall be paid for by the Contractor.

2.3 FORM MATERIALS

A. Construct formwork to shapes, lines, and dimensions required, plumb and straight, secured and braced sufficiently rigid to prevent deformation under load, and sufficiently tight to prevent leakage, all in conformance with ACI Standard 347, “Recommended Practice for Concrete Formwork”.

B. Formwork for exposed concrete shall be medium-density plastic overlaid plywood, 5/8” minimum thickness; for concealed concrete shall be “Plyform” plywood, 5/8” minimum thickness, or equal.

C. Chamfer Strips: Half-inch, 45 degree poplar wood strips, nailed six inches on center, and installed in inside corners of all forms, unless otherwise directed by Designer.

D. Form Ties and Spreaders: Richmond Tyscrus by Richmond Screw Anchor Co.; Superior-ties by Superior Concrete Accessories, Ind.; or Sure-Grip Ties by Dayton, or equal. Sure-Grip and Shore Co. Wire ties shall not be used. Ties for foundation walls shall be snap-ties or type

specified above with removal cones and shall incorporate water seal washer. Ties shall be arranged in a symmetrical manner.

E. Form Release Agent: Non-staining and non-emulsifiable type, or equal approved by Designer. Form release agent shall be biodegradable and shall not impart any stain to concrete nor interfere with adherence of any material to be applied to concrete surfaces.

2.4 REINFORCEMENT AND ACCESSORIES

A. Reinforcing Steel Bars: shall be newly rolled billet steel conforming to ASTM A615 Grade 60. Bars shall be bent cold.

B. Welded Wire Fabric: shall conform to ASTM A185.

C. All structural steel reinforcement and embedded items shall be hot-dip galvanized after fabrication in accordance with ASTM A123.

D. All hot-dip galvanized steel shall be inspected for compliance with ASTM A123 and shall be marked with a stamp that indicates the number of ounces of zinc per square foot of steel. After galvanizing, the bars shall be dipped in a 0.2 percent chromic acid solution. A notarized Certificate of Compliance with all of the above shall be required from the galvanizer.

E. Reinforcement Accessories: shall conform to Product Standard PS7-766, National Bureau of Standards, Department of Commerce, Class C, as produced by Dayton Superior Co., R.K.L. Building Specialties Co., Inc., or equal. Reinforcement accessories shall include spacers, chairs, ties, slab bolsters, clips, chair bars, and other devices for properly assembling, placing, spacing, supporting, and fastening reinforcement. Tie wire shall be galvanized or stainless wire of sufficient strength for intended purpose, but not less than No. 18 gage. Metal supports shall be of such type as not to penetrate surface of formwork and show through surface of concrete. Accessories touching interior formed surfaces exposed to view shall have not less than 1/8 inch of plastic between metal and concrete surface. Plastic tips shall extend not less than 1/2 inch up on metal legs. Individual and continuous slab bolsters and chairs shall be of type to suit various conditions encountered and must be capable of supporting 300 pound load without damage or permanent distortion.

2.5 MISCELLANEOUS MATERIALS

A. Grout: shall be ready-to-use metallic aggregate product requiring only addition of water at job site such as MasterFlow 885 by BASF, Vibro-Foil Ready-Mixed by GCPAT, Ferrolith G by Sonneborn, or equal. Grout shall be easily workable and shall have no drying shrinkage at any age. Compressive strength of grout (2" x 2" cubes) shall not be less than 5000 psi at 7 days, and 7500 psi at 28 days.

B. Vapor Retarder: Minimum 10 mil polyethylene, unless specifically specified elsewhere.

C. Membrane Curing Compound: Conform to ASTM C309, Type 1. Product used shall be shown to be compatible with the later application of coatings. Curing compound shall not be used on any floor slab scheduled to receive an adhered floor finish.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine all work prepared by others to receive work of this Section and report any defects affecting installation to the Contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.

1. Inspection shall be performed by a structural engineer licensed in the Commonwealth of Massachusetts. Certify compliance with shop drawings.

3.2 HANDLING, STORAGE, AND PROTECTION OF MATERIALS

A. Handle and store materials separately in such manner as to prevent intrusion of foreign matter, segregation, or deterioration. Do not use foreign materials or those containing ice. Remove improper and rejected materials immediately from point of use. Cover materials, including steel reinforcement and accessories, during construction period. Stockpile concrete constituents properly to assure uniformity throughout project.

3.3 ERECTION OF FORMWORK, SHORING AND RESHORING

A. Set and maintain formwork to insure complete concrete work within tolerance limits listed in ACI 347 latest edition, "Recommended Practice for Concrete Formwork", and with following additional requirements:

1. Maximum variations from plumb:
   a. In surfaces of columns and walls:
      1) In any 10 feet of length: 1/4 inch
      2) Maximum for entire length: 1/2 inch
2. Maximum variations from established position in plan shown on the drawings:
   a. Column: 1/2 inch
   b. Walls: 3/4 inch
3. Variations in cross-sectional dimensions of columns and beams and in thickness of slabs and walls.
   a. Minus: 1/8 inch
   b. Plus: 1/4 inch

B. For a minimum of one hour prior to concrete placement, wet forms continuously with water to swell forms in order to prevent leakage of concrete matrix and to minimize absorption of concrete matrix water by form materials. This requirement may be waived for those specific

cases where Designer deems it unnecessary or impractical. Care must be exercised to prevent a build-up of water at base of forms.

C. Before form materials can be re-used, surfaces that will be in contact with freshly cast concrete shall be thoroughly cleaned, damaged areas repaired and projecting nails withdrawn. Re-use of form material shall be subject to approval by Designer.

3.4 PLACING OF REINFORCEMENT

A. Reinforcement shall be placed in accordance with requirements of CRSI 93, "Recommended Practice for Placing Reinforcing Bars" and CRSI 93, "Recommended Practice for Placing Bar Supports" and with further requirements below.

B. Reinforcement shall be accurately placed in accordance with Contract Documents and shall be firmly secured in position by wire ties, chairs, spacers, and hangers, each of type approved by Designer.

C. Bending, welding or cutting reinforcement in field in any manner other than as shown on Drawings, is prohibited, unless specific approval for each case is given by Designer.

D. Reinforcement shall be continuous through construction joints unless otherwise indicated on Drawings.

E. Reinforcement shall be spliced only in accordance with requirements of Contract Documents or as otherwise specifically approved by Designer. Splices of reinforcement at points of maximum stress shall generally be avoided. Welded wire fabric shall lap six inches or one space plus two inches whichever is larger, and shall be wired together.

F. At time concrete is placed, reinforcement shall be free of excessive rust, scale, or other coatings that will destroy or reduce bond requirements. Reinforcement expected to be exposed to weather for a considerable length of time shall be painted with a heavy coat of cement grout. Protect stored materials so as not to end or distort bars in any way. Bars that become damaged will be rejected.

G. Before concrete is cast, check all reinforcement after it is placed to insure that reinforcement conforms to Contract Documents and approved Shop Drawings. Such checking shall be done only by qualified experienced personnel. In addition, the Designer shall be notified at least 36 hours prior to concrete placement and given opportunity to inspect completed reinforcement and formwork before concrete placement. Prior approval of Shop Drawings shall in no way limit Designer's right to demand modifications or additions to reinforcement or accessories.

3.5 JOINTS

A. Construction and control joints indicated on Drawings are mandatory and shall not be omitted.

B. Joints not indicated or specified shall be placed to least impair strength of structure and shall be subject to approval of Designer.

3.6 INSTALLATION OF EMBEDDED ITEMS

A. Conform to requirements of ACI 318, paragraph 6.3, "Conduits and Pipes Embedded in Concrete", and as specified below.

B. Install steel sleeves, embedded wall plates and similar items, furnished by other trades, at locations shown on the drawings.

C. Anchor bolts for column base plates shall be installed with templates provided. Vertical alignment and plan locations shall be maintained within one-sixteenth inches of the locations shown on the drawings.

1. Inspection shall be performed by a surveyor licensed in the Commonwealth of Massachusetts. Certify compliance with shop drawings.

3.7 MIXING, CONSISTENCY, AND DELIVERY OF CONCRETE

A. Concrete shall be ready-mixed, produced by plant acceptable to Designer. Hand or site mixing shall not be done. Constituents, including admixtures except certain corrosion inhibitors and superplasticizers, shall be batched at central batch plant. Admixtures shall be premixed in solution form and dispensed as recommended by manufacturer.

B. Central plant and rolling stock equipment and methods shall conform with Truck Mixer and Agitator Standard of Truck Mixer Manufacturer's Bureau of National Ready-Mixed Concrete Association, and Contract Documents. Consistency of concrete at time of deposit shall be as follows:

	Slump	
Portion of Structure	Recommended	Max. Range
Walls, columns	4"	3" - 5"
Slabs, beams	3"	2" - 4"

C. Ready mixed concrete shall be transported to site in watertight agitator or mixer trucks loaded not in excess of rated capacities. Discharge at site shall be within one and one-half hours after cement was first introduced into mix. Discard cement not discharged within one and one-half hours and dispose of legally. Concrete with a temperature greater than 85 degrees F. shall not be placed. Central mixed concrete shall be plant mixed a minimum of five minutes. Agitation shall begin immediately after premixed concrete is placed in truck and shall continue without interruption until discharged. Transit mixed concrete shall be mixed at mixing speed for at least ten minutes immediately after charging truck followed by agitation without interruption until discharged. Concrete shall be furnished by a single plant unless accepted by the Designer in writing.

D. Retempering of concrete which has partially hardened, that is, mixing with or without additional cement, aggregates, or water, will not be permitted.

3.8 PLACING CONCRETE

A. Intent of this Specification is that concrete shall not be pumped. Refer to "Submittals and Concrete Constituents" in this Section for requirements should pumping be proposed.

B. Remove water and foreign matter from forms and excavations and, except in freezing weather or as otherwise directed, thoroughly wet wood forms just prior to placing concrete. Place no concrete on frozen soil and provide adequate protection against frost action during freezing weather.

C. To secure full bond at construction joints, surfaces of concrete already placed, including vertical and inclined surfaces, shall be thoroughly cleaned of foreign materials and laitance, roughened with suitable tools such as chipping hammers or wire brushes, and recleaned by stream of water or compressed air. Well before new concrete is deposited, joints shall be saturated with water. After free or glistening water disappears joints shall be given thorough coating of neat cement slurry mixed to consistency of very heavy paste. Surface shall receive coating of approximately one-eighth inch thick; this shall be scrubbed in by means of stiff bristle brushes. New concrete shall be deposited before neat cement dries or changes color.

D. Do not place concrete having slump outside of allowable slump range.

E. Transport concrete from mixer to place of final deposit as rapidly as practical by methods which prevent separation of ingredients and displacement of reinforcement, and which avoid rehandling. Deposit no partially hardened concrete. When concrete is conveyed by chutes, equipment shall be of such size and U-shaped design as to insure continuous flow in chute. Flat (coal) chutes shall not be employed. Chutes shall be of metal or metal lines and different portions shall have approximately same slope. Slope shall not be less than 25 degrees nor more than 45 degrees from horizontal and shall be such as to prevent segregation of ingredients. Discharge end of chute shall be provided with baffle plate or spout to prevent segregation. If discharge end of chute is more than five feet above surface of concrete in forms, spout shall be used, and lower and maintained as near surface of deposit as practicable. When operation is intermittent, chute shall discharge into hopper. Chute shall be thoroughly cleaned before and after each run and debris and any water used shall be discharged outside forms. Concrete shall not be allowed to flow horizontally over distances exceeding five feet.

F. Concrete shall be placed in such manner as to prevent segregation, and accumulations of hardened concrete on forms or reinforcement above mass of concrete being placed. To achieve this end, suitable hoppers, spouts with restricted outlets and tremies shall be used as required.

G. During and immediately after depositing, concrete shall be thoroughly compacted by means of internal type mechanical vibrators or other tools, or by spading to produce required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on only enough to produce homogeneity and optimum consolidation without permitting segregation of constituents or "pumping" of air. Vibrators used for normalweight concrete shall operate at speed at not less than 7,000 vpm and be of suitable capacity. Do not use vibrators to move concrete. Vibration shall be supplemented by proper wooden spade puddling to remove included bubbles and honeycomb adjacent to visible surfaces. At least one vibrator shall be on hand for every 10 cubic yards of concrete placed per hour, plus one spare. Vibrators shall be operable and on site prior to starting placement.

H. Vertical lifts shall not exceed 18 inches. Vibrate completely through successive lifts to avoid pour lines. Vibrate first lift thoroughly until top of lift glistens to avoid stone pockets, honeycomb, and segregation.

I. Concrete shall be deposited continuously, and in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause formation of seams and planes of weakness within section. If section cannot be placed continuously between planned construction joints, as specified, field joint and additional reinforcement shall be introduced so as to preserve structural continuity. Designer shall be notified in any such case.

J. Cold joints, particularly in exposed concrete, including "honeycomb", are unacceptable. If they occur in concrete surfaces exposed to view, Designer will require that entire section in which blemish occurs be removed and replaced with new materials at the Contractor's expense.

K. When placing exposed concrete walls or columns, strike corners of forms rapidly and repeatedly from outside along full height while depositing concrete and vibrating.

L. Chutes, hoppers, spouts, adjacent work, etc. shall be thoroughly cleaned before and after each run and water and debris shall be discharged outside form.

3.9 FINISHING OF UNFORMED CONCRETE SURFACES

A. Smooth troweled finish: shall be provided where concrete flatwork is to be exposed in the finished work or is to receive resilient flooring materials.

B. Floated finish: shall be provided where concrete flatwork is to receive waterproofing membranes or setting beds for finished materials.

C. Floated finish: shall be provided for top surfaces of walls, slabs and beams.

D. Rough struck surface shall be provided at top of pedestals.

E. Steel Broom Finish (with smooth edging): shall be provided at exterior concrete walks, pavements and steps.

F. The Contractor, at his own expense, shall level depressed spots and grind high spots in concrete surfaces which are in excess of specified tolerances. Leveling materials proposed for providing proper surface shall be approved by Designer.

3.10 REPAIRING OF UNFORMED CONCRETE SURFACES

A. Tops of slabs and walls shall be repaired by using either same material as originally cast or by use of dry-pack material, as approved by Designer. Areas affected shall be chipped back square and to depth of one inch minimum. Hole shall then be moistened with water for a minimum of two hours, followed by brush coat of 1/16 inch thick cement paste. Immediately plug hole with concrete, or with dry pack material consisting of 1:1.5 mixture of cement and concrete sand mixed slightly damp to touch. Hammer dry-pack into hole until dense, and excess paste appears

on surface. Finish patch flush and to same texture as surrounding concrete. For large repairs employ 1-1-2 mixture of cement, concrete sand and pea gravel at same dry-pack consistency.

3.11 CURING AND PROTECTION

A. When concrete is placed at or below ambient air temperatures of 40 degrees F. or whenever in opinion of Designer, such or lower temperatures are likely to occur within 48 hours after placement of concrete, cold weather concreting procedures, according to ACI 306 and as specified herein, shall be followed. To this end, entire area affected shall be protected by adequate housing or covering, and heating. No salt, chemicals or other foreign materials shall be used in the mix to lower freezing point of concrete.

B. Protect concrete work against injury from heat, cold, and defacement of any nature during construction operations.

C. Concrete shall be treated and protected immediately after concreting or cement finishing is completed, to provide continuous moist curing above 50 degrees F. for at least seven days, regardless of ambient air temperatures.

D. Curing compounds will not be permitted for slab and beams.

E. Keep permanent temperature record showing date and outside temperature for concreting operations. Thermometer readings shall be taken at start of work in morning, at noon, and again late in afternoon. Locations of concrete placed during such periods shall likewise be recorded, in such manner as to show any effect temperatures may have had on construction. Copies of temperature record shall be distributed daily to Designer.

3.12 REMOVAL OF FORMWORK, SHORING AND RESHORING

A. The Contractor shall be responsible for proper removal of formwork, shoring, and reshoring.

B. Forms shall be removed only after concrete has attained sufficient strength to support its shown weight, construction loads to be placed thereon and lateral loads, without damage to structure or excessive deflection.

C. Forms and supports shall remain in place for not less than minimum periods of time noted below. These periods represent cumulative number of days or fractions thereof, consecutive unless otherwise approved by Designer during which time mean daily air temperature at surfaces of concrete is above 50 degrees F.

1. Vertical Surfaces: concrete shall have reached 100 day-degrees# and shall have attained strength of not less than 30 percent of f'c. Where such forms also support formwork for slab or beam soffits, removal times for latter shall govern.
2. Horizontal Surfaces: except as noted below, concrete shall have reached 300 day-degrees of curing and attained strength of not less than 60 percent of f'c.
    a. Soffits of beams or girders shall remain supported and in place until concrete has attained 600 day-degrees#.

b. Forms and supports of floor slabs shall remain in place until concrete has reached 400 day-degrees.

c. Definition of day-degrees: Total number of days times mean daily air temperature at surfaces of concrete. For example, five days at temperature of 60 degrees F. equals 300 day degrees. Days or fractions of days in which temperature is below 50 degrees F. shall not be included in calculation of day-degrees.

D. Form removal shall be so performed that reshores are placed at same time as stripping operations, and that no area larger than one-fourth of a slab panel is unsupported at any time.

E. Any test cylinders required to verify the specified minimum strengths for form removal shall be field cured under the same conditions as the concrete they represent. Such cylinders and testing shall be at the Contractor's expense.

3.13 REPAIRING AND FINISHING OF FORMED AND ARCHITECTURAL CONCRETE SURFACES

A. In accordance with the provisions of ACI 301, Chapter 10, all concrete shall have "smooth form finish".

B. Intent of this Specification is to require forms, mixtures of concrete, and workmanship so that concrete surfaces will require no patching, except for plugging of tie holes. However, where patching is acceptable to Designer, procedure described below shall be followed.

C. Defective concrete and honeycombed areas shall not be patched unless examined and approval is given by Designer. If such approval is received by the Contractor, areas involved shall be chipped down square and at least one inch deep to sound concrete by means of cold chisels or pneumatic chipping hammers. If honeycomb exists around reinforcement, chip to provide clear space at least three-quarter inch wide all around steel to afford proper ultimate bond thereto. For areas less than one and one-half inches deep, patch shall be made in same manner as described above for filling unformed concrete surfaces, care being exercised to use crumbly-dry (non-trowelable) mixtures and to avoid sagging. Thicker repairs shall require build-up in successive days, each layer being applied as described. To aid strength and bonding of multiple layer repairs, non-shrink, non-metallic aggregate shall be used as an additive as follows:

Materials	Volumes	Weights
Cement	1.0	1.0
Non-Metallic Aggregate	0.15	0.25
Sand	1.5	1.55

For very heavy (generally, formed) patches, pea gravel may be added to mixture and proportions modified as follows:

Materials	Volumes	Weights
Cement	1.0	1.0
Non-Metallic Aggregate	0.2	0.33

Sand	1.0	1.0
Pea Gravel	1.5	1.55

After hardening, rub lightly as described above for form tie holes.

1. Mortar for patching shall be same mix as above except aggregate shall pass a No. 14 sieve.
2. For all concrete to receive "smooth" finish, remove formwork fins and clean entire surface of grease, form oil, laitance, dust, and other foreign matter.
3. "Smooth" finish shall consist of having all fins removed, joint marks smoothed off, blemishes removed, and surfaces left smooth and unmarred.
4. Begin finishing operations as soon as practicable after removal of forms, continue with curing operations after finishing is completed. After concrete has been well cured, carefully inspect surfaces. Remove any fins, rough spots, streaks, hardened mortar or grout and other foreign material. Patch defects with finishing mortar as specified above, to satisfaction of Designer.

D. Patches which become crazed, cracked, or sound hollow upon tapping shall be removed and replaced with new material at the Contractor's expense.

3.14 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by DCAMM for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.

B. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

C. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at the Contractor's expense.

3.15 CLEANING

A. Concrete surfaces shall be cleaned of objectionable stains as determined by the Designer. Materials containing acid in any form or methods which will damage "skin" of concrete surfaces shall not be employed, except where otherwise specified.

END OF SECTION

SECTION 051200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 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. Structural steel for Cooling Tower supports.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Install the following items as furnished by the designated Sections: Not Applicable.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 055100 - METAL STAIRS AND RAILINGS for metal stairs and railings.
2. Section 099000 - PAINTING AND COATING for finish painting of exposed structural steel not shop painted under this Section.
3. Section 230001 – HEATING, VENTILATING AND AIR-CONDITIONING for Roof Top Unit.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

B. Architecturally Exposed Structural Steel: Structural steel designated as architecturally exposed structural steel in the Contract Documents.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using AISC's "Manual of Steel Construction, Load and Resistance Factor Design," Volume 2, Part 9.
2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer licensed in the Commonwealth of Massachusetts to prepare structural analysis data for structural-steel connections.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the Commonwealth of Massachusetts responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For Installer, fabricator, professional engineer, testing agency.

E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

F. Source quality-control test reports.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

B. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" and "Load and Resistance Factor Design Specification for Structural Steel Buildings."
4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
5. AISC's "Specification for Allowable Stress Design of Single-Angle Members" and "Specification for Load and Resistance Factor Design of Single-Angle Members."
6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 572/A 572M, Grade 50.

B. Channels, Angles-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 572/A 572M, Grade 50.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

F. Medium-Strength Steel Castings: ASTM A 27/A 27M, Grade 65-35 carbon steel.

G. High-Strength Steel Castings: ASTM A 148/A 148M,Grade 80-50, carbon or alloy steel.

H. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

D. Anchor Rods: ASTM F 1554, grade as applicable, hot-dip zinc coating, ASTM A 153/A 153M, Class C.

E. Threaded Rods: ASTM A 193/A 193M, grade as applicable, hot-dip zinc coating, ASTM A 153/A 153M, Class C.

F. Eye Bolts and Nuts: ASTM A 108, Grade 1030, cold-finished carbon steel.

G. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

A. Primer: SSPC-Paint 25, Type II, iron oxide, zinc oxide, raw linseed oil, and alkyd.

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

C. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

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

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" as applicable.

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

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

F. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

G. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced not more than 10 inches o.c., unless otherwise indicated.

H. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

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

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.

    a. Grind butt welds flush.
    b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

2.7 STEEL PRIMERS AND FINISHES

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for The Society for Protective Coatings (SSPC) surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 10/NACE No. 2, "Near White Metal Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 6, "Commercial Blast Cleaning."
3. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be field welded, embedded in concrete or masonry, unless otherwise indicated. Extend priming of partially embedded members to a depth of 2 inches.

4. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
5. Comply with SSPC-PA 2, "Measurement of Dry Coating Thickness with magnetic Gages."

C. Zinc-Rich Primer: Urethane zinc rich primer compatible with topcoat Specified in Section 099000 - PAINTING AND COATING. Provide primer with a VOC content of 340 g/L (2.8 lb/gal.) or less per OTC ozone standards. Provide Tnemec Series 394 Perimerprime or PPG PMC Amercoat 5105 for exposed steel to be fireproofed, or Tnemec 901K97 or 90-97 or PPG PMC Amercoat 68HS for exposed steel to be finish painted at 3.0 mils DFT or equal by DuPont, Carboline, or Sherwin-Williams.

D. Primer for Exposed Steel to Receive Multi-Coat Shop-Applied Coating: Tnemec 901K97 or 90-97 urethane zinc rich primer at 3.0 to 3.5 mils DFT, topcoated in shop with Tnemec Endurashield Series 73 or PPG PMC Amercoat 68 HS Primer at 3.0 to 5.0 mils DFT or equal by DuPont, Carboline, or Sherwin-Williams.

E. Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards. The galvanizing bath shall contain high grade zinc and other earthly materials. Fill vent holes and grind smooth after galvanizing.

1. Galvanizing shall exhibit a rugosity (smoothness) not greater than 4 rug (16-20 microns of variation) when measured by a profilometer over a 1 inch straight line on the surface of architectural and structural elements that are less than 24 pounds per running foot. Profilometer shall be capable of operating in 1 micron increments.
2. Surface blasting prior to application of factory-applied post galvanizing wet coatings will produce a high rugosity and shall not be acceptable.

F. Hot-Dip Galvanizing And Factory-Applied Primer for Steel: Provide hot-dip galvanizing and factory-applied prime coat, certified OTC/VOC compliant less than 2.8 lbs/gal. and conforming to EPA and local requirements. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations and as recommended by the primer coating manufacturer. Blast cleaning of the surface is unacceptable for surface preparation. Primer shall have a minimum two year re-coat window for application of finish coat. Coatings must meet or exceed the following performance criteria:

1. Abrasion Resistance per ASTM D 4060 (CS17 Wheel, 1,000 grams load); 1kg Load: 200 mg loss.
2. Adhesion per ASTM D4541: 1050 psi.
3. Corrosion Weathering per ASTM D5894, 13 cycles, 4,368 hours: Rating 10 per ASTM D714 for blistering; Rating: 7 per ASTM D610 for rusting.
4. Direct Impact Resistance per ASTM D2794: 160 in. lbs.
5. Flexibility per ASTM D522, 180º Bend, 1 inch Mandrel: Passes.
6. Pencil Hardness per ASTM D3363: 3H.

7. Moisture Condensation Resistance per ASTM D4585, 100º F, 2000 hours: Passes, no cracking or delamination
8. Dry Heat Resistance per ASTM D2485: 250º F.

G. Hot-Dip Galvanizing and Factory-Applied Urethane Primer and Finish for Steel: Provide factory-applied architectural coating over primed hot-dip galvanized steel matching approved samples.

1. Primer coat shall be factory-applied polyamide epoxy primer. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations and as recommended by the primer coating manufacturer.
2. Finish coat shall be factory-applied color-pigmented architectural finish. Apply finish coating at the galvanizer's plant, in a controlled environment meeting applicable environmental regulations and as recommended by the finish coating manufacturer.
3. Coatings shall be certified OTC/VOC compliant and conform to applicable regulations and EPA standards.
4. Apply the galvanizing, primer, and coating within the same facility and provide single-source responsibility for galvanizing, priming and finish coating.
5. Blast cleaning of the galvanized surface is required, unless galvanizer certifies performance will be met without blast cleaning and coating will be applied within 12 hours of galvanizing.
6. Primer shall meet or exceed the following performance criteria:
   a. Abrasion Resistance per ASTM D 4060 (CS17 Wheel, 1,000 grams load),1kg Load: 200 mg loss.
   b. Adhesion per ASTM D4541: 1050 psi.
   c. Corrosion Weathering per ASTM D5894, 13 Cycles, 4,368 Hours: Rating 10 per ASTM D714 for blistering; Rating 7 per ASTM D610 for rusting.
   d. Direct Impact Resistance per ASTM D2794: 160 in. lbs.
   e. Flexibility per ASTM D522, 180º Bend, 1 in. Mandrel: Passes.
   f. Pencil Hardness per ASTM D3363: 3B.
   g. Moisture Condensation Resistance per ASTM D4585, 100º F, 2000 Hours: Passes, no cracking or delamination.
   h. Dry Heat Resistance per ASTM D2485: 250º F.
7. Topcoat shall meet or exceed the following performance criteria:
   a. Abrasion Resistance per ASTM D 4060, CS17 Wheel, 1,000 Cycles 1kg Load: 87.1 mg loss.
   b. Adhesion per ASTM D 4541: 1050 psi.
   c. Direct Impact Resistance per ASTM D2794: >28 in. pounds.
   d. Indirect Impact Resistance per ASTM D2794: 12-14 in. pounds.
   e. Dry Heat Resistance per ASTM D2485: 200° F.
   f. Salt Fog Resistance per ASTM B 117 9,000 Hours: Rating 10 per ASTM D714 for blistering.
   g. Flexibility per ASTM D522, 180° Bend, 1/8 in. Mandrel: Passes.
   h. Pencil Hardness per ASTM D3363: 2H.
   i. Moisture Condensation Resistance per ASTM D4585, 100° F, 1000 Hours: No blistering or delamination
   j. Xenon Arc Test per ASTM D 4798: Pass 300 hours

2.8 SOURCE QUALITY CONTROL

A. Engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

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

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

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

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and other inspection procedures, at testing agency's option.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

1. Elevations shall be verified by a surveyor licensed in the Commonwealth of Massachusetts.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges."

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.
3. [Snug-tighten] [Pretension] anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection unless approved by Designer. Finish thermally cut sections within smoothness limits in AWS D1.1.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

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

3.4 FIELD CONNECTIONS

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

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent weld show-through on exposed steel surfaces.

a. Grind butt welds flush.
b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by DCAMM for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.

B. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

C. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

D. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and other inspection procedures at testing agency's option:

F. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

G. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION

SECTION 078413

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 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. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Alternates: Not Applicable.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 220001 - PLUMBING for cutting penetrations for plumbing piping and providing firestopping complying with requirements in this Section.
2. Section 230000 - HEATING, VENTILATING AND AIR CONDITIONING for cutting penetrations for ductwork and HVAC piping and providing firestopping complying with requirements in this Section.
3. Section 260001 - ELECTRICAL WORK for cutting penetrations for cable and conduit and providing firestopping complying with requriements in this Section.

1.3 COORDINATION

A. Jobsite conditions of each through-penetration firestop system must meet all details of the UL-Classified System selected. If jobsite conditions do not match any UL-classified systems, contact firestop manufacturer for alternative systems or Engineer Judgment Drawings.

B. Coordinate work with other trades to assure that penetration-opening sizes are appropriate for penetrant locations.

C. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

D. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

E. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined building inspector, if required by authorities having jurisdiction.

1.4 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping:

1. Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

2. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

    a. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems demonstrating no evidence of water leakage when tested according to UL 1479.
    b. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

F. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

1. Types of penetrating items.
2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

D. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Either a firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors" or a firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction of a minimum of five projects with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

B. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:

    a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
    b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed in the UL “Fire Resistance Directory.”

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hilti, Inc.
2. BioFireshield; RectorSeal Corporation.
3. Specified Technologies, Inc. (STI).
4. 3M; Fire Protection Products Division.
5. Or equal.

2.2 FIRESTOPPING MATERIALS

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Materials: Provide through-penetration firestop systems containing primary materials and fill materials which are part of the tested assemblies indicated in the approved Through-Penetration Firestop System Schedule submittal. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

C. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated

2.3 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by DCAMM for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.

B. Commissioning Authority: Cooperate with the Commissioning Authority engaged by DCAMM for field quality control activities for the Work of this Section.

C. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

D. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

E. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

F. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION

SECTION 230001

HEATING, VENTILATING AND AIR CONDITIONING

TABLE OF CONTENTS

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 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. In general, replacement of the cooling tower, piping, and condenser water pumps will occur in a phased approach. Refer to Specification Section 011000 – SUMMARY for information on work sequence.
2. Demolition of equipment, piping, supports, and controls as shown on the demolition drawings and as otherwise noted.
3. Open cell cooling tower. Include all testing, rigging, assembly, options and accessories. The installation of the cooling towers must be phased.
4. Plate and frame heat exchanger for free cooling.
5. Dirt separator.
6. Pumps.
7. Condenser water piping, valves, and fittings. Indoor piping shall be metal. Outdoor piping shall be PP-RCT.
8. Chilled water piping, valves, and fittings.
9. Make up water piping, valves, and fittings.
10. Pipe and equipment insulation.
11. All outdoor piping, including condenser water and makeup water, shall be provided with heat trace, 2” insulation, and aluminum jacketing. This shall include the new dirt separator. Heat trace shall be provided under Division 26.
12. Sleeves, inserts and hangers.
13. Equipment bases and supports.
14. Vibration isolation and inertia bases.
15. Motors and variable frequency drives (VFDs).
16. Chemical treatment
17. Flexible connections for pumps and other vibrating and rotating equipment.
18. Expansion joints

19. Pipe, valve and equipment identification.
20. Instruction manuals and startup instructions.
21. Testing and balancing.
22. Cleaning.
23. Automatic temperature controls. Provide a new direct digital control (DDC) building management system (BMS). All new equipment shall be connected to the new BMS. The existing chillers and existing to remain chilled water pumps shall also be migrated to the new BMS. Provide new alarms, graphics, and trending for all equipment.
    a. The contractor must procure startup services for all new equipment from the manufacturer or manufacturer's approved representative.
    b. The contractor must also procure startup services for the existing York chillers after they have been migrated to the new controls system. Startup shall be performed by the manufacturer or manufacturer's approved representative. The startup service shall include verification that all control points and alarms are present and functioning on the new DDC BMS.
24. Core drilling for the Work of this Section.
25. Coordination drawings and record drawings and similar requirements.
26. Rigging, hoisting, staging, scaffolding, etc. for all work in this section.
27. Coordination with General Contractor for use of staging, planking and scaffolding, interior and exterior, which is the responsibility of the General Contractor as specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.
28. Record drawings after completion of work.

B. Items to Be Installed Only: Not Applicable

C. Items to Be Furnished Only: Furnish the following items for installation by the designated Sections: Not Applicable

D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
    1. Section 078413 – PENETRATION FIRESTOPPING for coordination of floor and wall penetrations with firestopping contractor.
    2. Section 260001 - ELECTRICAL WORK for electrical power to mechanical equipment as indicated on the Drawings.

E. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

F. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in

accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

1.3 SUBMITTALS

A. Comply with requirements specified in Section 013300 – SUBMITTAL REQUIREMENTS.

B. Shop Drawing: Submittals shall include but not be limited to:

1. Coordinated shop drawings showing ductwork, piping, equipment, and coordination with other trades.
2. Complete automatic temperature controls submittal including network diagram, sequence of operations, and equipment diagrams.
3. Cooling Tower
4. Heat Exchanger
5. Piping, valves, hydronic accessories.
6. Identification for pipe, duct, valves and equipment.
7. Complete ductwork shop drawings, construction details and duct construction standards.
8. Pipe insulation.
9. Testing and balancing report.
10. Color selection charts and samples for equipment and systems in finished areas.
11. O&M Manuals.

1.4 DEFINITIONS

A. As used in this Section, "provide" means "furnish and install" and "HVAC" means "Heating, Ventilating and Air Conditioning" and "POS" means "Provided Under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."

1.5 CONTRACT DOCUMENTS

A. Listing of Drawings does not limit responsibility of determining full extent of work required by Contract Documents. Refer to Architectural, HVAC, Electrical, Structural, and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the Drawings or specifications or both, carries with

it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the Drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.

E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.

F. Data that may be furnished electronically by the Designer (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Designer's sealed or stamped construction documents.

1.6 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer 's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.

B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.

C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.

D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with Paragraph (A) above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.

E. In cases covered by Paragraph (D) above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.7 MODIFICATIONS IN LAYOUT

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.

B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.

C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.

D. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, D above. Systems shall be run in a rectilinear fashion.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.8 EXISTING CONDITIONS AND PREPARATORY WORK

A. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts. Report conditions that might affect work adversely in writing through Contractor to Designer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.9 CODES, STANDARDS, AUTHORITIES AND PERMITS

A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have legal jurisdiction over the site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:

1. Local and state building, plumbing, mechanical, electrical, fire and health department codes.

2. American Gas Association (AGA).
3. National Fire Protection Association (NFPA).
4. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
5. Occupational Safety and Health Act (OSHA).
6. Underwriters' Laboratories (UL).

B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME and AGA for intended service.

C. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:

1. American National Standards Institute (ANSI).
2. American Society of Mechanical Engineers (ASME).
3. National Electric Manufacturers Association (NEMA).
4. American Society for Testing and Materials (ASTM).
5. American Water Works Association (AWWA).
6. American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
7. Air Moving and Conditioning Association (AMCA).
8. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
9. American Diffuser Council (ADC).
10. Air Conditioning and Refrigeration Institute (ARI).
11. Thermal Insulation Manufacturers Association (TIMA).
12. Institute of Electrical and Electronics Engineers (IEEE).
13. Insulated Cable Engineers Association (ICEA).
14. Certified Ballast Manufacturers (CMB).
15. Illuminating Engineering Society (IES).

D. Special attention is directed to requirements of NFPA 45, Laboratories Using Chemicals.

1.10 GUARANTEE AND 24 HOUR SERVICE

A. Guarantee Work of this Section in writing for one year following the date of Substantial Completion. If the equipment is used for ventilation, temporary heat, etc. prior to Substantial Completion, the bid price shall include an extended period of warranty covering the one year of occupancy, starting from the initial date of Substantial Completion. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer ’s satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in OWNER's name.

C. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.

D. Provide 24 hour service beginning on the date the project is first occupied for public use by the User Agency, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to OWNER. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and OWNER approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.

E. Submit copies of equipment and material warranties to Designer before final payment.

F. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to OWNER.

G. This Paragraph shall not be interpreted to limit OWNER's rights under applicable codes and laws and under this Contract.

H. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph.

I. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work nor beneficial use, and shall not institute guarantee period.

J. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to The OWNER'S Project Manager's satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will suggest course of action.

1.11 RECORD DRAWINGS

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT.

B. All "main air" pneumatic control piping routing locations must be shown on the record Drawings.

C. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.12 MANUALS, AND OPERATING INSTRUCTIONS, AND PROTECTION

A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field assembled units, including as built wiring diagrams. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:

1. Directions for and sequence of operation of each item of HVAC system, e.g. air handling units and boilers. Sequence shall list valves, switches, and other devices used to start, stop and control system. Detail procedure to be followed in case of malfunctions. Include detailed approved flow diagrams of temperature control, heating, condensate, chilled water, condenser water, etc. as appropriate for systems provided. Include approved valve directory showing each valve number, location of each valve, and equipment or fixture controlled by valve.
2. Detailed maintenance and trouble shooting manuals containing data furnished by manufacturer for complete maintenance. Include copy of balancing report.
3. Lubrication instructions detailing type of lubricant, amount, and intervals recommended by manufacturer for each item of equipment. Include additional instructions necessary for implementation of first class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.

B. Furnish three copies of manuals to Designer for approval and distribution. Deliver manuals no less than 30 days prior to acceptance of equipment to permit User Agency's personnel to become familiar with equipment and operation prior to acceptance.

C. Provide framed and glazed charts as follows: mount as directed by Designer.

1. Flow diagrams from first part of manual as described above.
2. Valve directory.
3. Lubrication chart from third part of manual.

D. Operating instructions: Upon completion of installation or when OWNER accepts portions of building and equipment for operational use, instruct User Agency's operating personnel in any or all parts of various systems. Instructions shall be performed by factory trained personnel. OWNER shall determine which systems require additional instructions. Duration of instructions shall take equipment through complete cycle of operation (at least five working days). Make adjustments under operating conditions.

E. Each contractor shall be responsible for his work and equipment until finally inspected, tested, and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.

F. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.

1.13 COORDINATION DRAWINGS

A. Refer to Section 013100 – PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements.

B. Coordination Drawings include but are not necessarily limited to:

1. Structure.
2. Partition/room layout.
3. Ceiling tile and grid.
4. Light fixtures.
5. Access panels.
6. Sheet metal, heating coils, boxes, grilles, diffusers, etc.
7. All heating piping and valves.
8. Smoke and fire dampers.
9. Soil, waste and vent piping.
10. Major water and medical gases.
11. Roof drain piping.
12. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit.
13. Above ceiling miscellaneous metal.
14. Sprinkler piping and heads.
15. Heat tracing of piping.

Part 2 - PRODUCTS

2.1 PIPING AND FITTINGS

A. General:

1. Pipe materials and fitting materials shall be as indicated in Schedule of Pipe and Fitting Materials.

B. Schedule of Pipe and Pipe Fitting Materials:

SERVICE	SYSTEMS DESCRIP-TION	PIPE SIZE	PIPE MATERIAL	JOINTS	FITTING MATERIAL	FITTING RATING PSI/CLASS / WEIGHT
Chilled Water	CHWS/R	2-1/2" and over	Steel A53, Grade B, Smls	Butt Welded (Mains)	Malleable Iron, B16.3	Class 300

SERVICE	SYSTEMS DESCRIP-TION	PIPE SIZE	PIPE MATERIAL	JOINTS	FITTING MATERIAL	FITTING RATING PSI/CLASS / WEIGHT
			or ERW, Schedule 40	or Flanged (Runouts and Fittings)	Wrought Steel, A234 Grade WPB	
Indoor Condenser Water	CWS/R	2-1/2" and over	Steel A53, Grade B, Smls or ERW, Schedule 40	Butt Welded (Mains) or Flanged (Runouts and Fittings)	Malleable Iron, B16.3 Wrought Steel, A234 Grade WPB	Class 300
Outdoor Condenser Water	CWS/R	2-1/2" and over	PP-RCT. Refer to paragraph 2.2 of this section for information.			
Condensate Drain	CD	All	PVC, Schedule 40	Solvent Welded	PVC, Sched-ule 40	Class 150

Note 1: Use copper for drain lines in plenums and through fire rated walls. Copper tubing must be insulated for 12' from equipment.

C. Connections:

1. Provide dielectric fittings at connections of dissimilar materials.
2. Nipples shall be same material, make and thickness as pipe with which they are used. Close nipples shall not be used.
3. Make piping connections 2" dia. and smaller to valves and equipment with steel body, 300 psi brass seat unions on steel piping and with heavy semi flushed brass unions on copper tubing.
4. Fit flanged joints with Johns Manville or approved equal full face gaskets. Flanges shall be faced and drilled to ASA standards and fitted with semi finished hexagon machine bolts and nuts of proper number and size.
5. Make screw joints tight with Teflon (polytetrafluoroethylene) tape or litharge glycerin mixture applied to male threads. Use tapered threads.

6. Make fusion welded joints as required by ANSI B31.1. Make changes in direction of pipe with welded fittings only. Bevel connections before welding, mechanically or by flame cutting.

D. Grooved piping shall not be provided on this project.

2.2 OUTDOOR CONDENSER WATER PIPING

A. This Section covers PP-RCT pipe, fittings, joining methods and specialty items.

1. Basis of Design is Nupi Niron.
2. Alternate manufacturers shall be Aquatherm, ISCO, or approved equal.

B. Reference Documents

1. ASTM F 2389-10 - Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems
2. CSA B137.11 - Polypropylene (PP-R) Pipe and Fittings for Pressure Applications
3. NSF/ANSI 14 – Plastic Piping System Components and Related Materials

C. Quality Assurance

1. Niron Clima Pipe is certified to NSF 14, NSF 61, ASTM F 2389 and CSA B137.11.
2. Certification is according to ICC-ES and WQA.

D. Pipe and Piping Products

1. Pipe shall be Niron Clima Pipe manufactured from a PP-RCT resin meeting the short-term properties and long-term strength requirements of ASTM F 2389 and CSA B137.11. The pipe shall not contain rework or recycled materials. All pipe is made in an extrusion process and is pigmented as solid steel grey in color. The piping shall be extruded with a middle layer that has glass fiber content to restrict thermal expansion. All pipe complies with the rated pressure requirements of ASTM F 2389 and CSA B137.11. Pipe shall be Niron PP- RCT piping as manufactured by Nupi Americas of Houston, TX.

E. Fittings

1. Fittings shall be manufactured from a PP-RCT resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The fittings shall contain no rework or recycled. All fittings shall be as complying with NSF 14, ASTM F 2389 and CSA B137.11. Fittings shall be Niron PP-RCTpiping as manufactured by Nupi Americas of Houston, TX.
2. Fittings may be either socket fusion through nominal 5 inch (110 mm), electrofusion style through 8 inch (200mm) or butt fusion style in nominal 2 inch through 24 inch sizes (63mm through 630 mm). Electrofusion may also be performed in nominal sizes 10 inch through 24 inch (250mm through 630mm) by means of the use of electrofusion couplings.

F. Warranty

1. Pipe and fittings shall be covered by a factory warranty for 30 years to be free of defects in materials or manufacturing.

G. Valves

1. Niron Clima valves are manufactured in accordance with Nupi Americas' specifications and shall complies with the performance requirements of ASTM F 2389 or CSA B137.11. The valves shall contain no rework or recycled thermoplastic materials.

H. UV Protection

1. Where indicated on the drawings that the pipe will be exposed to direct UV light for more than 30 days, it shall be provided with a Factory applied, UV-resistant coating or alternative UV protection.

I. Thermal and Vapor Barrier

1. Where standard pipe insulation is indicated on the drawings or in these specifications, the contractor shall provide a thermal (radiant, conductive, and convective) and vapor barrier insulation. The insulation products shall be provided in appropriate thickness or as indicated on the drawings or elsewhere in these specifications. The standard pipe insulation shall be UV resistant, CFC-free, non-porous, non-fibrous, and resist mold growth.

J. Piping Applications

1. Install listed pipe materials and joining methods below in the following applications:
    a. Aboveground: Polypropylene (PP-RCT) piping in SDR 7.3, 9, 11, or 17 based on the required minimum pressure rating and use temperature, in accordance with manufacturer's instructions and ASTM F2389.

K. Fusion Welding of Joints

1. Install fittings and joints using socket-fusion, elecrofusion, butt-fusion or compression joining as applicable for the fitting or joint type. All fusion-weld joints shall be made in accordance with the specifications and product standards of Nupi Americas.
2. Fusion-weld tooling, welding machines, and electrofusion devices shall be as approved by Nupi Americas.
3. Prior to joining, the pipe and fittings shall be prepared in accordance with ASTM F 2389 and Nupi America's specifications.
4. Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with Nupi America's specifications.

L. Piping Installations

1. Install hangers and supports at intervals specified in the applicable Plumbing or Mechanical Code and/or as recommended by Nupi Americas.

2. Support vertical piping at each floor and as specified in the applicable Plumbing or Mechanical Code. Piping 2" (63mm) or smaller shall be installed with mid-story guides.

3. Fire stopping shall be provided to both be compatible with the Clima Piping and meet the requirements of ASTM E 814 or ULC S115, "Fire Tests of Through-Penetration Firestops". Pipe insulations or fire resistive coating shall be removed where the pipe passes through a fire stop and, if required by the firestop manufacturer, for 3 inches beyond the firestop outside of the fire barrier.

4. When installed in systems with pumps in excess of 7.5 HP, piping shall be protected from excessive heat generated by operating the pump at shut-off conditions. Where the possibility exists that the pump will operate with no flow, the protection method shall be a temperature relief valve or comparable level of protection, set to a maximum temperature of 185°F.

5. If heat tracing or freeze protection is specified for the piping, it should be installed on the pipe interior or exterior. It must be suitable for use with plastic piping and be self-regulating type, set to a temperature to insure proper temperature maintenance but so as to limit the surface temperature of the pipe to no more than 158oF (70oC)..

6. While still accessible all piping shall be pressure/leak tested to the manufacturer's standards. Tests shall be carried out using water, compressed air or a mixture of the two. The test pressure for a hydrostatic test shall be 1.5 times the design pressure or 150 psi, whichever is greater, and for an air test shall be 1.1 times the design pressure or 150 psi, whichever is greater. Any leaks detected shall be repaired at the contractor's expense by removing the leaking part and replacing with new parts welded per the Nupi Americas' guidelines.

M. Inspecting and Cleaning

1. The pipes should be flushed with cold water after finishing the installation.

2. Inspect and test piping systems following procedures of authorities having jurisdiction and as specified by the piping system manufacturer.

N. Heat Trace

1. Product shall be suitable to receive electric heat trace. Provide letter with submittal confirming heat trace shall not degrade product in any way or void any warranties.

2.3 PIPE INSULATION

A. Insulation shall be fibrous glass insulation with factory applied fire retardant vapor barrier jacket with K factor of 0.21 at 75°F mean temperature: by Owens Corning, CertainTeed, Manville or Knauf, installed as required by manufacturer. ASTM E 84 fire hazard ratings shall be 25 flame spread, 50 smoke developed and 50 fuel contributed.

B. Apply insulation after systems have been tested, proved tight and approved by Designer. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.

C. No leaks in vapor barrier or voids in insulation will be accepted.

D. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and through fire walls or smoke partitions shall have space allowed for application of approved packing between sleeves and piping, to provide fire stop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted.

E. Insulate flexible connections to same thickness and with same material as adjoining pipe insulation.

F. Provide fibrous dual temperature insulation with factory applied vapor barrier jacket on steam, outdoor condenser water, outdoor cooling tower drain and makeup, condensate, chilled water, drain, hot and cold water piping, unless noted otherwise.

G. Provide PVC jackets on all insulated indoor piping for protection.

H. Insulation thickness for indoor piping shall be as follows:

TABLE A Insulation Thickness (inches)							
PIPING SYSTEM TYPES	FLUID TEMPERATURE RANGE, ºF	<1”	1” to 1-1/2”	1-1/2” to <4”	4” to <8”	≤8”	INSULATION CONDUCTIVITY (BTU*IN)/(F.HR.SF) AT MEAN TEMP ºF
COOLING SYSTEMS / MAKE-UP WATER							
Chilled Water, Cold Water	40 to 60	1.0	1.0	1.0	1.0	1.5	0.21-0.28 @ 100ºF

I. Outdoor Piping

1. Provide 2” thick insulation for all outdoor condenser water and makeup water.
2. All outdoor condenser water and makeup water piping shall be heat traced.
3. All outdoor shall be provided with a 0.016” thick aluminum jacketing. Jacketing thickness shall be increased for large diameter piping per the manufacturer’s recommendations.

2.4 MANUAL BALANCING VALVES

A. Combination Balancing/Flow Measurement/Shut-off Valves

1) Valves shall be Y-pattern style with multi-turn hand wheel.
2) Valves shall be capable of being installed in any direction without affecting flow measurement and shall provide the following functions:
   a) Precise flow measurement.

b) Precision flow balancing.

c) Positive shut-of with no drip seat.

d) 3/4" drain port suitable for hose bib fitting. (Sizes 2" and below.)

3) Valves shall have four, 360° adjustment turns (2" and below), eight, 360O adjustment turns (2-1/2" - 6"), twelve, 360° adjustment turns (8", 10"), and sixteen, 360° adjustment turns (12") and up to twenty-two, 360° adjustment turns (16”). Handwheels shall have digital indicators with hidden memory and tamper-proof setting features.

4) Valves 2" and below shall be non-ferrous, pressure die-cast, non-porous Ametal copper alloy, with soldered ends. Install Series 78U union port fitting and Series 78 strainer/ball valve combination or Kit assembly 799 to complete terminal hookup at coil outlet.

5) Valves 2-1/2" and over shall be ductile iron body with all other metal parts of non-ferrous copper alloy. End connections shall be flanged or grooved.

6) Pressure ratings shall be 300 psi for 2" and below and 250 psi for flanged and 350 psi for grooved ends on 2-1/2” and larger.

7) Each valve shall have pressure/temperature readout ports with EPDM seals and attached shut-off valves.

8) One, computerized hand-held, balancing meter shall be furnished to the Owner’s Project Manager. The Testing and Balancing Contractor shall utilize this instrument for his work. The meter shall include the following:

a) Flow measurement direct in GPM.

b) Differential pressure measurement.

c) Temperature measurement.

d) Automatic calibration.

e) Automatic air purging.

f) Extended data logging functions.

9) Balance valves 2" and under shall be Tour and Anderson Model STAS. Valves 2-1/2" and over shall be Tour and Anderson Models STAF-SG or STAG. The handheld meter shall be Tour and Anderson Model CBI with PCB data logging features. Balance valves manufactured by Armstrong or Victaulic or Engineer-approved equal shall be considered equivalent.

2.5 VALVES AND STRAINERS

A. Valves on hot water services shall be 125 psi unless noted otherwise. Provide balancing valves where shown on Drawings and where required for proper balancing. All valves may not be shown.

B. Valves shall have name of manufacturer and guaranteed working pressure cast or stamped on bodies. Valves of similar type shall be by single manufacturer. Provide chain operators for valves 7 feet and higher above floor.

C. Provide butterfly valves for shutoff on hot water services 2-1/2" and larger. Do not use butterfly valves for balancing service.

1. Valves shall be rated 175 psi maximum working pressure, iron body, threaded-lug with resilient EPDM seats, bronze disc and 416 stainless stem, by Centerline, DeZurik, Keystone, or Bray.
2. Valves 6" and larger shall have gear or chain operators.
3. Valves smaller than 6" shall have seven-position lever or chain operators.
4. Test valves at 110% of rated pressure.

D. Provide bronze-body ball valves with reinforced teflon seats, seals, bearings and packing. Ball valves shall be used for hot water services in sizes 2" and smaller. Do not use ball valves for balancing service. Valves on insulated piping shall have 2" extended stems. Valves shall be by Apollo, Cannon, Nibco, Milwaukee, or Watts. Valves shall be rated 600 psi wog.

E. Check valves sized 2-1/2" and larger shall be iron body, flanged ends, bronze mounted, swing pattern. Check valves 2" and smaller shall be bronze, screwed ends, swing pattern. Check valves for hot water pump discharge shall be spring loaded, silent check, by APCO, Milwaukee, Mueller or Stockham.

F. Relief valves shall be brass with external lever, ASME-approved. Pipe discharge to floor drain with open connection at floor.

G. Strainers

1. Strainers 2" and smaller shall be 250 lb. bronze body, stainless steel, screen with 20 mesh screen opening, Y-pattern, screwed ends, Sarco Type BT, Mueller, Watts or Armstrong.
2. Strainers 2-1/2" and larger shall be 125 lb., cast iron body, stainless steel screen with manufacturer's recommended screen openings, Y-pattern, flanged, Sarco Type AF-125 or equivalent by Mueller, Watts or Armstrong.
3. Provide blow-off valve on each strainer.
4. Pump suction strainers 2" and smaller shall have 0.062 screen openings. Pump suction strainers 2-1/2" and larger shall have 0.125 screen openings.
5. Strainer gaskets shall not contain asbestos.

H. Provide threaded vacuum breakers with ball, spring, O-ring flexible seat, and screen. Ball shall be 440 stainless steel; seat shall be EPR. Spring shall be 316 stainless steel; screen and cap shall be 304 stainless steel and threaded collar shall be 416 stainless steel. Body shall be brass. Vacuum breakers shall be Johnson Series VB8 size 1-1/4 IPS, or equivalent by Watts or ITT Hoffman.

I. Provide unions for threaded end valves to facilitate removal from pipe.

J. Automatic Flow Control Valves

1. Provide automatic pressure compensating flow control valves by Griswold, or Autoflow where indicated on the drawings. Valves shall have the capacities and pressure differential characteristics, as indicated, and conform to the following specifications. Valves 2" and smaller shall be threaded bronze valves 2-1/2" and larger shall be flanged iron or steel body.
2. Valves shall be factory set and shall automatically limit the rate of flow to required engineered capacity within +5% accuracy over an operating pressure differential of at least 14 times the minimum required for control.
3. The control mechanism of the valve shall consist of self-contained, open-chamber cartridge assembly with unobstructed flow passages that eliminate accumulation of particles and debris. All internal working parts shall be stainless steel or nickel plated brass. Body shall be ductile iron, cast iron or bronze.
4. The cartridge assembly shall consist of a spring-loaded cup. The cup shall utilize the full available differential pressure across the valve to actuate the cup and, thereby, reduce friction and hysterisis and eliminate binding.
5. Valves shall be available in minimum of three pressure differential ranges, with the minimum range requiring less than 2 psig to control flow. Valve bodies shall be provided with inlet and outlet tappings suitable for connection of instruments for verification of flow rates and temperature and shall be marked to show direction of flow. Valve bodies shall be rated for use at not less than 150% of system designed operating pressures.
6. Certified performance data for the flow control valve, based on independent laboratory tests, supervised and witnessed by a registered professional engineer, shall be available.
7. All flow control valves shall be supplied by a single source responsibility.
8. Each automatic flow control valve shall be furnished with a valve kit consisting of 1/4" x 2" minimum size nipples, quick-disconnect valves (to be located outside of insulation), and fittings suitable for use with the measuring instruments specified, as well as temperature.
9. Provide a metal identification tag, with chain, for each installed valve. The tag to be marked with zone identification, valve model number and rated flow in GPM.
10. Flow control valve shall be warranted for period of five years from date of start-up.
11. Provide Owner with dual hose meter kit including pressure gauge with 4-1/2" dial, 3-way push button operated valve, 5' long dual connection hoses, dual shutoff and vent valves, dual special valves for connection to standard valve kit, flow conversion chart and carrying case.

K. Suction Diffusers

1. Suction diffuser/strainers shall have 200 psi cast iron body and stainless steel strainer with 5/32" perforations. Units shall include flanged connections, removable gasketed cover and straightening vanes. Diffusers shall be Taco, B&G or Mueller.
2. Provide 16 mesh start-up strainer.
3. Provide blow-off tapping on bottom of unit.

4. Provide full size inlet and outlet.

L. Combination Balancing/Flow Measurement/Shut-off Valves

1. Valves shall be Y-pattern style with multi-turn hand wheel.
2. Valves shall be capable of being installed in any direction without affecting flow measurement and shall provide the following functions:
   a. Precise flow measurement.
   b. Precision flow balancing.
   c. Positive shut-of with no drip seat.
   d. 3/4" drain port suitable for hose bib fitting. (Sizes 2" and below.)
3. Valves shall have four, 360° adjustment turns (2" and below), eight, 360° adjustment turns (2-1/2" - 6"), twelve, 360° adjustment turns (8", 10"), and sixteen, 360° adjustment turns (12"). Handwheels shall have digital indicators with hidden memory and tamper-proof setting features.
4. Valves 2" and below shall be non-ferrous, pressure die-cast, non-porous Ametal copper alloy, with soldered ends.
5. Valves 2-1/2" and over shall be ductile iron body with all other metal parts of non-ferrous copper alloy. End connections shall be flanged or grooved.
6. Pressure ratings shall be 300 psi for 2" and below and 250 psi for flanged and 300 psi for grooved ends.
7. Each valve shall have pressure/temperature readout ports with EPDM seals and attached shut-off valves.
8. One, computerized hand-held, balancing meter shall be furnished to the Owner's Project Manager. The Testing and Balancing Contractor shall utilize this instrument for his work. The meter shall include the following:
   a. Flow measurement direct in GPM.
   b. Differential pressure measurement.
   c. Temperature measurement.
   d. Automatic calibration.
   e. Automatic air purging.
   f. Extended data logging functions.
9. Balance valves 2" and under shall be Tour and Anderson Model STAS. Valves 2-1/2" and over shall be Tour and Anderson Models STAF-SG or STAG. The handheld meter shall be Tour and Anderson Model CBI with PCB data logging features. Balance valves manufactured by Armstrong or Victaulic shall be considered equivalent.

2.6 CHEMICAL TREATMENT - WATER SYSTEMS

A. Do not operate systems without water treatment. Water treatment chemicals shall be by Barclay, Dearborn, Olin or Mogul.

B. Flush and clean all closed loop systems with Dearborn BC-45 cleaner after completion of installation. After cleaning, add Dearborn B-524 nitrite inhibitor to closed loop systems, to control nitrite strength to 800-1,000 ppm maximum. Submit written report indicating that systems have been thoroughly cleaned and charged with corrosion inhibitor.

C. Effluent from HVAC system discharged to sewer shall meet requirements of applicable local, state and national water quality standards.

2.7 PRESSURE GAUGES, THERMOMETERS AND TEST PLUGS

A. Provide bronze Bourdon tube pressure gauges where shown on Drawings and where specified, by U.S. Gauge, Trerice, or Weksler, accurate to +1%.

1. Gauges shall have white faces with black-filled engraved lettering. Gauge bodies shall be set in phenolic cases. Provide siphons and shut-off cocks.

2. Gauges shall be easily accessible and easily read. Gauges readable from floor at less than five feet shall have 4-1/2" dials. Other gauges shall have 6" dials. Gauges graduations shall meet limit requirements of normal operation. Gauge shall indicate at mid-scale.

B. Provide separable well V-case thermometers by U.S. Gauge, Trerice, or Weksler where shown on Drawings and where specified. Thermometers shall have 9" scale and white face with black-filled engraved letters. Thermometers shall be angular or straight stemmed, as conditions necessitate. Thermometer wells shall be bronze and shall be installed so as to ensure minimum restriction of water flow in pipe.

1. Provide thermometer ahead of and beyond cooling coils, in pump suctions and discharges, and where shown on Drawings. Thermometers shall have scale range of 0°-120°F with 2°scale division.

2. Provide thermometer in condenser water system at each chiller, cooling tower and pump connection. Scale range shall be 20°-180°F with 2°scale division.

3. Provide thermometer in hot water system at each boiler, coil and pump connection, unless specified otherwise. Scale range shall be 30°-300°F with 2°scale division.

4. Provide additional thermometers where shown on Drawings.

C. Combination Pressure/Temperature Test Plugs

1. Provide in the supply and return piping at VAV boxes, duct coils, unit ventilators, chillers, boilers, pumps, and fan coil units, combination pressure temperature test plugs by Peterson Equipment Company "Petes Plug" or Sisco, Inc. "P/T Plugs".

2. Plug shall be 1/4" or 1/2" NPT, constructed of solid brass with a Nordel valve core suitable for temperatures up to 350°F. Plug shall be rated zero leakage from vacuum to 1000 psig.

3. Provide extension fitting for each plug suitable for use with 2" maximum pipe insulation.

4. Provide gauge test kit consisting of the following items:
   a. (2) 3-1/2" dial face gauges 0-100 psi and 0-231 feet.
   b. (2) Gauge adapters with 1/8" O.D. probe.
   c. (2) 5" stem pocket testing thermometers ranges 25-125°F; 0-220°F.
   d. (1) Carrying case.
   e. (2) 4' length of flexible hose with adapters.

2.8 PIPE HANGERS AND SUPPORTS

A. Provide pipe stands, supports, hangers and other supporting devices in accordance with ANSI B31.9 and MSS-69, as necessary to support work required by Contract Documents.

B. Secure vertical piping to building construction to prevent sagging or swinging.

C. Space hangers for horizontal piping as follows:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1 1/4"	3/8"	8 ft. 0"
1 1/2 and 2"	3/8"	10 ft. 0"
2 1/2 and 3"	1/2"	10 ft. 0"
4 and 5"	5/8"	12 ft. 0"
6"	3/4"	12 ft. 0"
8" and over	7/8"	12 ft. 0"

D. Horizontal copper tubing shall have maximum hanger spacing of 5 ft. for tubing 1 1/4" dia. and smaller and 10' for tubing 1 1/2" and larger. Maximum spacing for PVC pipe hangers shall be 4'.

E. Reduce spacing to a maximum of 10' - 0" apart, regardless of pipe size, as necessary for fittings, valves and other concentrated loads.

F. Support piping 4" dia. and larger from structure with pipe roll hangers with adjustable steel rod hangers, sized to accommodate insulation.

G. Support piping 3" dia. and under from structure with Carpenter and Patterson Fig. 100 clevis hangers or approved equal.

H. Hangers shall be by Carpenter and Patterson, F & S, or Grinnell Co. Figure numbers of Carpenter and Patterson are specified to establish standards of quality for performance and materials.

I. Provide spring hangers with travel stops as specified in Vibration Isolation Paragraph where necessary and where shown on Drawings.

J. Pipe supports for 4" and larger pipe and insulated high temperature piping shall have welded inserts of equal thickness to insulation to prevent compression of insulation. Other insulated pipe shall have 12", 14 GA shields at hangers, composed of 180°coverage of galvanized sheet metal

and high density, pre formed, rigid insulation. Where rollers are required, shield shall be steel pipe.

K. Hangers for horizontal lines shall be vertically adjustable to obtain pitch requirements of Piping Paragraph.

2.9 SLEEVES AND PENETRATIONS

A. Pipe Sleeves

1. Sleeves through floors and through exterior, structural and fire rated construction shall be hot dipped galvanized Schedule 40 steel pipe.
2. Sleeves through partitions and non fire rated construction shall be 26 gauge galvanized steel with lock longitudinal seams, or approved plastic pipe.
3. Provide waterproofing membrane locking devices at floors. Provide 150 lb. slip on welding flanges at exterior wall penetrations.

B. Duct Sleeves and Openings

1. Sleeves through floors, through exterior structure, through fire rated construction and through smoke partitions that require smoke dampers shall be Schedule 40 galvanized steel pipe for round duct and shall meet SMACNA Fire Damper and Heat Stop Guide for rectangular and flat oval ducts. Fireproof packing shall be applied to seal any openings between sleeve and wall. Materials shall maintain the fire rating of the wall, and shall be installed in accordance with the SMACNA Fire Damper and Heat Stop Guide.
2. Openings in walls, partitions and other fire rated construction that do not require smoke dampers shall meet NFPA 90A, Section 3 3.8.
3. Materials for prepared openings in partitions shall match construction penetrated.

C. Pipe Sleeve Packing

1. Packing between the pipe and the sleeve (or wall or slab opening) in fire rated walls or slabs shall be a combination of fireproof insulation and fireproof caulk. The combination of materials shall have the same fire rating, in hours, as the wall or slab, as tested in accordance with the latest edition of ASTME 814 (UL 1479). The combination of materials shall be classified by UL, (fill, void or cavity materials) for the fire rating required and shall be listed as a numbered system in the UL Fire Resistance Directory. Fiberglass shall not be used as the insulation material.
2. Acceptable fireproof insulation materials shall be: Kaolin (Kaowool by Babcock and Wilcox); ceramic fiber blanket (Fiberfrax by Standard Oil) or fire rated mineral wool (Thermafiber by USG). Acceptable fireproof caulks shall be: Silicone (Firestop by Dow Corning, Hilti CS240); ceramic fiber (Fyreputty by Standard Oil) or intumescent synthetic elastomer (Fire Barrier Caulk by 3M, Hilti CS2420).
3. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate foam, ceramic fibre or mineral fibre with approved sealant. Pack or foam to within 1" of

both wall surfaces. Seal penetration packing with approved caulking and paintable water proof mastic surface finish or silicone caulking.

4. All materials must be installed in accordance with manufacturers instructions; all gaps must be sealed. Finish caulk flush with wall or slab surface if piping runs exposed.

D. Other Water proof Pipe Penetrations

1. Modular mechanical penetration seals shall be interlocking synthetic rubber links shaped to fill annular space continuously, with galvanized carbon steel bolts, nuts and pressure plates to expand rubber seal between pipe and sleeve. Sleeve seal shall be water tight.

2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closed cell elastomeric seal (non fire rated) or preformed mineral fiber or silicone foam seal (fire rated).

3. Provide water proof 1" single ring set in silicone and bolted to floor or wall at chipped and drilled penetrations of existing slabs on grade and existing walls below grade.

2.10 ESCUTCHEONS AND DUCT COLLARS

A. Provide adjustable escutcheons on exposed piping that passes through finished floors, walls and ceilings. Escutcheons shall be chromium plated cast brass, sized to cover sleeve opening and to accommodate pipe and insulation.

B. Provide 4" wide 20 gauge galvanized sheet metal collars at sleeves and prepared openings, sized to cover entire duct penetration including sleeve and seal, and to accommodate duct and insulation as necessary. Edges shall have milled lips ground smooth. Paint to match finish of duct or as directed by Designer.

C. Provide #316 stainless steel/No. 4 finish collar for emergency generator exhaust piping which passes through exterior wall.

2.11 OPEN CELL COOLING TOWER

A. General Requirements and Quality Assurance

1. Provide, where shown on drawings, factory assembled and tested, induced draft, vertical discharge cooling towers of capacities as shown on schedules. Acceptable manufacturers shall be:
   a. Baltimore Aircoil (basis of design)
   b. Evapco
   c. Marley

2. Provided they:
   a. Meet the requirements of this specification
   b. Meet the performance requirements shown on the schedules with equal or less horsepower than the unit listed in the schedules

c. Be of equal or less height and loaded weight to the scheduled tower.

3. The submitted tower shall fit within the spatial envelope of the tower shown on the drawings.

4. The thermal performance of all cooling towers shall be determined by testing in accordance with Cooling Tower Institute Standard 201.

B. General: Furnish and install three (2) factory-assembled, induced draft, crossflow cooling tower(s) with vertical air discharge, conforming in all aspects to the specifications, schedules and as shown on the plans. Overall dimensions shall not exceed approximately 17'-2" ft long x 18'-1" wide x 14'-3" ft high. The total connected fan horsepower shall not exceed 40 HP. The cooling tower(s) shall be Baltimore Aircoil Company Model 3000.

C. Thermal Capacity: The cooling tower(s) shall be warranted by the manufacturer to cool 3,973 USGPM (lps) of water from 103ºF(°C) to 85 ºF(°C) at 77ºF(°C) entering wet bulb temperature. Additionally, the thermal performance shall be certified by the Cooling Technology Institute in accordance with CTI Certification Standard STD-201. Lacking such certification, a field acceptance test shall be conducted within the warranty period in accordance with CTI Acceptance Test Code ATC-105, by the Cooling Technology Institute or other qualified independent third party testing agency. Manufacturers' performance guarantees or performance bonds without CTI Certification or independent field thermal performance test shall not be accepted. The cooling tower(s) shall comply with the energy efficiency requirements of ASHRAE Standard 90.1.

D. JE PREMIER SERIES® Construction: All steel panels and structural members, including the structural frame, hot and cold water basins, distribution covers, fan deck and fan cylinder shall be constructed of Type 304 stainless steel and assembled with Type 304 stainless steel nut and bolt fasteners. All factory seams in the cold water basin shall be welded to ensure watertight assembly and welded seams shall be warranted against leaks for five (5) years. Stainless steel basins with bolted seams are not acceptable. The entire cooling tower, including fan motor, drive system, bearings, and structure, shall be backed by a comprehensive Louver-to-Louver℠ Five-Year warranty. Type 301 Stainless Steel shall not be an acceptable alternative.

E. Quality Assurance: The cooling tower manufacturer shall have a Management System certified by an accredited registrar as complying with the requirements of ISO9001:2008 to ensure consistent quality of products and services. Manufacturers that are not ISO9001 Certified shall not be acceptable.

F. Wind and Seismic Forces: The structure shall be designed, tested and certified in accordance with IBC 2009 regulations. The unit shall be certified by the manufacturer for operation after an event, up to S_{DS} and the wind load ratings listed above, and verify that such rating is based on actual shake-table testing. Experience or calculation data is not acceptable to verify operation. Units not provided with a certificate of IBC 2009 compliance shall not be an acceptable alternative.

G. Construction Details

1. Structure: The cooling tower shall be constructed with a sturdy structural frame designed to transmit all wind, seismic and mechanical loads to the equipment anchorage. The frame shall be constructed of heavy-gauge steel angles and channels.

2. Casing Panels: Casing panels shall be constructed of corrosion resistant Type 304 stainless.

3. Cold Water Basin: The cold water basin shall be constructed of heavy-gauge Type 304 stainless steel panels and structural members. All factory seams shall be welded to ensure watertight construction and welded seams shall be warranted against leaks for a period of five (5) years from date of shipment. Stainless steel basins with bolted seams are not acceptable. Basin shall include a depressed center section with drain/clean-out connection. The basin area under the fill shall be sloped toward the depressed center section to facilitate cleaning. Standard basin accessories shall include a corrosion resistant make-up valve with large diameter plastic float for easy adjustment of the operating water level, removable anti-vortexing device to prevent air entrainment, and large area lift out strainers with perforated openings sized smaller than the water distribution system nozzles.

4. Water Outlet: The water outlet connection shall be beveled for welding and grooved for mechanical coupling or bolt hole circle designed to accept an ASME Class 150 flat face flange. The outlet shall be provided with large-area lift out strainers with perforated openings sized smaller than the water distribution nozzles and an anti-vortexing device to prevent air entrainment. The strainer and vortex device shall be constructed of the same materials as the cold water basin to prevent dissimilar metal corrosion.

5. Water Distribution System: The hot water distribution basins shall be open and gravity fed for easy cleaning, and constructed of Type 304 stainless steel. The basins must be accessible from outside the unit and serviceable during tower operation. Basin weirs and plastic metering devices shall be provided to assure the even distribution of water over the fill. Weir dams shall accommodate a flow range of 50% to 100% of the design flow rate. Lift-off distribution covers shall be constructed of heavy-gauge Type 304 stainless steel and designed to withstand 50 psf (244 kg/m2) live load or a 200 pound (90.7 kg) concentrated load. Gravity flow nozzles shall be snap-in type for easy removal. Should pressurized nozzles be used, they shall utilize grommets, which ensure easy removal.

H. EASY CONNECT® Piping Arrangement: Each tower cell shall be furnished with a single water inlet connection complete with the means to automatically balance flow rates to the hot water basins.

I. Mechanical Equipment

1. Fan(s): Fan(s) shall be heavy-duty, axial flow with aluminum alloy blades selected to provide optimum cooling tower thermal performance with minimal sound levels. Air shall discharge through a fan cylinder designed for streamlined air entry and minimum tip clearance for maximum fan efficiency. The top of the fan cylinder shall be equipped with a conical, non-sagging removable fan guard.

2. Bearings: Fan(s) and shaft(s) shall be supported by heavy-duty, self-aligning, grease-packed ball bearings with moisture proof seals and integral slinger collars, designed for a minimum L_{10} life of 80,000 hours.

3. Mechanical Equipment Warranty: The fan(s), fan shaft(s), sheaves, bearings, and mechanical equipment support and fan motor shall be warranted against defects in materials and workmanship for a period of five (5) years from date of shipment. An

additional two years of warranty, for a total of seven (7) years, shall be provided for fan motor(s) when space heaters are field-wired at time of initial installation.

4. Fan & Drive System

   a. The Low Sound Fan is designed for optimal performance and low sound levels and is driven by the ENDURADRIVE® Fan System, which includes a direct drive motor and variable frequency drive (VFD). Motor is Totally Enclosed Air Over (TEAO) with an IP56 NEMA enclosure rating. Motor windings have insulation type Class H, and bearing(s) are sized for minimum L-10 life of 100,000 hours. Motor is equipped with a shaft grounding device as standard. Fan system is direct drive, and requires no gear or belts. VFD, in NEMA 1 enclosure, is suitable for indoor use and is designed specifically for this motor. Communication to building management system is via RS485 protocol and through Modbus as standard. VFD ships loose for installation and wiring by others, and VFD startup is provided by others.

J. Fill and Drift Eliminators

1. 4.1 Fill and Drift Eliminators: The fill and integral drift eliminators shall be formed from self-extinguishing (per ASTM-568) polyvinyl chloride (PVC) having a flame spread rating of 5 per ASTM E84 and shall be impervious to rot, decay, fungus and biological attack. The fill shall be suitable for entering water temperatures up to and including 130°F (54.4°C). The fill shall be manufactured, tested and rated by the cooling tower manufacturer and shall be elevated above the cold water floor to facilitate cleaning.

K. Air Inlet Louvers

1. 5.1 Air Inlet Louvers: Air Inlet louvers shall be separate from the fill and removable to provide easy access for inspection of the air/water interface at the louver face. Louvers shall prevent water splash out during fan cycling and be constructed of maintenance free, corrosion and UV resistant, fiberglass reinforced polyester (FRP).

L. Access

1. Plenum Access: Two hinged access doors shall be provided for access into the plenum section.

M. Sound Level: To maintain the quality of the local environment, the maximum sound pressure levels (dB) measured 50 ft (15240 mm) from the cooling tower operating at full fan speed shall not exceed the sound levels detailed below. If the tower exceeds these conditions the tower must be either oversized and reduced in horsepower, provided with a low sound fan, or provided with sound attenuation.

Location	63	125	250	500	1000	2000	4000	8000	dB(A)
Discharge	79	80	79	73	69	64	60	56	76
Air Inlet	73	72	74	70	65	57	51	47	71
Cased Face	75	69	71	65	60	52	46	42	67

N. Accessories

1. Balancing Valves: Heavy-duty butterfly valves shall be provided at the hot water inlet connections. These valves shall include cast iron bodies, elastomer seat and steel operating

stems. There shall be a locking handle to maintain the valve setting in any position. Wafer type field supplied spool piece is required between the inlet connection and the valve.

2. Basin Heater(s): The cooling tower cold water basin shall be provided with electric heater(s) to prevent freezing in low ambient conditions. The heater(s) shall be selected to maintain 40°F (4.44°C) basin water temperatures at -20°F (°C) ambient. The heater(s) shall be 480V / 3 phase/ 60 Hz electric and shall be provided with low water cutout and thermostat.

3. Basin Water Level Control: The cooling tower manufacturer shall provide an electric water level control (EWLC) system. The system shall consist of water level sensing and control units in quantities and locations as indicated on the drawings. Each water level sensing and control unit shall be hermetically sealed and consist of the following: solid state controls including all necessary relays and contacts to achieve the specified sequence of operation; status code LED which illuminates to indicate status: stainless steel water level sensing electrodes with brass holder; Schedule 40 PVC standpipe assembly with vent holes, and all necessary stainless steel mounting hardware. Provide PVC union directly below the control enclosure to facilitate the removal and access of electrodes and control enclosure. The number and position of water level sensing electrodes shall be provided to sense the following: high water level, low water level, high water alarm level, low water alarm level, and heater safety cutout.

4. Vibration Cutout Switch: Provide an electronic remote reset vibration switch with contact for BAS monitoring. Wiring shall be by the installing contractor. The electronic vibration cutout switch shall be set to trip at a point so as not to cause damage to the cooling tower. To ensure this, the trip point will be set in a frequency range of 2 to 1000 Hertz and a trip point of 0.45 in/sec (0.0114 m/sec).

5. Air intake Option: Provide removable UV and corrosion resistant PVC air intake screens. The screens shall shield the air inlet from sunlight. Type 304 stainless steel mesh screens are an acceptable alternative.

6. Ladder: An aluminum ladder (with galvanized steel safety cage) shall be provided for access to the fan deck. Access door or service platforms are not acceptable.

7. Handrails: 1-1/4" (31.75 mm) galvanized steel pipe handrail shall be provided around the perimeter of the cooling tower cells. The handrails shall be provided with knee and toe rails and shall conform to the requirements of OSHA applicable at the time of shipment.

8. Access Door Platform: A galvanized steel platform and aluminum ladder to grade shall be provided at all access doors to access the plenum section of the cooling tower. All working surfaces shall be able to withstand 50 psf (244 kg/m2) live load or 200 pound (90.72 kg) concentrated load.

9. Platform to Access External Motor (available on gear drives equipped with TEFC external motors only): A galvanized steel platform and ladder to grade shall be provided for access to the external fan motor. All working surfaces shall be able to withstand 50 psf (244 kg/m2) live load or 200 pound (90.72 kg) concentrated load.

10. Internal Walkway: An internal walkway shall be provided in the plenum section to provide for inspection and maintenance. All working surfaces shall be able to withstand 50 psf (244 kg/m2) live load or 200 pound (90.7 kg) concentrated load. Other components

of the cooling tower, i.e. basin and fill/drift eliminators, shall not be considered an internal working surface. Cooling tower manufacturers that promote these surfaces to be used as a working platform shall provide a two-year extended warranty to the Owner to repair any damage to these surfaces caused during routine maintenance.

11. Internal Platform: An internal platform shall be provided in the plenum section to provide for inspection and maintenance. All working surfaces shall be able to withstand 50 psf live load or 200 pound concentrated load. Other components of the cooling tower, i.e. basin floor and fill/drift eliminators, shall not be considered an internal working surface. Cooling tower manufacturers that promote these surfaces to be used as a working platform shall provide a two-year extended warranty to the Owner to repair any damage to these surfaces caused during routine maintenance.
12. Mechanical Equipment Removal Davit: Provide the mechanical equipment removal option to aid in motor removal or gear drive. The davit shall be portable from cell to cell and the heaviest piece shall weigh 60 lbs. The davit shall lower the motor or gear drive from the mechanical equipment supports down to an internal metal working surface.
13. Externally Mounted Pre-wired Terminal Box: The cooling tower shall ship from the factory with the fan motor(s) (and vibration cutout switch) wired to terminal blocks encased in a Type 304 stainless steel NEMA 3R enclosure, mounted on the outside of the tower. No casing penetrations shall be permitted in the field.

2.12 GASKETED PLATE AND FRAME HEAT EXCHANGER

A. Product

1. Basis-of-Design Product: Subject to compliance with requirements, provide Alfa Laval Inc.; or comparable product by one of the following:
    a. Bell & Gossett; a Xylem brand.
    b. Sondex.
    c. SPX Flow.
    d. or approved equal.
2. Submittals
    a. Include rated capacities, operating characteristics, and furnished specialties and accessories.
    b. Certification of compliance with AHRI Standard 400.

B. Warranty

1. Manufacturer agrees to repair or replace components of heat exchangers that fail in materials or workmanship within specified warranty period.
    a. For AHRI-certified heat exchangers, three year(s) from date of shipment.

C. Configuration: Freestanding assembly, consisting of frame support, top and bottom carrying and guide bars, fixed and movable end plates, tie rods, individually removable plates, and one-piece

gaskets. For floor-mounted heat exchangers, provide heat exchangers having integral legs with mounting feet.

D. Construction: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 1.

1. Provide plate heat exchanger with ASME U Stamp.

E. Standards:

1. AHRI LLHE Certification: Provide plate heat exchangers certified in accordance with AHRI Standard 400 and listed as AHRI-compliant at AHRInet.org site http://www.ahrinet.org/Certification/AHRI-Certification-Programs/Liquid-to-Liquid-Heat-Exchangers.aspx, section LLHE Specification Sheet Verifications.

a. Plate heat exchangers that are not certified AHRI-compliant are not acceptable.

b. When AHRI compliance is certified by NRTL, submit NRTL certification at no additional cost.

2. AHRI LLHE Verification: Submit AHRI specification sheet in AHRI format for each heat exchanger furnished, as found at http://www.ahridirectory.org/ahridirectory/pages/llhe/defaultSearch.aspx.

F. Frame:

1. Capacity to accommodate 20 percent additional plates.

2. End-Plate Material: Painted carbon steel.

3. Provide single-pass plate heat exchanger with all connections on fixed cover.

4. For plate heat exchangers 52 inches (1321 mm) or taller, provide steel roller bearing on moveable cover.

a. Provide plate heat exchanger that can be opened by hand, without use of lifting or rigging equipment.

5. Provide bolted-frame construction.

a. Welded frame construction is not acceptable.

6. Provide plate heat exchanger having construction that allows removal and replacement of individual plates, without the need to remove adjacent plates.

7. Provide lifting lugs suitable to lift completely assembled plate heat exchanger while flooded.

8. Finishes: Clean and prepare steel surfaces for painting in accordance with SSPC-SP1063T, and apply aliphatic acrylic polyurethane coating.

a. Finishes applied over dirt, grease, corrosion, or mill scale are not acceptable.

G. Top and Bottom Carrying and Guide Bars: Carbon steel

1. For plate heat exchangers 52 inches (1321 mm) or taller, provide stainless steel guide bars.

a. Painted or plated guide bars are not acceptable.

H. Tie Rods and Nuts: Steel:

1. Provide captive double-hex nut at stationary cover and removable hex nut and flat washer at movable cover.

a. Nuts welded to end of tie rods are not acceptable.

2. Provide plate heat exchanger designed to require four tie rods to assemble or disassemble plate heat exchanger.

a. For plate heat exchanger 50 inches (1270mm) or taller, provide bearing box on critical closing bolts

b. Provide anti-seize, corrosion-preventing thread lubricant. Zinc plating is not acceptable.

c. Provide plastic protective sleeve over exposed ends of tie rods.

I. Plates: 0.019-inch (0.5-mm) thick before stamping; Type 304 stainless steel.

1. Stamp plates from a single homogeneous sheet, in one pressing operation.

a. Plates requiring multiple pressings are not acceptable.

2. Provide plates with herringbone corrugations, and that are suitable to withstand 1.3 times the design pressure for one hour without showing signs of distortion, buckling, or deformation.

3. Provide self-aligning plates to accurately locate themselves in frame assembly, to prevent lateral motion, and to maintain gasket contact.

4. Reinforce plates at upper and lower mounting slots. Plates that deform when placed on guide rails are not acceptable.

5. Permanently mark plates and gaskets to identify material and grade.

6. Plates with welded reinforcement or stiffeners are not acceptable.

7. Enclose plates in solid stainless steel removable shroud.

J. Gasket Materials: Nitrile rubber, with relieving grooves to prevent intermixing of hot and cold liquids.

1. Provide one-piece, clip-on gaskets to fit around heat transfer area and at port holes.

K. Piping Connections: Factory fabricated of materials compatible with heat-exchanger shell. Attach tappings to shell before testing and labeling.

1. NPS 2-1/2 (DN 65) and Larger: Provide studded ports. Flanged connections are not acceptable.

L. Accessories:

1. Insulation and drip tray.

2. Port filter.

M. Source Quality Control

1. Factory Tests: Test and inspect heat exchangers in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 1. Affix ASME International label.
2. Hydrostatically test heat exchangers to minimum of one and one-half times pressure rating before shipment.
    a. Heat exchangers will be considered defective if they do not pass tests and inspections.
    b. Prepare test and inspection reports.

N. Preparation for Shipment

1. Attach nameplate to plate heat exchanger at location that is accessible and visible after installation.
    a. Include working pressure, design temperatures, closing dimension, surface area, media, and plate/gasket material.
2. Flush each plate heat exchanger clean at factory prior to shipment. Seal each connection at factory.

O. Examination

1. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.
2. Examine roughing-in for heat-exchanger piping to verify actual locations of piping connections before equipment installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

P. Installation of Heat Exchanger, General

1. Equipment Mounting:
    a. Install floor-mounted heat exchangers on cast-in-place concrete equipment bases. Install heat exchangers level and plumb in accordance with manufacturer's written instructions. Install floor-mounted and wall-hung steam heat exchangers at sufficient height, using sufficient length supports, to achieve required steam and condensate pipe pitch. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

Q. Installation of Gasketed-Plate Heat Exchanger

1. Install wall-mounted gasketed-plate heat exchanger on custom-designed wall supports anchored to structure as indicated on Drawings.

2. Install floor-mounted gasketed-plate heat exchangers on cast-in-place concrete equipment base, and fasten legs to base.

3. Install metal shroud over installed gasketed-plate heat exchanger in accordance with manufacturer's written instructions.

R. Piping Connections

1. Maintain manufacturer's recommended clearances for tube removal, service, and maintenance.

2. Install piping adjacent to heat exchangers to allow space for service and maintenance of heat exchangers. Arrange piping for easy removal of heat exchangers.

3. Install shutoff valves at heat-exchanger inlet and outlet connections.

4. Install pressure-relief valves on heat-exchanger tube outlet piping before any isolation valves.

5. Pipe pressure-relief valves, full size of valve connection, to floor drain.

6. Install hose end valve to drain shell.

7. Install thermometer on each heat-exchanger fluid inlet and outlet piping.

8. Install pressure gauges on each heat-exchanger fluid inlet and outlet piping.

S. Cleaning

1. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

2. Isolate heat exchangers from piping before flushing piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blind flanges in flanged joints to isolate equipment.

3. Flush heat-exchanger piping systems with clean water; then remove and clean or replace strainer screens before reopening flow to heat exchangers.

T. Field Quality Control

1. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

   a. Tests and Inspections:

      1) Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

      2) Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

   b. Heat exchanger will be considered defective if it does not pass tests and inspections.

   c. Prepare test and inspection reports.

2.13 CENTRIFUGAL PUMPS

A. General Requirements

1. Provide, where shown on drawings, centrifugal pumps, of capacities types and configurations shown on schedules. Acceptable manufacturers shall be:
   a. Armstrong
   b. Bell and Gossett
   c. Taco
2. Provided that they meet the requirements of this specification and the performance requirements shown on the schedules (with equal or less horsepower requirement than the pump shown on the schedules). Pumps, other than the scheduled model, may also be rejected, which operate in an inappropriate portion of their performance curves, including but not limited to, operating in the rightmost third of the curve.
3. Pumps shall be designed specifically for intended classes of service, with non overloading characteristics throughout the design curve (motors shall not operate in their service factor). Impeller shall be statically and dynamically balanced. Impeller size shall be no more than 90 % of casing size. Pump shall be factory tested at operating conditions, thoroughly cleaned, and painted with one coat of machinery enamel prior to shipment. Installation instructions shall be included with pump at time of shipment.
4. Coordinate with manufacturer of water treatment to ensure that normal life of pumps and components shall not be foreshortened by water treatment.
5. Provide cyclone type abrasive separators to provide clean water flush to seals for all pumps on open systems, and all pumps over 3HP on closed systems requiring flush. Separator materials and pressure ratings shall be suitable for intended class of service and maximum working pressure of the pump. Provide sheet metal guard to protect separator tubing from damage do not use poly tubing for separator. Provide shut off cocks with manual valved bypass line to allow separator to be removed for cleaning while seals continue to be flushed.
6. Provide, under the work of the mechanical section, flexible connections (if shown on details) and vibration isolation components for all pumps. See the vibration isolation paragraph of these specifications for specific requirements.
7. Provide steel channel base for each pump.
8. Motors shall be high efficiency type, see motor and starter paragraph of these specifications for requirements.

B. Pump Types and Materials of Construction

1. General:
   a. For all types of pumps listed below, bearing frame and pump internals shall be serviceable without disturbing motor or connected piping.
   b. For all types of pumps listed below, provide mechanical seals with carbon rings and ceramic faces, stainless or brass metal parts, stainless springs and synthetic rubber bellows. Seals shall operate satisfactorily to 225°.
   c. Unless otherwise stated in the schedules, all pumps shall be single stage.

d. Provide tappings for pressure gauges at inlet and discharge of all in line and split case pumps.

e. All couplings for variable speed pumps shall be capable of operating under all conditions without fatigue.

2. Double Suction Split Case Pumps:

a. Double suction pumps shall have horizontally or vertically split casings. Materials of construction shall be for a bronze fitted pump including cast iron casings, bronze shaft sleeves, alloy steel shafts and bronze, enclosed double suction impeller. Provide regreasable ball bearings, casing wear rings, drains and vents, coupling guards and steel baseplate. Stainless steel shaft with no sleeve may be substituted for shaft components named above, at manufacturers option.

3. End Suction Pumps

a. End suction pumps shall be based mounted, horizontally coupled with vertically split cases. Materials of construction shall be for a bronze fitted pump including cast iron casings, bronze shaft sleeves, alloy steel shafts and bronze enclosed impellers. Provide regreasable or permanently lubricated ball bearings, casing wear rings, drains and vents, coupling guards and steel baseplate.

4. In Line Pumps

a. In Line pumps shall have bronze fitted construction, including cast iron casings, bronze or copper shaft sleeves, alloy steel shafts and bronze impellers. Bearings shall be either be sleeve type or regreasable ball bearings. Provide casing wear rings, drain and vent connections and flexible coupling or direct drive connection between pump and motor. If the scheduled pump includes ball bearings and a direct drive motor to impeller connection, the submitted pump shall not have sleeve bearings or a flexible coupling between pump and motor.

2.14 MOTORS, STARTERS AND WIRING

A. Provide motors and controls for HVAC equipment, except units served by MCC provided under Section 260001, ELECTRICAL WORK. Provide control and other related wiring including interlocks. Power wiring (to panelboards, disconnect switches, starters and motors) will be provided under Section 260001, ELECTRICAL WORK. Starters that are not integral to equipment will be furnished, installed and wired under Section 260001, ELECTRICAL WORK.

B. Unless otherwise specified, motors shall be NEMA Design B, constant speed, self ventilated squirrel cage induction. Motors shall have 1.15 service factor unless totally enclosed. Motors shall have Class B insulation.

1. Motors under 1/2 hp, shall be designed for 120 V, 60 Hz, single phase, unless otherwise specified.

2. Motors ½ hp and over shall be as required in schedules.

C. All motors shall be high or premium efficiency type. They shall conform to NEMA Standard MG 1 12.53a and shall have their efficiencies determined in accordance with IEEE Standard 112

Method B. The NEMA nominal efficiency shall be listed on the motor nameplate. Minimum nominal efficiencies shall be as follows:

Size (HP)	Nominal Efficiency (Min.)
1 – 3	84%
5 - 7 1/2	88.5%
10 - 25	90%
30 - 100	93%
100+	95%

D. Starters furnished integral to equipment, and that require interlocks or remote control shall be magnetic with HAND OFF AUTOMATIC switch in cover. Provide magnetic starters as necessary, with auxiliary contacts, buttons and switches in required configurations. Refer to paragraph AUTOMATIC TEMPERATURE CONTROLS and to Control Drawings for interlock requirements.

1. Each 3 phase, 60 Hz motor shall be provided with magnetic starter with either ON OFF push button or hand off automatic switch.
2. Other motors shall be provided with a manual starter with ON OFF switch.
3. Control relay for each starter shall be for operation on 120 V, single phase, and transformer of sufficient capacity within starter case shall be furnished for this purpose.
4. Provide inverse time limit overload and under voltage protection in each leg and with pilot lights. Provide red and green On Off pilot lights.
5. Provide nameplates with engraved white lettering to designate area and equipment served.
6. Starters for refrigeration machines shall be furnished by unit manufacturer.
7. Provide starters for two speed motors with deceleration relay.
8. Furnish for all single speed motors, 25 hp and above, 95% power factor correction capacitors. Capacitors shall be in NEMA enclosure of the same rating as the motor's starter.

2.15 VARIABLE FREQUENCY DRIVES

A. Description

1. This specification is to cover a complete Variable Frequency Drive (VFD aka: VSD, AFD, ASD, Inverter, AC Drive, et al) consisting of a pulse width modulated (PWM) inverter designed for use with a standard NEMA Design B induction motor.
2. The drive manufacturer shall supply the drive and all necessary options as herein specified. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of twenty years. VFDs that are manufactured by a third party and “brand labeled” shall not be acceptable. Drive manufacturers who do not build their own power boards and assemblies, or do not have full control of the power board manufacturing and quality control, shall be considered as a “brand labeled” drive. All VFDs installed on this project shall be from the same manufacturer.

3. Provide integral disconnect for all VFDs.

B. Quality Assurance

1. Qualifications:

a. VFDs and options shall be UL508 listed as a complete assembly. The base VFD shall be UL labeled 100 kA RMS Symmetrical, 600V max. C

b. CE Mark – The base VFD shall conform to the European Union Electromagnetic Compatibility directive, a requirement for CE marking. The VFD shall meet product standard EN 61800-3 for the First Environment restricted level (Category C2). Base drives that only meet the Second Environment (Category C3, C4) shall be supplied with filters to bring the drive in compliance with the First Environment levels.

c. The entire VFD assembly, including the bypass (if specified), shall be seismically certified and labeled as such in accordance with the 2012 International Building Code (IBC):

1) VFD manufacturer shall provide Seismic Certification and Installation requirements at time of submittal.

2) Seismic importance factor of 1.5 rating is required, and shall be based upon actual shake test data as defined by ICC AC-156.

3) Seismic ratings based upon calculations alone are not acceptable. Certification of Seismic rating must be based on testing done in all three axis of motion.

4) Special seismic certification of equipment and components shall be provided by OSHPD preapproval.

d. Acceptable Manufacturers

1) ABB ACH Series, or approved equal.

e. Factory authorized start up and owner training should be provided locally upon request.

C. Submittals

1. Submittals shall include the following information:

a. Outline dimensions, conduit entry locations and weight.

b. Customer connection and power wiring diagrams.

c. Complete technical product description include a complete list of options provided. Any portions of this specification not met must be clearly indicated or the supplier and contractor shall be liable to provide all additional components required to meet this specification.

D. Product

1. The VFD package as specified herein and defined on the VFD schedule shall be enclosed in a UL Type enclosure (enclosures with only NEMA ratings are not acceptable), completely assembled and tested by the manufacturer in an ISO9001 facility.

2. The VFD shall provide full rated output from a line of ±10% of nominal voltage. The VFD shall continue to operate without faulting from a line of +30% to -35% of nominal voltage.

    a. VFDs shall be capable of continuous full load operation under the following environmental operating conditions:

        1) -15 to 40° C (5 to 104° F) ambient temperature. Operation to 50° C shall be allowed with a 10% reduction from VFD full load current.

        2) Altitude 0 to 3300 feet above sea level. Operation to 6600 shall be allowed with a 10% reduction from VFD full load current.

        3) Humidity less than 95%, non-condensing.

3. All VFDs shall have the following standard features:

    a. All circuit boards shall be coated to protect against corrosion.

    b. All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.

    c. The keypad shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate “bumpless transfer” of speed reference when switching between “Hand” and “Auto” modes. There shall be fault reset and “Help” buttons on the keypad. The Help button shall include “on-line” assistance for programming and troubleshooting.

    d. There shall be a built-in time clock in the VFD keypad. The clock shall have a battery backup with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. VFD programming shall be held in non-volatile memory and is not dependent on battery power

    e. The VFD’s shall utilize pre-programmed application macros specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The VFD shall have two user macros to allow the end-user to create and save custom settings.

    f. The VFD shall have cooling fans that are designed for easy replacement. The fans shall be designed for replacement without requiring removing the VFD from the wall or removal of circuit boards. The VFD cooling fans shall operate only when required, based on the temperature of and run command to the drive. VFD protection shall be based on thermal sensing and not cooling fan operation.

    g. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to set point without tripping or component damage (flying start).

    h. The VFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.

i. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds every minute. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430.250 for 4-pole motors.

j. VFDs through 200 HP shall have internal swinging (non-linear) chokes providing impedance equivalent to 5% to reduce the harmonics to the power line. Swinging choke shall be required resulting in superior partial load harmonic reduction. Linear chokes are not acceptable. 5% impedance may be from dual (positive and negative DC bus) chokes, or 5% swinging AC line chokes. VFD's with only one DC choke shall add an AC line choke.

k. The input current rating of the VFD shall not be greater than the output current rating. VFD's with higher input current ratings require the upstream wiring, protection devices, and source transformers to be oversized per NEC 430.122. Input and output current ratings must be shown on the VFD nameplate.

l. The VFD shall include a coordinated AC transient surge protection system consisting of 4 MOVs (phase to phase and phase to ground), a capacitor clamp, 1600 PIV Diode Bridge and internal chokes. The MOV's shall have a minimum 125 joule rating per phase across the diode bridge. VFDs that do not include coordinated AC transient surge protection shall include an external TVSS (Transient Voltage Surge Suppressor).

m. The VFD shall provide a programmable loss-of-load (broken belt / broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and / or over the serial communications bus. The loss-of-load condition sensing algorithm shall include a programmable time delay that will allow for motor acceleration from zero speed without signaling a false loss-of-load condition.

n. The VFD shall include multiple "two zone" PID algorithms that allow the VFD to maintain PID control from two separate feedback signals (4-20mA, 0-10V, and / or serial communications). The two zone control PID algorithm will control motor speed based on a minimum, maximum, or average of the two feedback signals. All of the VFD PID controllers shall include the ability for "two zone" control.

o. If the input reference is lost, the VFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, Form-C relay output and / or over the serial communication bus.

p. The VFD shall have programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.

4. All VFDs to have the following adjustments:

a. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed. The lockout range must be fully adjustable, from 0 to full speed.

b. Two (2) PID Set point controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed-loop control. The VFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The PID set point shall be adjustable from the VFD keypad, analog inputs, or over the communications bus. There shall be two independent parameter sets for the PID controller and the capability to switch between the parameter sets via a digital input, serial communications or from the keypad. The independent parameter sets are typically used for night setback, switching between summer and winter set points, etc.

c. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain the set point of an independent process (i.e. valves, dampers, etc.). All set points, process variables, etc. to be accessible from the serial communication network.

d. Two (2) programmable analog inputs shall accept current or voltage signals.

e. Two (2) programmable analog outputs (0-20ma or 4-20 ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, Active Feedback, and other data.

f. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices. All digital inputs shall be programmable to initiate upon an application or removal of 24VDC.

g. Three (3) programmable, digital Form-C relay outputs. The relay outputs shall include programmable on and off delay times and adjustable hysteresis. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating of 2 amps RMS. Outputs shall be true Form-C type contacts; open collector outputs are not acceptable. Drives that have only two (2) relay outputs must provide an option card that provides additional relay outputs.

h. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications), the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows VFD motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop and the damper shall be commanded to close. The keypad shall display “start enable 1 (or 2) missing”. The safety input status shall also be transmitted over the serial communications bus.

i. The VFD control shall include a programmable time delay for VFD start and a keypad indication that this time delay is active. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates. The time delay shall be field programmable from 0 – 120 seconds. Start delay shall be active regardless of the start command

source (keypad command, input contact closure, time-clock control, or serial communications), and when switching from drive to bypass.

j. Seven (7) programmable preset speeds.

k. Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.

l. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise. The VFD shall have selectable software for optimization of motor noise, energy consumption, and motor speed control.

m. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows higher carrier frequency settings without derating the VFD.

n. The VFD shall include password protection against parameter changes.

5. The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). All VFD faults shall be displayed in English words. The keypad shall include a minimum of 14 assistants including:
    1) Start-up assistant
    2) Parameter assistants
        a) PID assistant
        b) Reference assistant
        c) I/O assistant
        d) Serial communications assistant
        e) Option module assistant
        f) Panel display assistant
        g) Low noise set-up assistant
    3) Maintenance assistant
    4) Troubleshooting assistant
    5) Drive optimizer assistants

6. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):

    a. Output Frequency

    b. Motor Speed (RPM, %, or Engineering units)

    c. Motor Current

    d. Motor Torque

    e. Motor Power (kW)

    f. DC Bus Voltage

g. Output Voltage

7. The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fire / smoke control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed ranging from -500Hz (reverse) to 500Hz (forward). 2) Operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run in one of the two modes above. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation, without the need to cycle the normal digital input run command.

8. Serial Communications

   a. The VFD shall have an EIA-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet. [Optional protocols for LonWorks, Profibus, EtherNet, BACnet IP, and DeviceNet shall be available.] Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet). Use of non-certified protocols is not allowed.

   b. The BACnet connection shall be an EIA-485, MS/TP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:

      1) Data Sharing – Read Property – B.
      2) Data Sharing – Write Property – B.
      3) Device Management – Dynamic Device Binding (Who-Is; I-Am).
      4) Device Management – Dynamic Object Binding (Who-Has; I-Have).
      5) Device Management – Communication Control – B.

   c. Serial communication capabilities shall include, but not be limited to; run-stop controls, speed set adjustment, and lock and unlock the keypad. The drive shall have the capability of allowing the BAS to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The BAS shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.

   d. Serial communication in bypass (if bypass is specified) shall include, but not be limited to; bypass run-stop control, the ability to force the unit to bypass, and the ability to lock and unlock the keypad. The bypass shall have the capability of allowing the BAS to monitor feedback such as, current (in amps), kilowatt hours (resettable), operating hours (resettable), and bypass logic board temperature. The

BAS shall also be capable of monitoring the bypass relay output status, and all digital input status. All bypass diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote bypass fault reset shall be possible.

e. The VFD / bypass shall allow the BAS to control the drive and bypass digital and analog outputs via the serial interface. This control shall be independent of any VFD function. The analog outputs may be used for modulating chilled water valves or cooling tower bypass valves. The drive and bypass' digital (Form-C relay) outputs may be used to actuate a damper, open a valve or control any other device that requires a maintained contact for operation. In addition, all of the drive and bypass' digital inputs shall be capable of being monitored by the BAS system. This allows for remote monitoring of which (of up to 4) safeties are open.

f. The VFD shall include an independent PID loop for customer use. The independent PID loop may be used for cooling tower bypass value control, chilled water value / hot water valve control, etc. Both the VFD PID control loop and the independent PID control loop shall continue functioning even if the serial communications connection is lost. As default, the VFD shall keep the last good set point command and last good DO & AO commands in memory in the event the serial communications connection is lost and continue controlling the process.

9. EMI / RFI filters. All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level (Category C2) with up to 100 feet of motor cable. Second environment (Category C3, C4) is not acceptable, no Exceptions. Certified test reports shall be provided with the submittals confirming compliance to EN 61800-3, First Environment (C2).

10. DRIVE OPTIONS – Options shall be furnished and mounted by the drive manufacturer as defined on the VFD schedule. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

    a. Circuit Breaker - Door interlocked padlockable circuit breaker that will disconnect all input power from the drive and all internally mounted options. Circuit breaker option shall be available with or without systems requiring bypass.

    b. Disconnect Switch with Fuses - Door interlocked, padlockable disconnect switch that will disconnect all input power from the drive and all internally mounted options. Drive input fusing is included.

    c. Fieldbus adapters – The following optional fieldbus adapters shall be available as a plug in modules.
        1) LonWorks
        2) DeviceNet
        3) Ethernet IP
        4) ControlNet over Ethernet & ModBus TCP
        5) BACnet IP
        6) Profibus

11. BYPASS – Bypasses shall be furnished and mounted by the drive manufacturer as defined on the VFD schedule. All VFD with bypass configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

    a. A complete factory wired and tested bypass system consisting of a door interlocked, padlockable circuit breaker, output contactor, bypass contactor, and fast acting VFD input fuses. UL Listed motor overload protection shall be provided in both drive and bypass modes.

    b. The bypass enclosure door and VFD enclosure must be mechanically interlocked such that the disconnecting device must be in the "Off" position before either enclosure may be accessed.

    c. The VFD and bypass package shall have a UL listed short circuit current rating (SCCR) of 100,000 Amps and this rating shall be indicated on the UL data label.

    d. The drive and bypass package shall be seismic certified and labeled to the IBC:

        1) Seismic importance factor of 1.5 rating is required, and shall be based upon actual shake table test data as defined by ICC AC-156.

        2) Special seismic certification of equipment and components shall be provided by OSHPD preapproval.

    e. Drive Isolation Fuses - To ensure maximum availability of bypass operation, fast acting fuses, exclusive to the VFD, shall be provided to allow the VFD to disconnect from the line prior to clearing upstream branch circuit protection. This maintains bypass operation capability in the event of a VFD failure. Bypass designs which have no such fuses, or that incorporate fuses common to both the VFD and the bypass, will not be accepted. Third contactor "isolation contactors" are not an acceptable alternative to fuses, as contactors could weld closed and are not an NEC recognized disconnecting device.

    f. The bypass shall maintain positive contactor control through the voltage tolerance window of nominal voltage +30%, -35%. This feature is designed to avoid contactor coil failure during brown out / low line conditions and allow for input single phase operation when in the VFD mode. Designs that will not allow input single phase operation in the VFD mode are not acceptable.

    g. Motor protection from single phase power conditions - the bypass system must be able to detect a single phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single phase input power indication. Bypass systems not incorporating single phase protection in bypass mode are not acceptable.

    h. The bypass system shall be designed for stand-alone operation and shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the system for repair / replacement. Serial communications shall remain functional even with the VFD removed. Bypass systems that do not maintain full functionality with the drive removed are not acceptable.

    i. Serial communications – the bypass shall be capable of being monitored and / or controlled via serial communications. On-board communications protocols shall

include ModBus RTU; Johnson Controls N2; Siemens Building Technologies FLN (P1); and BACnet MS/TP.

1) Serial communication capabilities shall include, but not be limited to: bypass run-stop control, the ability to force the unit to bypass, and the ability to lock and unlock the keypad. The bypass shall have the capability of allowing the BAS to monitor feedback such as, current (Amps), kilowatt hours (resettable), operating hours (resettable), and bypass logic board temperature. The BAS shall also be capable of monitoring the bypass relay output status, and all digital input status. All bypass diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote bypass fault reset shall be possible. The following additional status indications and settings shall be transmitted over the serial communications bus and / or via a Form-C relay output – keypad "Hand" or "Auto" selected, bypass selected, and broken belt indication. The BAS system shall also be able to monitor if the motor is running in the VFD mode or bypass mode over serial communications. A minimum of 50 field serial communications points shall be capable of being monitored in the bypass mode.

2) The bypass serial communications shall allow control of the drive/bypass (system) digital outputs via the serial interface. This control shall be independent of any bypass function or operating state. The system digital (relay) outputs may be used to actuate a damper, open a valve or control any other device that requires a maintained contact for operation. All system analog and digital I/O shall be capable of being monitored by the BAS system.

j. There shall be an adjustable motor current sensing circuit for the bypass and VFD modes to provide proof of flow (broken belt) indication. The condition shall be indicated on the keypad display, transmitted over the BAS and / or via a Form-C relay output contact closure. The broken belt indication shall be programmable to be a system (drive and bypass) indication. The broken belt condition sensing algorithm shall be programmable to cause a warning or system shutdown.

k. The digital inputs for the system shall accept 24VDC. The bypass shall incorporate an internally sourced power supply and not require an external control power source. The bypass power board shall supply 250 mA of 24 VDC for use by others to power external devices.

l. There shall be a coordinated run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad command, time-clock control, digital input, or serial communications) the bypass shall provide a dry contact closure that will signal the damper to open before the motor can run. When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a bypass system input and allows motor operation. Up to four separate safety interlock inputs shall be provided. When any safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close. This feature will also operate in Fireman's override / smoke control mode.

m. The bypass control shall monitor the status of the VFD and bypass contactors and indicate when there is a welded contactor contact or open contactor coil. This failed

contactor condition shall be indicated on the bypass LCD display, programmed to activate a Form-C relay output, and / or over the serial communications protocol.

n. The bypass control shall include a programmable time delay bypass start including keypad indication of the time delay. A Form C relay output commands the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates at full speed in the bypass mode. The time delay shall be field programmable from 0 – 120 seconds.

o. There shall be a keypad adjustment to select manual or automatic transfer to bypass. The user shall be able to select via keypad programming which drive faults will result in an automatic transfer to bypass mode and which faults require a manual transfer to bypass. The user may select whether the system shall automatically transfer from drive to bypass mode on the following drive fault conditions:
   1) Over current
   2) Over voltage
   3) Under voltage
   4) Loss of analog input

p. The following operators shall be provided:
   1) Bypass Hand-Off-Auto
   2) Drive mode selector
   3) Bypass mode selector
   4) Bypass fault reset

q. The bypass shall include the ability to select the operating mode of the system (VFD/Bypass) from either the bypass keypad or digital input.

r. The bypass shall include a two line, 20 character LCD display. The display shall allow the user to access and view:
   1) Energy savings – in US dollars
   2) Bypass motor amps
   3) Bypass input voltage– average and individual phase voltage
   4) Bypass power (kW)
   5) Bypass faults and fault logs
   6) Bypass warnings
   7) Bypass operating time (resettable)
   8) Bypass energy (kilowatt hours – resettable)
   9) I/O status
   10) Parameter settings / programming
   11) Printed circuit board temperature

s. The following indicating lights (LED type) or keypad display indications shall be provided. A test mode or push to test feature shall be provided.
   1) Power-on (Ready)
   2) Run enable

3) Drive mode selected
4) Bypass mode selected
5) Drive running
6) Bypass running
7) Drive fault
8) Bypass fault
9) Bypass H-O-A mode
10) Automatic transfer to bypass selected
11) Safety open
12) Damper opening
13) Damper end-switch made

t. The Bypass controller shall have six programmable digital inputs, and five programmable Form-C relay outputs. This I/O allows for a total System (VFD and Bypass) I/O count of 24 points as standard. The bypass I/O shall be available to the BAS system even with the VFD removed.

u. The on-board Form-C relay outputs in the bypass shall programmable for any of the following indications.
1) System started
2) System running
3) Bypass override enabled
4) Drive fault
5) Bypass fault
6) Bypass H-O-A position
7) Motor proof-of-flow (broken belt)
8) Overload
9) Bypass selected
10) Bypass run
11) System started (damper opening)
12) Bypass alarm
13) Over temperature

v. The bypass shall provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in VFD or Bypass mode. The remote start/stop contact shall operate in VFD and bypass modes. The terminal strip shall allow for independent connection of up to four (4) unique safety inputs.

w. The bypass shall include a supervisory control mode. In this bypass mode, the bypass shall monitor the value of the VFD's analog input (feedback). This feedback value is used to control the bypass contactor on and off state. The supervisory mode shall allow the user to maintain hysteresis control over applications such as cooling towers and booster pumps.

x. The user shall be able to select the text to be displayed on the keypad when an external safety opens. Example text display indications include “FireStat”, “FreezStat”, “Over pressure” and “Low suction”. The user shall also be able to determine which of the four (4) safety contacts is open over the serial communications connection.

y. Smoke Control Override Mode (Override 1) – The bypass shall include a dedicated digital input that will transfer the motor from VFD mode to Bypass mode upon receipt of a dry contact closure from the Fire / Smoke Control System. The Smoke Control Override Mode action is not programmable and will always function as described in the bypass User’s Manual documentation. In this mode, the system will ignore low priority safeties and acknowledge high priority safeties. All keypad control, serial communications control, and normal customer start / stop control inputs will be disregarded. This Smoke Control Mode shall be designed to meet the intent of UL864/UUKL.

z. Fireman’s Override Mode (Override 2) – the bypass shall include a second, programmable override input which will allow the user to configure the unit to acknowledge some digital inputs, all digital inputs, ignore digital inputs or any combination of the above. This programmability allows the user to program the bypass unit to react in whatever manner the local Authority Having Jurisdiction (AHJ) requires. The Override 2 action may be programmed for “Run-to-Destruction”. The user may also force the unit into Override 2 via the serial communications link.

aa. Class 10, 20, or 30 (programmable) electronic motor overload protection shall be included.

bb. Drive Service Switch – Drive service switches shall be furnished and mounted by the drive manufacturer as defined on the VFD schedule. VFD/Bypass configurations that utilize contactors as a means to remove VFD input power for the purpose of VFD servicing are not acceptable. NEC Code does not recognize a contactor as a means of disconnect in a motor control circuit.

E. Installation

1. Installation shall be the responsibility of the mechanical contractor. The contractor shall install the drive in accordance with the recommendations of the VFD manufacturer as outlined in the VFD installation manual.

2. Power wiring shall be completed by the electrical contractor, to NEC code 430.122 wiring requirements based on the VFD input current. The contractor shall complete all wiring in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

F. Start-up

1. Factory start-up shall be provided for each drive by a factory authorized service center. A start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

G. Product Support

1. Factory trained application engineering and service personnel that are thoroughly familiar with the VFD products offered shall be locally available at both the specifying and installation locations. A toll free 24/365 technical support line connected to factory support personnel located in the US shall be available. Technical support offered only through the local sales office is not acceptable.

2. Training shall include installation, programming and operation of the VFD, bypass and serial communication. Factory authorized start up and owner training to be provided locally upon request.

H. Warranty

1. The VFD Product Warranty shall be 36 months from the date of factory shipment. The warranty shall include all parts, labor, travel time and expenses. A toll free 24/365 technical support line shall be available.

2.16 VIBRATION ISOLATION (SEISMIC)

A. General

1. Description

a. Provide the necessary vibration isolation materials to eliminate excessive noise and vibration from being transmitted from the equipment to the occupied areas of the structure and also serve as the basis for seismic restraint design for the entire mechanical system within the building (see definitions). Provide isolation materials and seismic restraints complete as shown and specified.

b. The work in this section includes the following:

1) Vibration isolation elements for equipment.
2) Equipment isolation bases.
3) Piping flexible connectors.
4) Seismic restraints for isolated equipment.
5) Seismic restraints for non-isolated equipment.
6) Certification of seismic restraint designs, and installation supervision.
7) Certification of seismic attachment of housekeeping pads.

c. Definitions: The term EQUIPMENT will be used throughout this specification and it includes all non-structural components within the facility and 5 feet outside the facility that is not buried underground including but not limited to:

Air Distribution	Piping
Ductwork	Pumps
Var. Freq. Drives	Fans
Control Panels	

2. Certification and Analysis

a. Seismic restraint calculations must be provided for all connections of equipment to the structure.

b. Calculations to support seismic restraint designs stamped by a structural, civil engineer or professional mechanical engineer.

c. A seismic design liability insurance certificate must accompany all submittals.

3. Code and Standards Requirements

a. IMC-2015

b. SMACNA Guidelines for seismic restraint of mechanical system

c. NFPA - 13 and 14

d. All State and local codes.

4. Manufacturer Responsibility

a. Manufacturer of vibration and seismic control equipment shall have the following responsibilities:

1) Determine vibration isolation and seismic restraint sizes and locations.

2) Provide equipment vibration isolation and seismic restraints as scheduled or specified.

3) Guarantee specified isolation system deflections.

4) Provide installation instructions, drawings and field supervision to insure proper installation and performance of systems.

b. Manufacturer's working in this section must provide a seismic design errors and omissions insurance certificate with their bid to certify their ability to provide engineering and design as required by this section.

5. Quality Assurance

a. All vibration isolators shall have calibration markings or some method to determine the actual deflection under the imposed load after installation and adjustment.

b. All isolators shall operate within the linear portion of their load vs. deflection curves. Load vs. deflection curves shall be furnished by the manufacturer and must be linear over a deflection range of not less than 50% above the design deflection.

c. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than +10%.

d. Substitution of internally isolated and restrained equipment in lieu of the isolation and restraints specified in this section is acceptable provided all conditions of this section are met. The equipment manufacturer shall provide a letter of guarantee stamped and certified per paragraph A.2 stating that the specified noise and vibration levels will be obtained and that the restraints are in compliance with these specifications or all costs of converting to the specified external vibration isolation and/or restraints shall be born by the equipment manufacturer.

e. The following specifications describe spring hangers with 30 degree misalignment feature. This requirement is mandatory. The Contractor shall replace any hangers without the 30 degree capability discovered on site at no additional cost to Owner.

B. Products

1. Description

a. All vibration isolation and seismic devices shall be the product of a single manufacturer.

b. Acceptable manufacturers of vibration isolation products shall be: Mason Industries, Amber Booth Company, Peabody Noise Control, Korfund Dynamics Corporation, Vibration Mountings and Equipment, or Vibration Eliminator Co. provided they meet the requirements of this specification. Mason Industries model numbers have been used in this specification to establish quality of components. Products of the other listed manufacturers are acceptable provided their systems strictly comply with intent, structural design, performance and deflections of the base manufacturer.

2. Seismic Restraints and Vibration Isolation Types

a. General

1) Shall be capable of accepting, without failure, one-half "G" external forces, one "G" for life safety equipment. Shall maintain the equipment in a captive position, and not short circuit isolation during normal operating conditions. Isolators shall have provisions for bolting and welding to the structure.

2) Attachment plates to be cast into housekeeping pads, concrete inserts, beam clamps, etc. that may be required for seismic compliance, shall be provided by this section.

3) Housekeeping pad attachment shall be designed and certified by this section. Materials and labor required shall be by the concrete section of these specifications.

b. Seismic Restraints

1) Type I: Shall comply with general characteristics of spring isolator Type A with the following additional features. Isolator shall incorporate snubbing restraint in all directions, and be capable of supporting equipment at fixed elevations during installation, and have a one "G" rating. Cast or aluminum housings, except ductile iron, are not acceptable.

a) Mason Ind. type SSLFH.

2) Type II: Each corner or side of equipment base shall incorporate a seismic restraint having a minimum of 5/8" thick, all directional resilient pad limit stop. Restraints shall be fabricated of plate, structural members or square metal tubing. Angle bumpers are not acceptable. Isolator shall have a one "G" acceleration rating.

a) Mason Ind. Type Z-1011 or Z-1225.

3) Type III: Multiple metal cable type with approved fastening devices to equipment and structure. System to be field bolted to deck or overhead

structural members using two sided beam clamps or appropriately designed inserts for concrete. All parts of the system including cables, and excluding fasteners are to be of a single supplier to assure seismic compliance.

a) Mason Ind. Type SCB Seismic Restraining System

4) Type IV: Double deflection neoprene isolator (min. 0.3") encased in ductile iron or steel casing. Isolator shall have one "G" acceleration rating.

a) Mason Ind. Type BR or RBA.

5) Type V: Non-isolated equipment shall be field bolted or welded (powder shots not acceptable) to the structures as required to meet seismic forces. Bolt diameter, imbedment data, and/or weld length must be shown in certified calculations as required by paragraph A.2 above.

c. Vibration Isolators

1) Type A: Spring Isolator

a) Having a minimum OD to OH of 0.8:1.

b) Corrosion resistance were exposed to corrosive environment with:

2) (Springs cadmium plated or electro-galvanized.

3) (Hardware cadmium plated.

4) (All other metal parts hot-dip galvanized.

a) Reserve deflection (from loaded to solid height) of 50% of rated deflection.

b) Minimum ¼" thick neoprene acoustical base pad on underside, unless designed otherwise.

c) Designed and installed so that ends of springs remain parallel.

d) Non-resonant with equipment forcing frequencies or support structure natural frequency.

e) Mason Ind. Type SLF.

f) NOTE: SEISMIC RESTRAINT II must be used with type A spring isolator.

5) Type B: Spring isolator shall be the same as Type A with the following additional features:

a) Built-in vertical limit stops with minimum ¼" clearance under normal operation.

b) Tapped holes in top plate for bolting to equipment.

c) Capable of supporting equipment at a fixed elevation during equipment installation. Installed and operating heights shall be identical.

d) Adjustable and removable spring pack with separate neoprene isolation pad.

e) Housing rated to accept one "G" Acceleration.

f) Mason Ind. Type SLR.

g) NOTE: Type B spring isolator must be bolted or welded to the structure.

6) Type C: Spring hanger rod isolator.

a) Spring element (type A) seated on a steel washer within a neoprene cup incorporating a rod isolation bushing.
b) Steel retainer box encasing the spring and neoprene cup.
c) When used on ductwork, provide eyebolts for attachment to duct straps.
d) Spring diameter and hanger box lower hole size shall allow 30 degree hanger rod misalignment.
e) Mason Ind. Type 30, W30.
f) NOTE: MUST BE USED WITH SEISMIC RESTRAINT III

7) Type D: Same as SEISMIC RESTRAINT IV.
8) Type E: Elastomer hanger rod isolator.
   a) Molded (min. 1-3/4" thick) neoprene element with projecting busing lining the rod clearance hole. Static deflection at rated load shall be a minimum of 0.35".
   b) Steel retainer box encasing neoprene mounting capable of supporting equipment up to four times the rated capacity of the element.
   c) Mason Ind. Type HD.
   d) NOTE: SEISMIC RESTRAINT III must be used with Type E hanger rod isolator.
9) Type F: Combination Spring/Elastomer hanger rod isolator.
   a) Spring and neoprene elements in a steel retainer box with the features as described for Type C and E isolators.
   b) Mason Ind. Type 30N.
   c) NOTE: SEISMIC RESTRAINT III must be used with Type F hanger rod isolator.
10) Type G: Pad type elastomer isolator.
   a) 0.75" minimum thickness, 50 psi maximum loading, ribbed or waffled design.
   b) Minimum 0.1" deflection.
   c) 1/16" galvanized steel plate between multiple pad layers.
   d) Load distribution plate where attachment to equipment bearing surface is less than 75% of the pad area. (Type "GM")
   e) Mason Ind. Type Super W pad.
   f) NOTE: Bolting required for seismic compliance. Neoprene and duck washers and bushings shall be provided to prevent short circuiting.
11) Type H: Pad type elastomer isolator.
   a) Laminated canvas duck and neoprene, maximum loading 1000 psi, minimum ½" thick.
   b) Load distribution plate where attachment to equipment bearing surface is less than 75% of the pad area. (Type "HM")
   c) Mason Ind. Type HL pad.

d) NOTE: Bolting required for seismic compliance. Neoprene and duck washers and bushings shall be provided to prevent short circuiting.

12) Type I: Thrust restraints.
    a) A spring element similar to Type A isolator shall be combined with steel angles, backup plates, threaded rod, washers and nuts to produce a pair of devices capable of limiting movement of air handling equipment to ¼".
    b) Restraint shall be easily converted in the field from a compression type to tension type.
    c) Unit shall be factory precompressed.
    d) Thrust restraints shall be installed on all cabinet fan heads, axial or centrifugal fans whose thrust exceeds 10% of unit weight.
    e) Mason Ind. Type WB
13) Type J: Steel Rails.
    a) Steel members of sufficient strength to prevent equipment flexure during operation.
    b) Height saving brackets as required to reduce operating height.
    c) Mason Ind. Type ICS or R.
14) Type K: Pipe anchors.
    a) All directional acoustical pipe anchor, consisting of a telescopic arrangement of two sizes of steel tubing separated by a minimum of ½" thickness of Type H pad.
    b) Vertical restraints shall be provided by a similar material arranged to prevent vertical travel in either direction.
    c) Allowable loads on isolation materials shall not exceed 500 psi and the design shall be balanced for equal resistance in any direction.
    d) Must be bolted or welded to meet seismic criteria.
    e) Mason Ind. Type ADA
15) Type L: Isolated clevis hanger.
    a) Combination clevis or rod roller hanger and a Type C, (LC) E, (LE) or F, (LF) isolation hanger.
    b) System shall be precompressed to allow for rod insertion and standard leveling.
    c) Mason Ind. Type CIH
16) Type M: Flashable restrained isolator
    a) Shall have all features of Type B isolator.
    b) Shall have waterproof spring covers for adjustment or removal of springs.
    c) Unit shall have a structural top plate for welding or bolting of supplementary support steel.
    d) Isolator shall accept 2" roofing insulation and be flashed directly into the waterproofing membrane.

e) To be complete with wood nailer and flashing.

f) Mason Ind. Type REVRS

3. Equipment Bases

a. General

1) All curbs and roof rails are to be bolted or welded to the building steel or concrete deck to attain acceleration criteria and shall be wind restrained for 100 mph wind loads.

b. Type B-1: Integral Structural Steel Base.

1) Reinforced as required to prevent base flexure at equipment startup and misalignment of driver and driven units. Centrifugal fan bases shall be complete with motor slide rails and drilled for driver and driven units.

2) Height saving brackets as required to reduce operating height.

3) Member depth shall be a minimum of 1/10 of the longest unsupported span.

4) Mason Ind. Type M, WF

5) NOTE:RESTRAINT I, II or IV must be used with Type B-1 base.

c. Type B-2: Concrete Inertia Base

1) Rectangular structural concrete forms for floating foundations. Base for split case pumps shall be large enough to support elbows. The base depth shall be a minimum of 1/12 the longest span, but not less than 6" or greater than 14". Forms shall include concrete reinforcement consisting of ½" bars or angles welded in place on 6" centers both ways. A layer 1½" above the bottom and an additional top layer of reinforcing for all bases exceeding 120" in one direction. Isolators shall be set into pocket housings which are an integral part of the base construction and set at the proper height to maintain 2" clearance below the base. Base shall be furnished with templates and anchor bolt sleeves.

a) Mason Ind. Type K, BMK, or KIPWF

b) NOTE: RESTRAINT I, II, or IV must be used with Type B-2 base.

d. Type B-4: Flashable Roof Rail System

1) Rooftop fans, condensing units, air handlers, etc., shall be mounted on continuous support piers that combines equipment support and isolation into one assembly.

2) Rails shall incorporate Type A isolators which are adjustable, removable and interchangeable after equipment has been installed.

3) The system shall maintain the same installed and operating height with or without the equipment load.

4) The system shall have full plywood nailers on all four sides, designed to accept membrane waterproofing and shall be dry galvanized or plastic coated.

5) Unit shall be supplied with flashing.

6) Curbs shall be Mason Ind. Type R-7000 having a minimum 3" rated static deflection.

e. Type B-5: Roof Rail Base
   1) Rails shall be constructed from structural steel angles as required to prevent flexure and misalignment under load.
   2) Each rail shall be the full length of the supported equipment and be welded to a series of Type B isolators. Bolt-on angle cross ties at the ends and center shall form one rigid platform.
   3) Roof Rail Type TRSLR

f. Type B-6: Non-isolated Roof Curb
   1) Non-isolated, curb mounted rooftop equipment shall be mounted on structural curbs that meet the one "G" acceleration criteria.
   2) Curbs shall accept standard 2" roof insulation.
   3) Curb shall be Mason Ind. Type B-6000.

g. Type B-7: Computer Room Unit Base
   1) Computer room AC units shall be welded or bolted to welded structural steel stands having a minimum ½ "G" certified lateral acceleration capabilities.
   2) Stand shall have +2" of adjustment to accommodate floor irregularities.
   3) Bolting or welding required to meet seismic criteria.
   4) Base shall be Mason Ind. Type CRFS-1.

4. Flexible Connectors

a. All connectors shall be installed on the equipment side of shut-off valves, horizontal and parallel to shafts whenever possible.

b. Type FC-1: Elastomer Connector
   1) Manufactured of nylon tire cord and EPDM, both molded and cured in hydraulic presses.
   2) Straight connectors to have two (2) spheres reinforced with a molded-in, external ductile iron ring between the spheres.
   3) Rated at 250 psi/170°F, dropping in a straight line to 170 psi/250°F for sizes 1½" to 12".
   4) Sizes 10" and 12" at 200 psi and greater operating pressure, to employ control cables with neoprene end fittings isolated from anchor plates by means of ½" bridge bearing neoprene bushings.
   5) Connectors shall be pre-extended per manufacturer's recommendations to prevent elongation under pressure.
   6) Minimum safety factor of 3.6:1 at maximum pressure ratings shall be certified by test reports. Submittals shall also include two test reports by independent consultants showing minimum reduction of 20 Db in vibration accelerations and 10 Db in sound pressure levels at typical blade passage frequencies.
   7) Connectors bolted to victaulic or approved equal type couplings or gate, butterfly or check valves to have a minimum 5/8" flange spacer installed between the connector and the coupling flange.
   8) Neoprene in lieu of EPDM is not acceptable.

c. Mason Ind. Super-Flex Types: MFTNC or MFTFU.

d. Type FC-2: Flexible stainless steel hose.

1) Stainless steel hose and braid rated with 3:1 safety factor.

2) 2" and smaller with male nipples, 2-1/2" and larger with fixed steel flanges.

3) Lengths as follows:

1/2 x 9	2-1/2 x 12	10 x 26
3/4 x 10	3 x 14	12 x 28
1 x 11	4 x 15	14 x 30
1-1/4 x 12	5 x 19	16 x 32
1-1/2 x 13	6 x 20	
2 x 14	8 x 22	

4) Mason Ind. Type BSS, or as approved.

e. Type FC-3: Unbraided exhaust hose.

1) Low pressure stainless steel angularly corrugated with flanged ends.

2) Maximum temperature of 1500 degrees F.

3) Lengths as follows:

2-1/2 x 15	8 x 22
3 x 16	10 x 26
4 x 17	12 x 28
5 x 18	14 x 30
6 x 19	16 x 32

4) Mason Ind. Type SDL-RF, or as approved.

f. Type FC-4: Bronze braided flexible hose.

1) Bronze hose and braid rated with a minimum 3:1 safety factor. (Minimum 150 PSI).

2) Copper tube ends.

3) Lengths as follows:

1/8 x 7-1/2	3/4 x 11-1/2	3 x 27
1/4 x 8-1/4	1-1/4 x 14-3/4	3-1/2 x 32
3/8 x 9	1-1/2 x 17	4 x 33
1/2 x 9-3/4	2 x 20	5 x 41
5/8 x 10	2-1/2 x 2	46 x 48

4) Mason Ind. Type BFF, or as approved.

C. Execution

1. General

a. Isolation and seismic restraint system must be installed in strict accordance with the manufacturer's written instructions. Vibration isolators shall not cause any change of position of equipment resulting in stress on equipment connections.

2. Equipment Installation

a. Equipment shall be isolated and restrained as per Table A in this section.

b. Place floor mounted equipment on 4" high concrete housekeeping pads properly doweled or expansion shielded to the deck to meet acceleration criteria. Mount vibration isolators and/or bases on housekeeping pads.

c. Additional Requirements

1) The minimum operating clearance under inertia bases shall be 2".

2) The minimum operating clearance under other bases shall be 1".

3) All bases shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine, isolators and restraints.

4) The isolators shall be installed without raising the equipment.

5) After the entire installation is complete, and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. When the isolators are properly adjusted the blocks shall be barely free and shall be removed. Remove all debris from beneath the equipment and verify that there are no short circuits of the isolation. The equipment shall be free in all directions.

6) Install equipment with flexibility in wiring.

3. Piping and Ductwork Isolation

a. All piping and ductwork is included in this section.

b. Installation

1) Isolate the following piping and ductwork outside of shafts:

a) All water and steam piping in mechanical rooms.

b) Piping exposed on roof.

c) Water piping and ductwork within 50 ft. or 100 pipe diameters (whichever is greater) from connected rotating or reciprocating equipment and pressure reducing stations.

d) Control air piping, from compressor discharge to receiver.

c. The isolators shall be installed with the hanger box attached to, or hung as closely as possible to the structure.

d. The isolators shall be suspended from substantial structural members sized for 0.08" deflection at center of span, not from slab diaphragm, unless specifically permitted.

e. Hanger rods shall not short circuit the hanger box.

f. Horizontal suspended pipe 1¼" to 2" and all steam piping shall be suspended by Type E isolators with a minimum 3/8" deflection. Water pipe larger than 2" shall be supported by Type F isolators with a minimum 0.75" deflection or same deflection as equipment for the first three locations nearest equipment whichever is greater.

1) Type L hangers may be substituted for the above.

g. Ductwork shall be supported by Type C hangers with 1" minimum deflection.

h. Horizontal floor and roof supported pipe shall be the same as C.3.f except use isolator Type D and Type A, respectively.

i. Vertical riser pipe supports under 2" diameter shall utilize type H isolation.

j. Vertical riser guides, if required shall avoid direct contact of piping with the building.

k. Pipe anchors or guides where required, shall utilize Type K isolators.

l. Riser sway supports, where required, shall utilize two (2) neoprene elements (Type G or H) to accommodate tension and compression forces.

m. Install TYPE FC-1 (FC-4 for freon) flexible connectors at all connections of pipe to equipment such as pumps and as shown on the drawings.

n. Install FC-2, FC-3 or FC-4 type connectors only at locations which exceed temperature or service (such as gas, fuel oil or freon) limitations of FC-1.

o. For control air piping, provide two flexible connectors Type FC-2 90 degrees to each other in the compressor discharge piping to the receiver. When the receiver is remote from the compressor, isolate the piping between the compressor and receiver with Type C isolators having 3/8" deflection. The receiver shall be isolated with Type D isolators having 3/8" deflection.

4. Seismic Restraints

a. Installation

1) All floor mounted equipment whether isolated or not shall be bolted or welded to the structure to allow for required acceleration. Bolt points, diameter of inserts, imbedment depth and weld length as shown on the approved submittal drawings shall be followed in all respects.

2) All suspended equipment shall be four point independently braced with Type III restraints, installed taught for non-isolated equipment, piping or ductwork and slack with ½" cable deflection for isolated equipment.

a) Piping, Schedule 10, 20 or 40 weld or Victaulic or approved equal braced at a maximum of 40 foot intervals and at turns of more than 4 feet.

b) Piping, lateral bracing at 80 foot intervals.

c) No-hub piping to be braced at 20 foot intervals (or 40 foot using appropriately rated seismic couplings) as required.

d) Ductwork to be braced a maximum of every 40 feet and at every turn and at run ends. Lateral bracing shall be every 60 feet.

3) Seismic restraints are not required on the following:

a) Gas piping less than 1" ID.

b) Piping in mechanical equipment room less than 1¼" ID.

c) Other piping less than 2½" ID.

d) All rectangular ducts less than 6 sq. ft. in cross sectional area.

e) All round ducts less than 28" diameter.

f) All clevis hung pipe suspended by individual hangers 12" in length (6" in length for fire protection mains) or less from the top of the pipe support to the bottom of the support for the hanger.

g) All top supported ducts suspended by hangers 12" or less in length from the top of the duct to the bottom of the support for the hanger.

4) Chimneys and stacks passing through floors are to be bolted at each floor level or secured above and below each floor with riser clamps.

5) Chimneys and stacks running horizontally to be braced every 30 feet with Type III restraint.

6) Where base anchoring of equipment is insufficient to resist seismic forces, restraints such as Type III shall be located above the units center of gravity to suitably resist "G" forces.

7) NOTE: Vertically mounted tanks may require this additional restraint.

8) For overhead support equipment, overstress of the building structure must not occur. Bracing may occur from:

a) Flanges and structural beams.

b) Upper or lower truss chords in bar joists.

c) Cast in place inserts or drilled and shielded inserts in concrete structures.

9) Pipe risers through cored shafts require no additional seismic bracing. (Core diameters to be a maximum of 2" larger than pipe OD.)

b. Non-isolated Equipment Installation

1) HVAC

a) All ceiling suspended pipe and duct not excluded by diameter or distance from structure allowances.

2) Restraint Type III or V

a) All ceiling suspended equipment including but not limited to tanks, stacks and VAV boxes.

3) Restraint Type III or V

a) NOTE: If VAV units are rigidly attached to duct (no flex) they shall be considered ductwork.

b) All diffusers in acoustical tile ceilings to be four point independently cable braced unless ceiling meets seismic Zone 2 requirements. In such case earthquake clips, or other approved means of positive attachment shall secure fixture to T-bar structure.

4) Restraint Type III

a) All floor mounted equipment and tanks.

5) Restraint Type III or V

a) Computer room AC units. Bolted to floor mounted stands that are in turn bolted to deck.

6) Base Type B-7

a) Roof (curb) mounted, AC, H&V units, or fans to be mounted on seismically rated curbs.

7) Base Type B-6

5. Inspection

a. Upon completion of installation of all vibration isolation devices, the local representative shall inspect the completed project and certify in writing to the Contractor that all systems are installed properly, or require correction. The contractor shall submit a report to Owner's Project Manager, including the representative's report. Certify correctiveness of the installation or detailing corrective work to be done.

TABLE A

			ON GRADE				ABOVE GRADE			
EQUIPMENT	HP	MTNG	ISOL	DEFL	BASE	RESTR	ISOL	DEFL	BASE	RESTR
Axial Fans		Flr Clg	D -	.30 - -	-- --	IV -	A** F	See Guide	-- --	I, II I, II
Base Mounted Pumps	to 15 > 15	Flr Flr	D D	.30 .30	B-2 B-2	IV IV	A A	.75 1.50	B-2 B-2	I, II I, II
Boilers		Flr	GM	.10	--	V	B	.75	--	V
Cabinet Fans &	To 1	Flr Clg	D -	.30 - -	-- --	IV -	D F	.35 35	-- --	IV III
Packaged A.H.U.	> 1	Flr Clg	A -	.75 - -	-- --	I,II -	A** F	See Guide	-- --	I,II III
Centrif. Fans Arr. 1 & 3		Flr Clg	D -	.30 - -	B-1 ***	IV -	A** F	See Guide	B-1 ***	I, II III
Arr. 9 & 10		Flr Clg	D -	.30 - -	J --	IV -	A** F	See Guide	J J	I, II III
Curb Mtd. Equip.		Roof	-	--	--		-	--	B-6	V
Unit/Cab. Heaters		Clg	-	--	--	-	E	.30	--	III

*Used on vertically arranged units. Rails to be 1-1/2 times the unit height.

** Substitute TYPE B isolator for roof installations.

***Substitute TYPE B-2 base for Class 2 & 3 fans.

DEFL. GUIDE	
RPM	DEFL
< 400 < 600 > 600	3.5" 2.5 1.5

A. NOTES:

6. "ISOL" AND "BASE" COLUMN INDICATES LETTER TYPE AS APPEARS IN THE SPECS.
7. "MTNG" REFER TO METHOD OF SUPPORT OF EQUIPMENT FROM THE STRUCTURE.
8. "SEE GUIDE" INDICATES ISOLATOR DEFLECTION SELECTION TO BE TAKEN FROM RPM/DEFLECTION GUIDE AT BOTTOM OF TABLE.

2.17 AUTOMATIC TEMPERATURE CONTROLS

A. BMS Description

1. Provide a new automatic temperature control systems. The system shall be DDC type with full remote access capabilities to the BMS. Control down to the terminal unit shall be DDC.
2. The BMS programming shall control occupied, partial occupancy and unoccupied operation of HVAC systems to reduce or shut-off ventilation air, exhaust air, fan systems, etc. The BMS shall control local room day/night set point temperatures and shall monitor local space temperature and occupant adjusted set points.
3. Direct Digital Control of the mechanical systems shall be performed by a field programmable microprocessor-based direct digital controller (DDC), which incorporates closed loop control algorithms, all necessary energy management functions, and provides for digital display and convenient local adjustments of desired variables at the controller cabinet.
4. A minimum of one DDC panel will be provided in each building/area to provide local monitoring and operator control of the system. Systems which require the existing user-defined data base to be reentered through the operator's terminal after a failure or power interruption shall not be acceptable.
5. The following energy management routines shall be employed wherever possible:
   a. Start/stop time optimization
   b. Duty cycling (temperature compensated)
   c. Enthalpy based economizer control
   d. Supply air reset
   e. Outdoor air reset
   f. Event initiated programs
   g. Simultaneous heating and cooling monitoring
6. All control functions shall be executed within the control unit. University personnel shall be able to customize control strategies and sequences of control, and shall be able to

define appropriate control loop algorithms and choose the optimum loop parameters for loop control. Control loops shall support any of the following control modes:

a. Two position

b. Proportional

c. Proportional plus integral

d. Proportional plus integral plus derivative

7. In addition, the University shall be able to create customized control strategies based upon arithmetic, Boolean, or time delay logic. The arithmetic functions shall permit simple relationships between variables (+, -, x, ÷) as well as more complex relationships, e.g., square root and exponential. If the controller is configured by anything other than the creation of a source language program, such as by the use of a menu-driven prompt and response program, by the filling-in of a computer generated template, or by the use of graphical programming tools, the Contractor shall likewise provide all software necessary to carry out the configuration process.

8. All inputs to the DDC shall be available for remote monitoring by the University EMS. A scan by the EMS shall identify all alarm conditions and clock functions in a manner compatible with the EMS software.

9. All temperature control strategies and energy management routines for any DDC on the network shall be accessible by an operator or technician through a local operator's terminal, one of which shall be provided for each controller. The terminal shall be an integral key-pad and LED display or a hand-held terminal.

10. The system shall be provided complete with all equipment and documentation necessary to allow an operator to perform the functions listed below for the DDC to which the terminal is connected as well as any other DDC on the Campus network:

    a. Read the value of a measured variable

    b. Start or stop equipment

    c. Monitor the status of controlled equipment

    d. Read the set-point and tuning parameters of control loops

    e. Read all active alarms

11. To assist efficient operation and maintenance, provide equipment status and alarm monitoring system pressures, air filter differential pressure, air and water flow for large systems, VSD and fume hood monitor network connection. Match existing campus sequences wherever possible. The designer will write sequences of operation for all equipment controlled by the HVAC control system. Please strive for simplicity while providing accurate control of temperature and ventilation with minimum energy consumption.

12. The Building Management System (BMS) shall be a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the

owner's IT staff to ensure that the FMS will perform in the owner's environment without disruption to any of the other activities taking place on that LAN.

13. All points of user interface shall be on standard PCs that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser.

14. The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specifications together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.

15. The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.

16. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.

17. Manage and coordinate the BMS work in a timely manner in consideration of the Project schedules. Coordinate with the associated work of other trades so as to not impede or delay the work of associated trades.

18. The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:

    a. Operator information, alarm management and control functions.

    b. Enterprise-level information and control access.

    c. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.

    d. Diagnostic monitoring and reporting of BMS functions.

    e. Offsite monitoring and management access.

    f. Energy management

    g. Standard applications for terminal HVAC systems

    h. Demand Ventilation Control with CO2 Sensors.

    i. Integration with the HVAC unit and associated return/exhaust fan.

    j. Integration with the Laboratory Airflow Control System devices.

B. General Description

1. The Building Management System (BMS) shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third-party devices and

applications. The system shall be designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.

2. The Building Management System shall consist of the following:
   a. Standalone Network Automation Engine(s)
   b. Field Equipment Controller(s)
   c. Input/Output Module(s)
   d. Local Display Device(s)
   e. Portable Operator's Terminal(s)
   f. Distributed User Interface(s)
   g. Network processing, data storage and communications equipment
   h. Other components required for a complete and working BMS
3. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.
4. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
5. Acceptable Manufacturers
   a. Johnson Controls Inc, Metasys Extended Architecture
   b. Siemens
   c. Honeywell
   d. Or approved equal.

C. BMS Architecture

1. Automation Network
   a. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard “off the shelf” products available through normal PC vendor channels.
   b. The automation network shall be capable of operating at a communication speed of 100 Mbps, with full peer-to-peer network communication.
   c. Network Automation Engines (NAE) shall reside on the automation network.
   d. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.
2. Control Network

a. Network Automation Engines shall provide supervisory control over the control network and shall support all three (3) of the following communication protocols:
   1) BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9.
   2) LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).
   3) The Johnson Controls N2 Field Bus.

b. Control networks shall provide either "Peer-to-Peer," Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.

c. DDC Controllers shall reside on the control network.

d. Control network communication protocol shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.

e. A BACnet Protocol Implementation Conformance Statement shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.

f. The Conformance Statements shall be submitted 10 day prior to bidding.

3. Integration

a. Direct Protocol (Integrator Panel)
   1) The BMS system shall include appropriate hardware equipment and software to allow bi-directional data communications between the BMS system and 3rd party manufacturers' control panels. The BMS shall receive, react to, and return information from multiple building systems, including but not limited to the chillers, boilers, variable frequency drives, power monitoring system, and medical gas.
   2) All data required by the application shall be mapped into the Automation Engine's database, and shall be transparent to the operator.
   3) Point inputs and outputs from the third-party controllers shall have real-time interoperability with BMS software features such as: Control Software, Energy Management, Custom Process Programming, Alarm Management, Historical Data and Trend Analysis, Totalization, and Local Area Network Communications.

b. BACnet Protocol Integration - BACnet
   1) The neutral protocol used between systems will be BACnet over Ethernet and comply with the ASHRAE BACnet standard 135-2003.
   2) A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.
   3) The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

D. User Interface

1. Dedicated Web Based User Interface

a. Dedicated User Interface Architecture – The architecture of the computer shall be implemented to conform to industry standards, so that it can accommodate applications provided by the BMS Contractor and by other third party applications suppliers, including but not limited to Microsoft Office Applications. Specifically it must be implemented to conform to the following interface standards.
   1) Microsoft Internet Explorer for user interface functions
   2) Microsoft Office Professional for creation, modification and maintenance of reports, sequences other necessary building management functions
   3) Microsoft Outlook or other e-mail program for supplemental alarm functionality and communication of system events, and reports
   4) Required network operating system for exchange of data and network functions such as printing of reports, trends and specific system summaries.

b. Operating System Software
   1) Windows 10.
   2) Where user interface is not provided via browser, provide complete operator workstation software package, including any hardware or software keys. Include the original installation disks and licenses for all included software, device drivers, and peripherals.
   3) Provide software registration cards to the Owner for all included software.

2. Distributed Web Based User Interface

a. All features and functions of the dedicated user interface previously defined in this document shall be available on any computer connected directly or via a wide area or virtual private network (WAN/VPN) to the automation network and conforming to the following specifications.

b. The software shall run on the Microsoft Internet Explorer (6.0 or higher) browser.

c. Minimum hardware requirements:
   1) 256 MB RAM
   2) 2.0 GHz Clock Speed Pentium 4 Microprocessor.
   3) 40.0 GB Hard Drive.
   4) 1 Keyboard with 83 keys (minimum).
   5) SVGA 1024x768 resolution display with 64K colors and 16 bit color depth.
   6) Mouse or other pointing device

3. User Interface Application Components

a. Operator Interface
   1) An integrated browser based client application shall be used as the user operator interface program.
   2) All Inputs, Outputs, Setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.

3) The user interface software shall provide help menus and instructions for each operation and/or application.

4) All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.

5) The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:

   a) User access for selective information retrieval and control command execution

   b) Monitoring and reporting

   c) Alarm, non-normal, and return to normal condition annunciation

   d) Selective operator override and other control actions

   e) Information archiving, manipulation, formatting, display and reporting

   f) FMS internal performance supervision and diagnostics

   g) On-line access to user HELP menus

   h) On-line access to current FMS as-built records and documentation

   i) Means for the controlled re-programming, re-configuration of FMS operation and for the manipulation of FMS database information in compliance with the prevailing codes, approvals and regulations for individual FMS applications.

6) The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.

b. Navigation Trees

1) The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the networks.

2) Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.

3) The navigation trees shall be “dockable” to other displays in the user interface such as graphics. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar or closed altogether. A simple keystroke will reattach the navigation to the primary display of the user interface.

c. Alarms

1) Alarms shall be routed directly from Network Automation Engines to PCs and servers. It shall be possible for specific alarms from specific points to be

routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:

a) Log date and time of alarm occurrence.

b) Generate a "Pop-Up" window, with audible alarm, informing a user that an alarm has been received.

c) Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.

d) Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.

e) Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.

f) Any attribute of any object in the system may be designated to report an alarm.

2) The FMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions

3) The FMS shall annunciate application alarms at minimum, as required by Part 3.

d. Reports and Summaries

1) Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:

a) All points in the BMS

b) All points in each BMS application

c) All points in a specific controller

d) All points in a user-defined group of points

e) All points currently in alarm

f) All points locked out

g) All BMS schedules

h) All user defined and adjustable variables, schedules, interlocks and the like.

2) Summaries and Reports shall be accessible via standard UI functions and not dependent upon custom programming or user defined HTML pages.

3) Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.

4) The system shall allow for the creation of custom reports and queries via a standard web services XML interface and commercial off-the-shelf software such as Microsoft Access, Microsoft Excel, or Crystal Reports.

e. Schedules
   1) A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:
      a) Weekly schedules
      b) Exception Schedules
      c) Monthly calendars.
   2) Weekly schedules shall be provided for each group of equipment with a specific time use schedule.
   3) It shall be possible to define one or more exception schedules for each schedule including references to calendars
   4) Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.
   5) Changes to schedules made from the User Interface shall directly modify the Network Automation Engine schedule database.
   6) Schedules and Calendars shall comply with ASHRAE SP135/2003 BACnet Standard.
   7) Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.

f. Password
   1) Multiple-level password access protection shall be provided to allow the user/manager to user interface control, display, and database manipulation capabilities deemed appropriate for each user, based on an assigned password.
   2) Each user shall have the following: a user name (24 characters minimum), a password (12 characters minimum), and access levels.
   3) The system shall allow each user to change his or her password at will.
   4) When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.
   5) A minimum of five levels of access shall be supported individually or in any combination as follows:
      a) Level 1 = View Data
      b) Level 2 = Command
      c) Level 3 = Operator Overrides
      d) Level 4 = Database Modification
      e) Level 5 = Database Configuration
      f) Level 6 = All privileges, including Password Add/Modify
   6) A minimum of 100 unique passwords shall be supported.

7) Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.

8) The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.

g. Screen Manager - The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.

h. Dynamic Color Graphics

1) The graphics application program shall be supplied as an integral part of the User Interface. Browser or Workstation applications that rely only upon HTML pages shall not be acceptable.

2) The graphics applications shall include a create/edit function and a runtime function. The system architecture shall support an unlimited number of graphics documents (graphic definition files) to be generated and executed.

3) The graphics shall be able to display and provide animation based on real-time data that is acquired, derived, or entered.

4) Graphics runtime functions – A maximum of 16 graphic applications shall be able to execute at any one time on a user interface or workstation with 4 visible to the user. Each graphic application shall be capable of the following functions:

a) All graphics shall be fully scalable

b) The graphics shall support a maintained aspect ratio.

c) Multiple fonts shall be supported.

d) Unique background shall be assignable on a per graphic basis.

e) The color of all animations and values on displays shall indicate if the status of the object attribute.

5) Operation from graphics – It shall be possible to change values (setpoints) and states in system controlled equipment by using drop-down windows accessible via the pointing device

6) Graphic editing tool – A graphic editing tool shall be provided that allows for the creation and editing of graphic files. The graphic editor shall be capable of performing/defining all animations, and defining all runtime binding.

a) The graphic editing tool shall in general provide for the creation and positioning of point objects by dragging from tool bars or drop-downs and positioning where required.

b) In addition, the graphic editing tool shall be able to add additional content to any graphic by importing backgrounds in the SVG, BMP or JPG file formats.

7) Aliasing – Many graphic displays representing part of a building and various building components are exact duplicates, with the exception that the various variables are bound to different field values. Consequently, it shall be possible to bind the value of a graphic display to aliases, as opposed to the physical field tags.

i. Historical trending and data collection

1) Each Automation Engine shall store trend and point history data for all analog and digital inputs and outputs, as follows:

a) Any point, physical or calculated, may be designated for trending. Three methods of collection shall be allowed:

(1). Defined time interval

(2). Upon a change of value

2) Each Automation Engine shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.

a) Trend and change of value data shall be stored within the engine and uploaded to a dedicated trend database or exported in a selectable data format via a provided data export utility. Uploads to a dedicated database shall occur based upon one of the following: user-defined interval, manual command, or when the trend buffers are full. Exports shall be as requested by the user or on a time scheduled basis.

b) The system shall provide a configurable data storage subsystem for the collection of historical data. Data can be stored in either Microsoft Access or SQL database format.

j. Trend data viewing and analysis

1) Provide a trend viewing utility that shall have access to all database points.

2) It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.

3) The trend viewing utility shall have the capability to define trend study displays to include multiple trends

4) Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as ranging, color, and plot style.

5) Display magnitude and units shall both be selectable by the operator at any time without reconfiguring the processing or collection of data. This is a zoom capability.

6) Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.

7) Trend studies shall be capable of calculating and displaying calculated variables including highest value, lowest value and time based accumulation.

E. Network Automation Engines (NAE)

1. Provide new SNE controllers. Outdated NAE controllers shall not be accepted.
2. The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Automation Engines.
3. Automation network – The NAE shall reside on the automation network and shall support a subnet of system controllers.
4. User Interface – Each NAE shall have the ability to deliver a web based User Interface (UI) as previously described. All computers connected physically or virtually to the automation network shall have access to the web based UI.
    a. The web based UI software shall be imbedded in the NAE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.
    b. The NAE shall support up four (4) concurrent users.
    c. The web based user shall have the capability to access all system data through one NAE.
    d. Remote users connected to the network through an Internet Service Provider (ISP) or telephone dial up shall also have total system access through one NAE.
    e. Systems that require the user to address more than one NAE to access all system information are not acceptable.
    f. The NAE shall have the capability of generating web based UI graphics. The graphics capability shall be imbedded in the NAE.
    g. Systems that support UI Graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.
    h. The web based UI shall support the following functions using a standard version of Microsoft Internet Explorer:
        1) Configuration
        2) Commissioning
        3) Data Archiving
        4) Monitoring
        5) Commanding
        6) System Diagnostics
    i. Systems that require workstation software or modified web browsers are not acceptable.
    j. The NAE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.
5. Processor – The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor.

Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.

6. Memory – Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
7. Hardware Real Time Clock – The NAE shall include an integrated, hardware-based, real-time clock.
8. The NAE shall include troubleshooting LED indicators to identify the following conditions:
    a. Power - On/Off
    b. Ethernet Traffic – Ethernet Traffic/No Ethernet Traffic
    c. Ethernet Connection Speed – 10 Mbps/100 Mbps
    d. FC Bus – Normal Communications/No Field Communications
    e. Peer Communication – Data Traffic Between NAE Devices
    f. Run – NAE Running/NAE In Startup/NAE Shutting Down/Software Not Running
    g. Bat Fault – Battery Defective, Data Protection Battery Not Installed
    h. Fault – General Fault
    i. Modem RX – NAE Modem Receiving Data
    j. Modem TX – NAE Modem Transmitting Data
9. Communications Ports – The NAE shall provide the following ports for operation of operator Input/Output (I/O) devices, such as industry-standard computers, modems, and portable operator's terminals.
    a. Up to two (2) USB port
    b. Up to two (2) URS-232 serial data communication port
    c. Up to two (2) RS-485 port
    d. One (1) Ethernet port
10. Diagnostics – The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
11. Power Failure – In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.
    a. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.

b. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.

12. Certification – The NAE shall be listed by Underwriters Laboratories (UL).

13. Controller network – The NAE shall support the following communication protocols on the controller network:

a. The NAE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.

1) A BACnet Protocol Implementation Conformance Statement shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.

2) The Conformance Statements shall be submitted 10 day prior to bidding.

3) The NAE shall support a minimum of 100 control devices.

b. The NAE shall support LonWorks enabled devices using the Free Topology Transceiver FTT10.

1) All LonWorks controls devices shall be LonMark certified.

2) The NAE shall support a minimum of 255 LonWorks enabled control devices.

c. The NAE shall support the Johnson Controls N2 Field Bus.

1) The NAE shall support a minimum of 100 N2 control devices.

2) The Bus shall conform to Electronic Industry Alliance (EIA) Standard RS-485.

3) The Bus shall employ a master/slave protocol where the NAE is the master.

4) The Bus shall employ a four (4) level priority system for polling frequency.

5) The Bus shall be optically isolated from the NAE.

6) The Bus shall support the Metasys Integrator System.

F. Field Equipment Controller (FEC)

1. Provide new CGM controllers. Outdated FEC controllers shall not be accepted.

2. The Field Equipment Controller (FEC) shall be a fully user-programmable, digital controller that communicates via BACnet MS/TP protocol.

3. The FEC shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.

4. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.

5. The FEC shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

6. The FEC shall include a removable base to allow pre-wiring without the controller.

7. The FEC shall include troubleshooting LED indicators to identify the following conditions:
    a. Power On
    b. Power Off
    c. Download or Startup in progress, not ready for normal operation
    d. No Faults
    e. Device Fault
    f. Field Controller Bus - Normal Data Transmission
    g. Field Controller Bus - No Data Transmission
    h. Field Controller Bus - No Communication
    i. Sensor-Actuator Bus - Normal Data Transmission
    j. Sensor-Actuator Bus - No Data Transmission
    k. Sensor-Actuator Bus - No Communication
8. The FEC shall accommodate the direct wiring of analog and binary I/O field points.
9. The FEC shall support the following types of inputs and outputs:
    a. Universal Inputs - shall be configured to monitor any of the following:
        1) Analog Input, Voltage Mode
        2) Analog Input, Current Mode
        3) Analog Input, Resistive Mode
        4) Binary Input, Dry Contact Maintained Mode
        5) Binary Input, Pulse Counter Mode
    b. Binary Inputs - shall be configured to monitor either of the following:
        1) Dry Contact Maintained Mode
        2) Pulse Counter Mode
    c. Analog Outputs - shall be configured to output either of the following
        1) Analog Output, Voltage Mode
        2) Analog Output, current Mode
    d. Binary Outputs - shall output the following:
        1) 24 VAC Triac
    e. Configurable Outputs - shall be capable of the following:
        1) Analog Output, Voltage Mode
        2) Binary Output Mode
10. The FEC shall have the ability to reside on a Field Controller Bus (FC Bus).
    a. The FC Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.

b. The FC Bus shall support communications between the FECs and the NAE.

c. The FC Bus shall also support Input/Output Module (IOM) communications with the FEC and with the NAE.

d. The FC Bus shall support a minimum of 100 IOMs and FEC in any combination.

e. The FC Bus shall operate at a maximum distance of 15,000 Ft. between the FEC and the furthest connected device.

11. The FEC shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus).

a. The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.

b. The SA Bus shall support a minimum of 10 devices per trunk.

c. The SA Bus shall operate at a maximum distance of 1,200 Ft. between the FEC and the furthest connected device.

12. The FEC shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the FC Bus or the SA Bus.

13. The FEC shall support, but not be limited to, the following:

a. Hot water, chilled water/central plant applications

b. Built-up air handling units for special applications

c. Terminal units

d. Special programs as required for systems control

G. Input/Output Module (IOM)

1. The Input/Output Module (IOM) provides additional inputs and outputs for use in the FEC.

2. The IOM shall communicate with the FEC over either the FC Bus or the SA Bus using BACnet Standard protocol SSPC-135, Clause 9.

3. The IOM shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.

4. The IOM shall have a minimum of 4 points to a maximum of 17 points.

5. The IOM shall support the following types of inputs and outputs:

a. Universal Inputs - shall be configured to monitor any of the following:

1) Analog Input, Voltage Mode

2) Analog Input, Current Mode

3) Analog Input, Resistive Mode

4) Binary Input, Dry Contact Maintained Mode

5) Binary Input, Pulse Counter Mode

b. Binary Inputs - shall be configured to monitor either of the following:
   1) Dry Contact Maintained Mode
   2) Pulse Counter Mode

c. Analog Outputs - shall be configured to output either of the following
   1) Analog Output, Voltage Mode
   2) Analog Output, current Mode

d. Binary Outputs - shall output the following:
   1) 24 VAC Triac

e. Configurable Outputs - shall be capable of the following:
   1) Analog Output, Voltage Mode
   2) Binary Output Mode

6. The IOM shall include troubleshooting LED indicators to identify the following conditions:
   a. Power On
   b. Power Off
   c. Download or Startup in progress, not ready for normal operation
   d. No Faults
   e. Device Fault
   f. Normal Data Transmission
   g. No Data Transmission
   h. No Communication

H. Networked Thermostat (TEC)

1. The Networked Thermostats shall be capable of controlling the following:
   a. A four pipe fan coil system with multi-speed fan control.
   b. A pressure dependant Variable Air Volume System or similar zoning type system using reheat.
   c. A two pipe fan coil with a single speed fan.

2. The Networked Thermostat shall communicate over the Field Controller Bus using BACnet Standard protocol SSPC-135, Clause 9.
   a. The Networked Thermostat shall support remote read/write and parameter adjustment from the web based User Interfaceable through a Network Automation Engine.

3. The Networked Thermostat shall include an intuitive User Interface providing plain text messages.
   a. Two line, 8 character backlit display

b. LED indicators for Fan, Heat, and Cool status

c. Five (5) User Interface Keys
   1) Mode
   2) Fan
   3) Override
   4) Degrees C/F
   5) Up/Down

d. The display shall continuously scroll through the following parameters:
   1) Room Temperature
   2) System Mode
   3) Schedule Status – Occupied/Unoccupied/Override
   4) Applicable Alarms

4. The Networked Thermostats shall provide the flexibility to support the following inputs:
   a. Integral Indoor Air Temperature Sensor
   b. Duct Mount Air Temperature Sensor
   c. Remote Indoor Air Temperature Sensor with Occupancy Override and LED Indicator.
   d. Two configurable binary inputs
5. The Networked Thermostats shall provide the flexibility to support the following outputs:
   a. Three Speed Fan Control
   b. On/Off Control
   c. Floating Control
   d. Proportional (0 to 10V) Control
6. The Networked Thermostat shall provide a minimum of six (6) levels of keypad lockout.
7. The Networked Thermostat shall provide the flexibility to adjust the following parameters:
   a. Adjustable Temporary Occupancy from 0 to 24 hours
   b. Adjustable heating/cooling deadband from 2º F to 5º F
   c. Adjustable heating/cooling cycles per hour from 4 to 8
8. The Networked Thermostat shall employ nonvolatile electrically erasable programmable read-only memory (EEPROM) for all adjustable parameters.

I. Network Sensors (NS)

1. The Network Sensors (NS) shall have the ability to monitor the following variables as required by the systems sequence of operations:
   a. Zone Temperature

b. Zone humidity

c. Zone setpoint

2. The NS shall transmit the zone information back to the controller on the Sensor-Actuator Bus (SA Bus) using BACnet Standard protocol SSPC-135, Clause 9.

3. The Network Sensors shall include the following items:

a. A backlit Liquid Crystal Display (LCD) to indicate the Temperature, Humidity and Setpoint.

b. An LED to indicate the status of the Override feature.

c. A button to toggle the temperature display between Fahrenheit and Celsius.

d. A button to initiate a timed override command

4. The NS shall be available with either screw terminals or phone jack.

5. The NS shall be available in either surface mount or wall mount styles.

J. System Configuration Tool (SCT)

1. The Configuration Tool shall be a software package enabling a computer platform to be used as a stand-alone engineering configuration tool for a Network Automation Engine (NAE) or a Network Integration Engine (NIE).

2. The configuration tool shall provide an archive database for the configuration and application data.

3. The configuration tool shall have the same look-and-feel at the User Interface (UI) regardless of whether the configuration is being done online or offline.

4. The configuration tool shall include the following features:

a. Basic system navigation tree for connected networks

b. Integration of Metasys N1, LonWorks, and BACnet enabled devices

c. Customized user navigation trees

d. Point naming operating parameter setting

e. Graphic diagram configuration

f. Alarm and event message routing

g. Graphical logic connector tool for custom programming

h. Downloading, uploading, and archiving databases

5. The configuration tool shall have the capability to automatically discover field devices on connected buses and networks. Automatic discovery shall be available for the following field devices:

a. BACnet Devices

b. LonWorks devices

c. N2 Bus devices

d. Metasys N1 networks

6. The configuration tool shall be capable of programming the Field Equipment Controllers.
   a. The configuration tool shall provide the capability to configure, simulate, and commission the Field Equipment Controllers.
   b. The configuration tool shall allow the FECs to be run in Simulation Mode to verify the applications.
   c. The configuration tool shall contain a library of standard applications to be used for configuration.
7. The configuration tool shall be capable of programming the field devices.
   a. The configuration tool shall provide the capability to configure, simulate, and commission the field devices.
   b. The configuration tool shall allow the field devices to be run in Simulation Mode to verify the applications.
   c. The configuration tool shall contain a library of standard applications to be used for configuration
8. A wireless access point shall allow a wireless enabled portable PC to make a temporary Ethernet connection to the automation network.
   a. The wireless connection shall allow the PC to access configuration tool through the web browser using the User Interface (UI).
   b. The wireless use of configuration tool shall be the same as a wired connection in every respect.
   c. The wireless connection shall use the Bluetooth Wireless Technology.

K. Temperature Sensors

1. General Requirements:
   a. Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.
   b. The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.
   c. The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion:

Point Type	**Accuracy**
Chilled Water	± .5°F.
Room Temp	± .5°F.
Duct Temperature	± .5°F.
All Others	± .75°F.

2. Room Temperature Sensors
    a. Room sensors shall be constructed for either surface or wall box mounting.
    b. Room sensors shall have the following options when specified:
        1) Setpoint reset slide switch providing a ±3 degree (adjustable) range.
        2) Individual heating/cooling setpoint slide switches.
        3) A momentary override request push button for activation of after-hours operation.
        4) Analog thermometer.
3. Room Temperature Sensors with Integral Display
    a. Room sensors shall be constructed for either surface or wall box mounting.
    b. Room sensors shall have an integral LCD display and four button keypad with the following capabilities:
        1) Display room and outside air temperatures.
        2) Display and adjust room comfort setpoint.
        3) Display and adjust fan operation status.
        4) Timed override request push button with LED status for activation of after-hours operation.
        5) Display controller mode.
        6) Password selectable adjustment of setpoint and override modes.
4. Thermo wells
    a. When thermo wells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and Greenfield fitting.
    b. Thermo wells shall be pressure rated and constructed in accordance with the system working pressure.
    c. Thermo wells and sensors shall be mounted in a threadolet or 1/2” NFT saddle and allow easy access to the sensor for repair or replacement.
    d. Thermo wells shall be constructed of 316 stainless steel.
5. Outside Air Sensors
    a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
    b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
    c. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.
6. Duct Mount Sensors
    a. Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.

b. Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.

c. For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.

7. Averaging Sensors

a. For ductwork greater in any dimension that 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.

b. For plenum applications, such as mixed air temperature measurements, a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.

c. Capillary supports at the sides of the duct shall be provided to support the sensing string.

8. Acceptable Manufacturers: Johnson Controls, Setra.

L. Status and Safety Switches

1. General Requirements

a. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BMS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.

2. Current Sensing Switches

a. The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.

b. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.

c. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.

d. Acceptable manufacturers: Veris Industries

3. Air Flow Switches

a. Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.

b. Acceptable manufacturers: Johnson Controls, Cleveland Controls

4. Air Pressure Safety Switches

a. Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120VAC.

b. Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.

c. Acceptable manufacturers: Johnson Controls, Cleveland Controls

M. Actuators

1. General Requirements

a. Damper and valve actuators shall be electronic and/or pneumatic, as specified in the System Description section.

2. Electronic Damper Actuators

a. Electronic damper actuators shall be direct shaft mount.

b. Modulating and two-position actuators shall be provided as required by the sequence of operations. Damper sections shall be sized Based on actuator manufacturer's recommendations for face velocity, differential pressure and damper type. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the dampers, as required. All actuators (except terminal units) shall be furnished with mechanical spring return unless otherwise specified in the sequences of operations. All actuators shall have external adjustable stops to limit the travel in either direction, and a gear release to allow manual positioning.

c. Modulating actuators shall accept 24 VAC or VDC power supply, consume no more than 15 VA, and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA, and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal and may be used to parallel other actuators and provide true position indication. The feedback signal of one damper actuator for each separately controlled damper shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.

d. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Isolation, smoke, exhaust fan, and other dampers, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop associated fan. Two-position actuators, as specified in sequences of operations as "quick acting," shall move full stroke within 20 seconds. All smoke damper actuators shall be quick acting.

e. Acceptable manufacturers: Johnson Controls, Mamac.

N. Control Dampers

1. The BMS Contractor shall furnish all automatic dampers. All automatic dampers shall be sized for the application by the BMS Contractor or as specifically indicated on the Drawings.

2. All dampers used for throttling airflow shall be of the opposed blade type arranged for normally open or normally closed operation, as required. The damper is to be sized so that, when wide open, the pressure drop is a sufficient amount of its close-off pressure drop to shift the characteristic curve to near linear.

3. All dampers used for two-position, open/close control shall be parallel blade type arranged for normally open or closed operation, as required.

4. Damper frames and blades shall be constructed of either galvanized steel or aluminum. Maximum blade length in any section shall be 60". Damper blades shall be 16-gauge minimum and shall not exceed eight (8) inches in width. Damper frames shall be 16-gauge minimum hat channel type with corner bracing. All damper bearings shall be made of reinforced nylon, stainless steel or oil-impregnated bronze. Dampers shall be tight closing, low leakage type, with synthetic elastomer seals on the blade edges and flexible stainless steel side seals. Dampers of 48"x48" size shall not leak in excess of 8.0 cfm per square foot when closed against 4" w.g. static pressure when tested in accordance with AMCA Std. 500.

5. Airfoil blade dampers of double skin construction with linkage out of the air stream shall be used whenever the damper face velocity exceeds 1500 FPM or system pressure exceeds 2.5" w.g., but no more than 4000 FPM or 6" w.g. Acceptable manufacturers are Johnson Controls D-7250 D-1250 or D-1300, Ruskin CD50, and Vent Products 5650.

6. One piece rolled blade dampers with exposed or concealed linkage may be used with face velocities of 1500 FPM or below. Acceptable manufacturers are: Johnson Controls D-1600, Ruskin CD36, and Vent Products 5800.

    a. Multiple section dampers may be jack-shafted to allow mounting of piston pneumatic actuators and direct connect electronic actuators. Each end of the jackshaft shall receive at least one actuator to reduce jackshaft twist.

O. Control Relays

1. Control Pilot Relays

    a. Control pilot relays shall be of a modular plug-in design with retaining springs or clips.

    b. Mounting Bases shall be snap-mount.

    c. DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.

    d. Contacts shall be rated for 10 amps at 120VAC.

    e. Relays shall have an integral indicator light and check button.

    f. Acceptable manufacturers: Johnson Controls, Lectro

2. Lighting Control Relays

    a. Lighting control relays shall be latching with integral status contacts.

    b. Contacts shall be rated for 20 amps at 277 VAC.

    c. The coil shall be a split low-voltage coil that moves the line voltage contact armature to the ON or OFF latched position.

d. Lighting control relays shall be controlled by:
   1) Pulsed Tri-state Output – Preferred method.
   2) Pulsed Paired Binary Outputs.
   3) A Binary Input to the Facility Management System shall monitor integral status contacts on the lighting control relay. Relay status contacts shall be of the "dry-contact" type.

e. The relay shall be designed so that power outages do not result in a change-of-state, and so that multiple same state commands will simply maintain the commanded state. Example: Multiple OFF command pulses shall simply keep the contacts in the OFF position.

P. Electronic Signal Isolation Transducers

1. A signal isolation transducer shall be provided whenever an analog output signal from the BMS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.
2. The signal isolation transducer shall provide ground plane isolation between systems.
3. Signals shall provide optical isolation between systems.
4. Acceptable manufacturers: Advanced Control Technologies

Q. External Manual Override Stations

1. External manual override stations shall provide the following:
   a. An integral HAND/OFF/AUTO switch shall override the controlled device pilot relay.
   b. A status input to the Facility Management System shall indicate whenever the switch is not in the automatic position.
   c. A Status LED shall illuminate whenever the output is ON.
   d. An Override LED shall illuminate whenever the HOA switch is in either the HAND or OFF position.
   e. Contacts shall be rated for a minimum of 1 amp at 24 VAC.

R. Local Control Panels

1. All control panels shall be factory constructed, incorporating the BMS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush latch.
2. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices—such as relays, transducers, and so forth—that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.

3. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.
4. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.
5. All wiring shall be neatly installed in plastic trays or tie-wrapped.
6. A convenience 120 VAC duplex receptacle shall be provided in each enclosure, fused on/off power switch, and required transformers.

S. Power Supplies

1. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75% of the rated capacity of the power supply.
2. Input: 120 VAC +10%, 60Hz.
3. Output: 24 VDC.
4. Line Regulation: +0.05% for 10% line change.
5. Load Regulation: +0.05% for 50% load change.
6. Ripple and Noise: 1 mV rms, 5 mV peak to peak.
7. An appropriately sized fuse and fuse block shall be provided and located next to the power supply.
8. A power disconnect switch shall be provided next to the power supply.

T. Thermostats

1. Electric room thermostats of the heavy-duty type shall be provided for unit heaters, cabinet unit heaters, and ventilation fans, where required. All these items shall be provided with concealed adjustment. Finish of covers for all room-type instruments shall match and, unless otherwise indicated or specified, covers shall be manufacturer's standard finish.

U. Training

1. The BMS contractor shall provide the following training services:
   a. One days of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

2.18 ACCESS DOORS

A. Access doors in gypsum ceilings shall be provided by the General Contractor as shown on the architectural plans to provide service access to the fan coil units. Additional access doors for hot

and chilled water system isolation valves and motorized dampers shall be provided by the mechanical contractor per the following specification.

B. Provide proper access to materials and equipment that require inspection, replacement, repair or service and coordinate their delivery with the installing Trade. If proper access cannot be provided, confer with Engineer as to best method of approach for minimizing effect of reduced access which may result.

C. Coordinate and prepare a location, size, and function schedule of access panels required to fully service equipment and deliver to a representative of the installing Trade. Furnish and install distinctively colored buttons (color as selected by Engineer) in finished ceiling to identify all access panels.

D. Furnish access panels for installation under other Sections where fire dampers, volume dampers, controls, shut-off valves, control valves, check valves, or other items installed under this Section require access and are concealed in floor, wall, furred space or above ceiling.

E. Ceilings consisting of lay-in or removable splined tiles do not require access panels and dampers, splitters, or test hole openings above ceiling shall have location marked with thumb tack on finished ceiling panel. Location shall be noted on record drawings.

F. Furnish access doors and frames for walls and ceilings to applicable trades for installation. Size as required for access and maintenance, minimum 16 by 16 inches.

G. 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. J. L. Industries, Inc, Inc.
2. Karp Associates, Inc.
3. Larsen's Manufacturing Company.
4. Milcor Inc.
5. Nystrom, Inc.

H. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces as applicable.
2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 0.060-inch-thick sheet metal with suitable bead flange.
4. Hinges: Continuous piano.
5. Lock: Cylinder, keyed alike.

I. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces as applicable.
2. Fire-Resistance Rating: Not less than that of adjacent construction.

3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch .
5. Frame: Minimum 0.060-inch thick sheet metal with suitable bead flange.
6. Hinges: Continuous piano.
7. Automatic Closer: Spring type.
8. Lock: Self-latching device with cylinder lock, keyed alike.

J. Coordinate with architectural ceiling plans.

Part 3 - EXECUTION

3.1 COMMISSIONING OF EQUIPMENT AND SYSTEMS

A. The Designer will check the completed installation either sequentially as different parts are completed, or when the entire installation is complete, at the sole option of the Designer.

B. Prior to the Designer's checking a part of the installation or the entire installation, this contractor shall submit a letter signed by an officer of this contracting company or an officer of the Construction Manager stating that:

1. he is a an officer of the company,
2. he has personally inspected the installation to be checked,
3. the date of his inspection,
4. the installation is complete and tested and ready to be inspected by the Designer, and that all required test reports have been submitted.

C. This contractor shall arrange that an officer of this contracting company or of the Construction Manager, as well as OWNER's Project Manager, in addition to other test witnesses that may be specified, shall witness the below listed tests. At the conclusion of each such test this contractor shall submit a letter signed by the officer stating that:

1. he is an officer of the company,
2. he has personally witnessed the test (give the name of the test),
3. the date of testing,
4. the results of testing, as compared to specified performance,
5. listing the name, title, and company affiliation of all those witnessing the test.

D. Tests Requiring Letters:

Electrical:	Fire alarm

Emergency Lighting and Power Distribution
Fire Department Control Center

HVAC: System operation and controls

3.2 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.

1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.

2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.

3. Obtain detailed installation information from manufacturers of equipment provided under this Section.

4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections.

5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Designer.

6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor mounted vibrating and rotating equipment provided under this Section.

7. Notify Designer of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Designer, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove non functioning and abandoned piping, ductwork and equipment as directed by Designer. Dispose of or store items as requested by Designer.

B. Maintenance of equipment and systems: Maintain HVAC equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions. Do not use boilers before providing water treatment where required; this includes use of boilers for temporary heat or for testing.

C. Use of premises: Use of premises shall be restricted as directed by Designer and as required below.

1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable

appearance and operation of equipment, to satisfaction of Designer and as specified under CLEANING paragraph.

2. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.

3. Do not interfere with function of existing sewers and water and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Designer as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Designer to provide minimal interference with normal operation. Obtain Designer ’s approval of the method proposed for minimizing service interruption.

D. Surveys and measurements:

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.

2. In event of discrepancy between actual measurements and those indicated, notify Designer in writing and do not proceed with work until written instructions have been issued by Designer.

E. Fireproofing:

1. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible, prior to start of spray fiber work.

2. Ducts, piping and other items which would interfere with proper application of fireproofing shall be installed after completion of spray fiber work.

3. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to OWNER.

F. Temporary Heat:

1. Special reference is made to Section 015000, TEMPORARY FACILITIES AND CONTROLS.

2. Coordinate work under this Section with progress of construction so that permanent heating system will be ready to provide temporary heating if permitted by Designer as soon as building is closed in.

3. Provide and direct labor required for attendance, operation and final restoration of permanent heating system if used for temporary heating purposes. Continuous direct attendance shall be provided whenever permanent system is in operation prior to acceptance of permanent heating system by OWNER’s Project Manager.

G. Gypsum Drywall Enclosures:

1. Coordinate and supervise construction of drywall and related work affecting work of this Section.
2. Work shall include but not be limited to following:
   a. Supply and return air duct enclosures on rooftop air handling units.
   b. Supply air plenums located above labs and computer rooms.
   c. Return air shafts.
3. Ensure tightness of plenums and chases used as part of air distribution system. System will not be accepted until proved tight, without leakage. Notify Designer in writing after system test for leakage, if construction and finish of plenums and ducts are not satisfactory.

H. Airbound Coils

1. If, after plant is in operation, any coils or other apparatus are stratified or air bound (by vacuum or pressure), they shall be repiped with new approved and necessary fittings, air vents, or vacuum breakers at no extra cost. If connections are concealed in furring, floors, or ceilings, this trade shall bear all expenses of tearing up and refinishing construction and finish, leaving same in as good condition as before it was disturbed.

3.3 MATERIALS AND WORKMANSHIP

A. Work shall be neat and rectilinear. Ductwork and piping shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment as required by manufacturers. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe and duct openings shall be temporarily closed to prevent obstruction and damage before completion.

B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.

C. References to manufacturers and to catalog designation, are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.

D. Finish of materials, components and equipment shall be as approved by Designer and shall be resistant to corrosion and weather as necessary.

E. OWNER will not be responsible for material and equipment before testing and acceptance.

3.4 CONTINUITY OF SERVICES

A. Do not interrupt existing services without the OWNER Project Manager’s approval.

B. Schedule interruptions in advance, according to the OWNER Project Manager's instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.

C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on the User Agency's operations.

3.5 TAGS

A. Upon completion of work, attach engraved laminated tags to all valves (listed in the valve directory called for in the "Bulletins, Manuals and Instructions" paragraph of these specifications) and all pieces of HVAC equipment (including but not limited to pumps, fans, air handlers, coils and all other equipment listed in the HVAC schedules). Valve tags shall have black characters on white face, consecutively numbered and prefixed by letter "V". Equipment tags shall have black characters on white face, with labels corresponding to drawing schedule numbers.

B. Embossed or engraved aluminum or brass tags may be substituted if desired. Tags shall be at least 1/8" thick.

C. Valve tags shall be at least 1" in diameter with numerals at least 3/8" high and attached by "S" hooks or chains. Equipment tags shall be at least 2" diameter securely attached to apparatus.

D. Provide manufacturers equipment nameplates, catalog numbers and rating identification securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

3.6 PIPE AND DUCT IDENTIFICATION

A. Ductwork shall be stenciled at each junction or branch takeoff, at least once in each room, and at intervals not longer than 20 ft. Stencil shall clearly identify duct service (S for supply, R for return, X for exhaust), area served by branch, and arrow indicating direction of flow.

B. Provide color coded pipe identification markers on piping installed under this Section. Pipe markers shall be snap on laminated plastic protected by clear acrylic coating. Pipe markers shall be applied after architectural painting where such is required.

C. Provide arrow marker with each pipe content marker to indicate direction of flow. If flow can be in either direction, use double headed arrow marker.

D. Mains shall be labeled at points of entrance and exit from mechanical room, adjacent to each valve, on each riser, at each tee fitting, at points of entrance and exit from building, at least once in each room, and at intervals no longer than 20 ft.

E. Size of legend letters on markers and length of color field shall be per the latest edition of ANSI A13.1.

F. Markers shall be "Setmark" by Seton Name Plate Corp. or approved equal.

G. Following color coding shall be used with names in white letters on the background color noted.

Service	Legend	Background Color
Chilled water supply	CHWS	Green
Chilled water return	CHWR	Green
Condenser water supply	CWS	Green
Condenser water return	CWR	Green

H. Color banding shall meet latest edition of ANSI A13.1 and OSHA.

3.7 WELDING

A. Weld only by approved acetylene or electric welding processes and welders shall hold certificate from approved insurance company.

B. Conduct test to demonstrate suitability of procedures to be used in making welds which conform to specified requirements.

C. Specification for welding procedure shall meet requirements of Welding Qualifications, Section IX, ASME Boiler and Pressure Vessel Code and ANSI B31.1.

D. Align components. No strain shall be placed on weld during welding. No part of pipe shall be offset more than 20% of thickness. Set flanges and branches properly.

E. Welder Qualification:

1. Test welders to demonstrate ability to make acceptable welds. Tests conducted for qualification of welder for work under one Division or Section shall not qualify welder for work under another Division or Section.
2. Tests shall be as prescribed for welder qualification in Section IX of the ASME code.
3. Records of such tests shall be as follows: Each welder shall be assigned an identifying number, letter or symbol. Identifying mark shall be stamped adjacent to welds made by this welder. Identification shall be at top of horizontal piping and at front of vertical piping.
4. Maintain record of welders employed, showing dates and results of tests and identifying mark assigned to each welder. Certify records and make them accessible to the OWNER Project Manager. Before completion of project, one copy of records shall be turned over to OWNER.
5. No qualification shall be older than three years when welder commences work on this project. If welder has not welded in required welding process for a period of six months, he shall be re certified.

F. Welding Tests

1. As designated by Designer, remove welds for destructive testing or for testing by non destructive means. Tests shall be as determined by Designer.
2. If, in Designer ’s opinion, welds so tested do not meet requirements of Sections VIII and IX of ASME, remove welds welded by that welder, at no cost to OWNER. Rewelding shall be performed by qualified welder other than welder whose welds did not pass test. Welders whose welds were defective shall not be employed on site for remainder of project.
3. Welding of stanchions, brackets, anchors and other welding not performed on pipe joints shall be in accordance with requirements of AWS specifications and requirements.

3.8 PENETRATIONS AND SLEEVES

A. General

1. Provide pipe and duct sleeves and packing materials as specified and as shown on Drawings at penetrations of foundations, walls, slabs (except on grade), partitions and floors. Sleeves shall meet NFPA 101 requirements and materials requirements of Part 2 of this Section.
2. Coordinate work carefully with architectural and structural work. Set sleeves in forms before concrete is poured. Provide core drilling as necessary if walls are poured, or otherwise constructed, without sleeves and a wall penetration is required. Provide core drilling as required for penetrations of existing construction. Do not penetrate structural members without Designer ’s approval.
3. Sleeves for insulated pipe and duct in non fire rated construction shall accommodate continuous insulation without compression. Sleeves and/or penetrations in fire rated construction shall be packed with fire rated material which shall maintain the fire rating of the wall. Seal ends of penetrations to provide continuous vapor barrier where insulation is interrupted. See Part Two of these specifications for requirements for packing materials.
4. Sleeves through floors shall be water tight and shall extend 2" above floor surface.

B. Pipe Sleeves

1. Annular space between pipe and sleeve shall be at least 1/4".
2. Sleeves are not required for slabs on grade unless specified otherwise.
3. Sleeves and packing materials, through rated fire walls and smoke partitions shall maintain fire rating of construction penetrated.
4. Do not support piping risers on sleeves.

C. Duct Sleeves and Prepared Openings

1. Provide duct sleeves for round ducts 15" and smaller; provide prepared, framed openings for round ducts larger than 15" and for square, rectangular and flat oval ducts, except as specified otherwise. Sleeves shall meet SMACNA requirements.

2. Provide sleeves for ducts through 1 , 2 or 3 hour fire rated construction and smoke partitions, regardless of size and shape of ducts. Sleeves shall maintain fire rating of construction penetrated. Sleeve and seal materials, construction and clearances shall meet requirements of SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems.

3. Prepared openings shall be framed to provide 1" clearance between framing and duct or duct insulation.

D. Installation Testing, Listings and Approvals

1. Installation shall meet material manufacturer's recommendations exactly, particularly as regards safety, ventilation, removal of foreign materials and other details of installation. Dam openings as recommended. Remove flammable materials used for damming and forming seals in fire rated construction.

2. Sleeve penetration methods shall be water and gas tight and shall meet requirements of ASTM E 119 Standard Methods of Fire Tests of Building Construction and Materials.

3. Fire stop penetration seal methods and materials shall be FM approved and UL listed as applicable.

4. Inspect foamed sealants to ensure manufacturer's optimum cell structure and color ranges.

3.9 ANCHORS AND INSERTS

A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

B. Provide anchors as necessary for attachment of equipment supports and hangars.

3.10 INSTALLATION OF EQUIPMENT

A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Designer and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof mounted equipment shall be installed and supported on structural steel provided under other Sections.

C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.

E. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section Five of Code of Practice of American Institute of Steel Construction.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warrantee. Report in writing to Designer, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

3.11 PAINTING

A. Equipment installed under this Section shall have shop coat of non lead gray paint. Hangers and supports shall have one coat of non lead red primer. Machinery such as pumps, fans, etc., shall be stenciled with equipment name. Stencil shall be at least 6" high for large equipment, 2" high for small equipment. Finish painting, including painting of various piping and duct systems, shall be done under other Sections.

B. Note requirement for Designer ’s approval invoked under Part 3 article, MATERIALS AND WORKMANSHIP regarding finish of material and equipment which are visible or subject to corrosive or atmospheric conditions.

3.12 EXPANSION PROVISIONS

A. Installation of piping must allow for expansion using offsets, loops, swing joints, expansion joints, etc. as shown and as necessary to prevent undue strain. Take offs from mains to runouts shall not have less than three elbow swing.

B. Mains and risers with loops or offsets shall be securely anchored to structure so as to impart expansion towards loops or offsets. Anchors shall be constructed of heavy forged wrought iron, secured to pipe and to structure. Provide vibration isolation as required.

C. Provide pipe alignment guides as required to guide expanding pipe to move freely from anchor points toward expansion joints, offsets, etc.

3.13 CLEANING

A. Piping

1. Furnish pipe cleaning chemicals, chemical feed equipment, materials and labor necessary to clean piping.
2. Permanently install necessary chemical injection fittings complete with stop valves.

3. After chilled water, heating hot water, condenser water, steam and condensate piping have been pressure tested and approved for tightness, clean and flush piping specified under WATER TREATMENT Paragraph.

4. Maintain continuous blowdown and make up, as required during flushing operation.

B. Equipment

1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.14 STARTUP, TESTING AND BALANCING

A. General

1. Provide qualified personnel, equipment, apparatus and services for start up, testing and balancing of mechanical systems, to performance data shown in schedules, as specified, and as required by codes, standards, regulations and authorities having jurisdiction including City Inspectors, OWNER's Project Manager and Designer. Note that some ATC start up procedures listed below require the cooperation of the balancing contractor and the rooftop unit manufacturer's representative (if rooftop units are involved) and some balancing procedures require the cooperation of the ATC contractor and the rooftop units manufacturer representative (if appropriate). Ensure that all contractors are present on site during the entire time that these procedures take place. Note that some procedures listed below have a distinct order of precedence, e.g., the testing of the temperature control system shall not occur until major pieces of mechanical equipment have been started up and testing is complete. Ensure that any listed orders of precedence for procedures are followed.

2. Startup, testing and balancing shall not diminish guarantee requirements.

3. Notify Designer and authorities involved at least two weeks before startup testing and balancing begins.

4. Before temperature control testing begins a meeting shall be held between the HVAC engineer, the balancing contractor, the automatic temperature control contractor and the mechanical contractor. The mechanical contractor shall present the HVAC engineer with the completed checklists (contained in this specification) certifying that equipment startup and testing has been completed. The temperature control contractor shall then present his procedures for testing the ATC system to the HVAC engineer for review and approval. Allow one full day for this meeting.

5. When the temperature control testing has been completed a second meeting shall be held. At this time the temperature control contractor shall present the HVAC engineer with the completed controls startup checklist (contained in this specification). The balancing contractor shall present HVAC engineer with certificates of calibration for balancing instruments, proposed balancing forms and proposed balancing procedures to the HVAC engineer, for review and approval. Allow one full day for this meeting.

6. If, through no fault of the Designer, the above two meetings do not take place and the temperature control startup and balancing proceeds the following shall occur.

a. All balancing reports shall be rejected.

b. The contractors requisition for monies covering the ENTIRE portion of the testing and balancing work will be rejected. Others will be hired to complete the work. These requirements shall be strictly enforced.

7. Do not cover or conceal work before testing and inspection and obtaining approval.

8. Instruments for testing and balancing shall have been calibrated within one month prior to testing and balancing. Calibration shall be traceable to NBS Standards. Provide Photostat of certificate of calibration to Designer 's representative at meeting demonstrating balancing procedures mentioned in Paragraph 4 above.

9. Leaks, damage and defects discovered or resulting from startup, testing and balancing shall be repaired or replaced to like new condition with acceptable materials. Tests shall be continued until system operates without adjustments or repairs.

10. Report on reporting forms, submitted to Designer for approval in advance, and on forms provided by Designer.

11. For each piece of equipment, copy nameplate data and include in report.

12. Submit six copies of testing and balancing reports to Designer for approval.

13. Provide capacity and performance of equipment by field testing. Install equipment and instruments required for testing, thermo wells and gauge connections at no additional cost to OWNER.

14. Qualified representative of equipment manufacturer shall be present at test.

15. Startup, testing and balancing procedures outlined below are the minimum effort required for the project. Contractor shall use any additional procedures he feels will be necessary to properly startup, test and balance the job.

B. Equipment Startup

1. Start up the following pieces of equipment in strict accordance with manufacturers instructions and with manufacturers representative present:

a. Cooling Tower

b. Pumps

c. Heat Exchanger

d. Complete the following checklist to certify to the Designer that startup of the above pieces of equipment has successfully been accomplished. Copy multiple checklists as required. Edit inappropriate items as required.

EQUIPMENT LIST	DATE CONFIRMED	MANUFACTURERS REPRESENTATIVE NAME AND SIGNATURE	CONSTRUCTION MANAGER REPRESENTATIVE NAME AND SIGNATURE

COOLING TOWER

PUMPS

HEAT EXCHANGER

C. Equipment and Piping Testing

1. Tests: No tests shall be started until systems have been cleaned as described under CLEANING Paragraph. Provide temporary piping and connections for testing, flushing or draining systems to be tested. If leaks develop, repairs shall be made and tests repeated. Tests shall be continued until systems operate without adjustments and repair to equipment or piping. Tests are further specified under other paragraphs of this Section. Test requirement specifically includes, but is not limited to the following:

   a. Cooling tower

   b. Pumps

   c. Heat exchanger

2. Circulating Water Pumps and Fans

   a. Take field measurements on vibration and alignment of pumps, chillers and fans driven by motors over 10 hp. Readings shall include:

      1) Shaft alignment
      2) Equipment vibration
      3) Bearing housing vibration
      4) Foundation vibration
      5) Building structure vibration
      6) Readings directed by Designer
      7) Maximum vibration at any point listed shall not exceed 2 mils.

   b. Hydrostatic Test of Piping

      1) Conduct hydrostatic leak tests in accordance with ANSI B31.3, Power Piping Code.
      2) Testing medium shall be water at ambient temperature.
      3) When designated test pressure is applied, connections shall be inspected by Designer ’s representative for acceptance.

4) Leaks discovered during testing shall be repaired at no cost to OWNER; retest system.

5) Isolate system piping from system components during test.

6) If any thermostatic traps are present, isolate and remove them before and during testing.

7) Before test, piping shall be cleaned and flushed as required under CLEANING Paragraph.

8) After testing, stuffing boxes and valves shall be repacked as directed by Engineer.

9) Test pressurized piping system to 150% of design operating pressure, no more than 500 psi and no less than 125 psi.

3. When testing is complete fill in the following checklist certifying satisfactory completion of testing. Make multiple copies of checklist as required, edit out items which are not appropriate.

EQUIPMENT AND PIPING TESTING CHECKLIST

TEST ITEM	DATE CONFIRMED	MANUFACTURERS REPRESENTATIVE NAME AND SIGNATURE	CONSTRUCTION MANAGERS REPRESENTATIVE NAME AND SIGNATURE
VIBRATION AND ALIGNMENT			
FANS			
HYDROSTATIC TESTS OF PIPING			

D. Air and Water Balancing

1. General

a. Provide qualified personnel, equipment and services for balancing and adjusting of mechanical systems. Submit resumes at demonstration of balancing meeting.

b. Personnel shall be experienced and qualified to perform, record, and evaluate all procedures contained here and/or as outlined on drawings.

c. For each air handler on job, provide, under the work of the mechanical section, one spare sheave of size to be determined after traverses are complete.

d. Submit procedures, recording forms, and test equipment for review prior to balancing, as described in Paragraph A.4 above.
   1) Balancing procedure or sequence is contained herein.
   2) Recording forms used for balancing must be submitted to Designer for approval before balancing is started.
      a) Failure to submit forms will result in rejection of entire submittal.
      b) Submit description of balancing equipment being used.
   3) Balancing shall not begin until system has been installed complete and capable of normal operation.
      a) All grilles, dampers, fans, coils, pumps, valves and linkages shall be installed and operating prior to balancing.
      b) System shall be capable of operating under control as specified on drawings and/or contained herein.
   4) Independent balancing agency shall have the following qualifications:
      a) Agency is known to have specialized in balancing commercial HVAC system for at least 3 years.
      b) Agency shall provide proof of qualifications to Designer ’s satisfaction. Qualification shall include submitted at least three sample balancing reports prepared for commercial HVAC system over 100,000 ft2 in floor area.
      c) Agency employed balancing technicians shall be qualified to balance HVAC system to Designer ’s satisfaction. Submit resume of technician.
      d) At least one balancing technician shall remain on from start to acceptance of final balance report.
      e) Agency shall be approved by Designer.

2. Air System Balancing

   a. Testing agency shall balance, adjust and test motors, systems, air moving equipment and distribution, supply, return and exhaust systems, as follows:
      1) Adjust blower rpm to design requirements and record. Test and record motor full load amperes.
      2) Make pitot tube traverse of main supply, return and exhaust and obtain design cfm at fans.
      3) Test and record system static pressure, suction and discharge.
      4) Test and record entering air temperatures.
      5) Balance and adjust supply air systems in finished areas of building:
         a) Balance and adjust as required to deliver volume of air at each air outlet within 10% of design flow shown on Drawings.
         b) Readjust air volumes after occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.

6) Balance supply air systems in unfinished areas:
   a) Supply air systems shall be balanced after installation of items related to same systems with exception of duct taps to air diffusers in interior zones.
   b) Balance as required to deliver air volume at outlets within 10% of design flow shown on Drawings.
   c) Provide sufficient temporary openings in interior zone duct systems to adjust interior zone air volumes.
   d) Readjust air volumes after completion and occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.
7) Adjust toilet exhaust and relief air systems as required to deliver air volumes at inlets within 10% of design flow.
8) Adjust miscellaneous ventilation systems as required to deliver air volumes at inlets and outlets within 10% of design flow.

b. Compile test data and submit to Designer for approval.

c. If questions arise, tests or portions of tests shall be repeated in presence of Designer.

3. Air System Balancing:

a. Visually inspect all fire, smoke and volume dampers on branch take offs to each floor to ensure that they are fully open.

b. Verify with straight edge that fan and motor shafts are parallel and that sheaves are in proper alignment. Use Browning belt tensioner to confirm belts are at proper tension. Refer to deflection tables appropriate for installed belts.

c. Start fans, verify that fan rotation is correct. If not, coordinate with electrical contractor to switch power leads such that the fan rotates correctly.

d. Verify that fan belts are tight on one side and have slight bow on other side when fan is operating with no excessive squeal at startup. If not correct, adjust sheaves or motor base accordingly.

e. Check nameplate voltage on motor, compare to scheduled voltage. Notify Designer immediately of any discrepancies. Measure and record actual voltage across all power leads. Notify Designer of discrepancies immediately.

f. For each variable volume air handling unit do the following:
   1) Add total cfm of all volume boxes shown on approved shop drawings.
   2) Divide this total by the maximum cfm scheduled for the unit to get diversity factor. For example, if total box cfm is 50,000 and AHU is scheduled for 40,000 cfm diversity is 40,000/50,0000 = 80%.
   3) Open (by setting local stats to call for maximum cooling) number of volume boxes necessary to approximate diversity, i.e., in the above example, open 80% of the volume boxes.

g. Check motor nameplates full load amps, measure and record amperage across all power leads. If there are marked discrepancies in amperage draws between legs, notify Designer immediately.

h. Measure and record fan and motor rpm. Check that motor rpm agrees with nameplate and scheduled rpm.

i. Perform static pressure profile as follows: Record all results and submit to Designer.
   1) Determine static pressure across supply and return fans as follows:
      a) Measure static or total pressure at fan suction.
      b) Measure static pressure at fan discharge.
      c) Differential is total static pressure developed by fan.
   2) Determine static pressure:
      a) In discharge ductwork after AHU smoke damper.
      b) Across each filter section.
      c) Across each coil.
      d) Across fire and volume dampers at branch take offs to each floor.
      e) At up to 25 points, in system shown on drawings or to be selected by Designer to be determined when ductwork shop drawings are approved.
   3) Determine the correct causes of any excessively high readings, i.e. open throttled dampers, clean dirty coils, etc. Cover all holes when measurements are complete.

j. Add 1/2" of static pressure to the system, to simulate the effect of dirty filters. Static may be added by throttling branch volume dampers, blanking off portions of the filter section, covering filter section with cheesecloth or other suitable means. Confirm 1/2" static has been added with new static pressure reading across fan. Open dampers, remove cheesecloth, etc. after traverses are complete.

k. Perform pitot tube traverse of supply ducts downstream from AHU discharges and return ducts. Summing CFM totals from diffusers is not an acceptable method of determining total airflow from AHU's. At Designer's request, show Designer holes where traverses were taken. Perform traverses in accordance with procedures outlined in latest edition of the SMACNA HVAC Testing. Adjusting and Balancing Manual, except that if recommended lengths of straight duct before and after traverse points are not available, increase number of measuring points by 50%. If a 24 point traverse would be called for given the duct cross section area measure 36 points, for example.

l. Measure amperage at each power leg after traverse is complete. If an overload condition exists with measured CFM equal to scheduled CFM, notify Designer immediately.

m. For economizer systems with ATC contractors presence and assistance, adjust minimum and maximum outdoor air CFM to quantities shown on schedules. Place outdoor air dampers in minimum position as adjusted by ATC contractor. Measure temperature in mixed air plenum, temperature of outdoor air and by proportioning determine % of outdoor air being supplied. Place outdoor air damper in maximum open position or fully open variable outside air damper and repeat above measurements.

n. For systems with variable volume boxes or constant volume boxes do the following, with ATC Contractor present for necessary coordination:

1) At static pressure probe location in field with number of stats necessary to approximate installed diversity calling for full cooling, measure static pressure with manometer and compare with reading registering at DDC system field panel or CRT. The "most critical" volume box shall be determined by the Designer from approved sheet metal shop drawings submittals. Typically the pressure drop from the supply fan outlet to this box inlet is greater than for any other box. Observe damper linkage, at this box, instruct ATC contractor to vary static pressure setpoint as required so that with stats calling for full cooling, most critical box damper is 75% open. (Score line on damper linkage and mark full open and closed positions of box damper. Using protractor mark 75% position open position on volume box.)

2) At each variable volume box, confirm that thermostat and box controller are of the same type (i.e., direct acting or reverse acting). At each variable box and constant volume box disconnect the actuator's pneumatic air line and confirm that box damper fails to position called for on control drawings.

3) At each variable volume box, set thermostat serving box for no cooling. At box test ports take differential pressure reading with magnehelic gauge. Note the magnehelic must be calibrated against a manometer before use. Adjust box minimum position at controller so that differential pressure reading corresponds to box minimum primary air CFM shown on schedules. Place thermostat controlling box to full cooling position. Using magnehelic gauge adjust box controller maximum position setting to produce differential pressure corresponding to box maximum primary air as shown on schedules. Measure CFM's from all diffusers served by box. Confirm total agrees with scheduled box cfm. If box has a reheat coil set start to call for full heating and confirm that box diverting relay switches to heating operation at proper thermostat pressure. With magnehelic gauge confirm differential pressure corresponding to heating CFM. Confirm that P/E's controlling electric heating coils (if any) stage properly. Confirm that hot water control valve modulates open.

4) At each fan box, set thermostat serving box for full heating. At box test ports take differential pressure rating the magnehelic gauge. Adjust box minimum position at controller so that differential pressure reading corresponds to box minimum primary air CFM shown on schedules. With stats continuing to call for full heating, confirm that fan is operating. Measure CFM's or all diffusers that the box serves and adjust fan speed controller, and/or inlet damper to produce CFM for box as shown on schedules. Place thermostat controlling box to full cooling position. Using magnehelic gauge adjust box controller maximum position setting to produce differential pressure corresponding o box maximum primary air as shown on schedules.

5) At each constant volume box, use magnehelic gauge to adjust setpoint of box controller to differential pressure corresponding to velocity (airflow) scheduled for box.

o. Balance each diffuser on each floor to within 10% of scheduled values. Follow procedures in SMACNA manual referenced above.

p. For constant volume systems, perform pitot tube traverses for branch ducts on each floor. Adjust volume dampers to produce design CFM for each branch.

q. Traverse all exhaust ducts. By sheave adjustment or damper throttling balance fans to +10% airflow scheduled on drawings.

r. Balance supply air systems in unfinished areas:

1) Supply air systems shall be balanced after installation of items related to same systems with exception of duct taps to air diffusers in interior zones.

2) Balance as required to deliver air volume at outlets within 10% of design flow shown on Drawings.

3) Provide sufficient temporary openings in interior zone duct systems to adjust interior zone air volumes.

4) Readjust air volumes after completion and occupancy, as required to properly balance heating and cooling loads throughout conditioned areas.

s. For fume hoods, open sash fully. Take six point reading across face of hood using hot wire anemometer or velometer with low flow probe (or average air across entire face of hood with rotating vane anemometer). Adjust volume damper in hood exhaust ductwork so that average velocity across hood face is +100 FPM.

4. Water Balancing and Adjusting

a. Balancing shall not begin until systems have been installed complete, including pumps, piping, valves and coils.

b. Make adjustments as required to deliver water volumes at coils and equipment within 5% of design flow, or as required to properly balance cooling and heating loads throughout conditioned areas.

c. Adjustments in water volumes shall be made in manner satisfactory to Designer.

d. Report on system performance shall include:

1) Manufacturer, size, type, location including room number, and zone of each coil and piece of equipment.

2) Design and actual water flow.

3) Complete nameplate data for each piece of equipment reported.

4) Complete identification of data.

END OF SECTION

SECTION 260001

ELECTRICAL WORK

(Filed Sub-Bid Required)

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SECTION 260001

ELECTRICAL WORK

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-bids for work under this Section shall be for the complete work and shall be submitted through DCAMM's E-Bid Room as stipulated in the DCAMM Instructions to Bidders.

2. Sub-bids filed with the Division of Capital Asset Management and Maintenance shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Commonwealth of Massachusetts in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements:

1. Sub bidder's attention is directed to Massachusetts G.L. Chapter 149 Section 44F, as amended, which provides in part as follows.
2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub trade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

CLASS OF WORK	REFERENCE SECTION
None	

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:

E-000	Electrical Legend, Notes & Abbreviations
ED-300	Electrical Demolition Penthouse Plan
ED-301	Electrical Demolition 10th Floor Plan
E-300	Electrical Power Penthouse Plan
E-301	Electrical Power 10th Floor Plan

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. Disconnection and removal of conduit and wiring for mechanical equipment indicated on plans, included but not limited to condensate pumps, chilled water pumps and cooling tower disconnects.
2. Conduit and wiring
3. Disconnect switches.
4. Circuit breakers in existing panels and motor control center
5. Modification of existing motor control center.
6. Installation of cooling tower basin heater control panel and powering basin heaters.
7. 120V control wiring for cooling tower water level controller
8. Heat tracing of piping.
9. Core drilling for the Work of this Section.
10. Certified seismic restraints to meet the Commonwealth of Massachusetts Building Code applicable at the time the building permit is issued.
11. Coordination drawings and record drawings and similar requirements.

B. The Electrical Sub-Contractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the electrical work.

1.3 SUBMITTALS

A. Submit the following in accordance with SECTION 01 33 00 SUBMITTAL REQUIREMENTS.

B. Shop Drawing: Shop drawings shall include, but not be limited to, the following:
1. Disconnect Switches.
2. Wiring and cables.
3. Heat tracing
4. Circuit breakers
5. Conduit.
6. Boxes and fittings.
7. Grounding and bonding.

C. Hanger Pull-Out Testing Submittals and Requirements: Hangers and supports will be tested for pull-out by the Independent Testing Agency designated by the DCAMM Project Manager. Comply with the requirements of Section 014325 – TESTING AGENCY SERVICES and the following:

1. Sub Contractor's Documentation Prior to Testing:
   a. Submit manufacturer's name and model number for each type of hanger and support proposed for use, and technical data including type, load capacity, test reports, methods for installation, and use limitations.
   b. Submit a schedule for each type of hanger and support indicating where units for testing will be installed, including substrate, and materials to be supported.
   c. Submit a letter from Sub Contractor indicating supports have been installed in accordance with manufacturer's recommendations and project requirements, and are ready for testing.
2. Independent Testing Agency's Documentation Prior to Testing for Sub Contractor's Information:
   a. Submit the methods and type of equipment which will be used to test hangers and supports.
   b. Submit loads which will be applied, and criteria for acceptance or failure of hangers and supports.
3. Quantity to Be Installed by Sub Contractor for Testing: Two of each size of each type of hanger or support.
4. Testing Results: The Independent Testing Agency will submit reports indicating test results.
   a. Units which did not deform or fail during testing may remain in place.
   b. Units which failed during testing shall be replaced and testing repeated until satisfactory results are obtained.
   c. Cost of repeat testing will be at the expense of the Sub Contractor.
   d. Contractor shall repair damaged substrates, if any.

D. Delegated-Design Submittal: For seismic restraints.

1. Seismic-Restraint Details: Signed and sealed by a qualified Massachusetts registered professional engineer.
2. Design Calculations: Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer licensed in the Commonwealth of Massachusetts responsible for their preparation.

   a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

3. Detail fabrication, including anchorages and attachments to structure and to supported equipment including raceways and cable trays.
4. Seismic and Wind Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
d. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES, OSHPD, or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 REFERENCES

A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the drawings or specifications for electrical work carries with it the instruction to furnish, install and connect the item as part of the electrical work, regardless of whether or not this instruction is explicitly stated.

B. It shall be understood that the specifications and drawings for electrical work are complimentary and are to be taken together for a complete interpretation of the electrical work except that indications on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

1.5 REGULATORY REQUIREMENTS

A. Comply with all applicable federal and state laws, and all local codes, by-laws and ordinances.

B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Designer rules otherwise.

C. Request inspections from authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the DCAMM's Project Manager s at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.

D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements and regulations:

1. State Building Code
2. State Electrical Code

3. National Fire Protection Association (NFPA)
4. Local Town Regulations and By-laws
5. Underwriter's Laboratories, Inc. (UL)
6. National Electrical Manufacturer's Association (NEMA)
7. American National Standards Institute (ANSI)

E. All electrical work shall meet or exceed any other state and local codes and/or authorities having jurisdiction including all other standards indicated herein.

1.6 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the Construction Manager and be responsible for the correct laying out of the electrical work. In the event of a discrepancy between actual measurements and those indicated, notify the Construction Manager in writing, and do not proceed with the work required until written instructions have been issued by the Construction Manager.

1.7 COORDINATION

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.

B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work, and also furnish information and shop drawings necessary to permit trades affected by the work to install same properly and without delay.

D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer. Where the electrical work shall interfere with the work of other trades, assist in working out the space conditions to make satisfactory adjustments before installation. Without extra cost to DCAMM, make reasonable modifications to the work as required by normal structural interferences. Pay the Construction Manager for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any electrical work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the electrical trades involved without extra cost to DCAMM.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the electrical work, and repair all damages without extra cost to DCAMM.

1.8 MECHANICAL AND ELECTRICAL COORDINATION

A. Subcontractor shall furnish and install various electrical items relating to the heating and ventilating equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The Heating and Ventilating and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating and ventilating equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the Heating and Ventilating Subcontractor.

D. 120V and above power wiring sources extended and connected to heating and ventilating control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostat, zone valve and any switch wiring shall be the responsibility of the Heating and Ventilating Subcontractor.

E. Temperature control and equipment wiring shall be installed by the Division 23.

F. Pipe Tracing shall be furnished and installed by the specified subcontractor. Power connections shall be by the Electrical Subcontractor.

G. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

1.9 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

A. Refer to Section 013100 – PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements

1.10 INSTALLATION REQUIREMENTS

A. The arrangement of all electrical work shown on the drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.

B. Check the architectural plans and specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Designer for his determination prior to proceeding with the work.

1.11 TYPICAL DETAILS

A. Typical details where shown on the drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Designer.

1.12 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for mechanical and electrical work. Internal diameter of sleeve shall be 2" larger than the outside diameter of the pipe or insulation covered line passing through it.

1.13 ACCESSIBILITY

A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.

B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

1.14 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required.

C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction; all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized.

1.15 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical and electrical equipment at the site.

1.16 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment etc. necessary for the proper operation and maintenance of the mechanical and electrical systems until final completion of the work, at which time they shall be handed over to DCAMM's Project Manager.

1.17 RECORD DRAWINGS, PROJECT CLOSEOUT

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT.

B. This trade shall submit the record set for approval by the fire and building departments in a form acceptable to the departments, when required by the jurisdiction.

C. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.18 GUARANTEE/WARRANTY

A. Guarantee Work of this Section in writing for one year from the date of Certificate of Agency Use and Occupancy. Guarantees or warranties that start at the date of shipment from the factory, or from the completion date of an individual portion of the project, are not acceptable. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in User Agency's name.

1. Upon receipt of notice from DCAMM's Project Manager of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.
2. At nine months into the one-year guarantee period, the contractor shall perform a 100% test of all installed equipment. Any device and/or part found to be defective shall be repaired and/or replaced at no cost to DCAMM. The Contractor shall notify the fire department one month in advance of the 100% test.

3. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.
4. Provide 24 hour service beginning on the date the project is accepted by DCAMM, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to DCAMM. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and DCAMM's Project Manager's approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.
5. Submit copies of equipment and material warranties to Designer before final payment.
6. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to User Agency.
7. This Paragraph shall not be interpreted to limit DCAMM's rights under applicable codes and laws and under this Contract.
8. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph. Those paragraphs will govern.
9. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work by DCAMM's Project Manager, and shall not initiate the guarantee period.
10. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to DCAMM's Project Manager's satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will direct course of action.

1.19 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT, including CAMIS spreadsheet data collection for Equipment Template and PM Procedure tabs.

B. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:

1. TABLE OF CONTENTS
2. Introduction
   a. Explanation of manual and its purpose and use.
   b. Description of the electrical systems.
   c. Safety precautions necessary for equipment.
   d. Illustrations, schematics and diagrams.
   e. Installation drawing.
3. Maintenance
   a. Maintenance and lubricating instructions.
   b. Replacement charts.
   c. Trouble shooting charts for equipment components.
   d. Testing instructions for each typical component.

e. Two typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.

4. Manufacturer's Literature
   a. The equipment for which shop drawings have been submitted and approved.
   b. Power Monitoring: Software and Firmware Operational Documentation:
      1) Software operating and upgrade manuals.
      2) Software licenses.
      3) Software service agreement.
      4) PC installation and operating documentation, manuals, and software for the PC and all installed peripherals. Provide separately for each PC.
      5) Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on compact disk or portable storage device with a USB interface of the hard-copy submittal.
      6) Program Software Backup: On compact disk or portable storage device with a USB interface, complete with data files.
      7) Device address list.
      8) Printout of software application and graphic screens.

1.20 QUALITY ASSURANCE

A. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

B. All work shall comply with the latest editions of the codes as referenced herein.

C. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.

D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to DCAMM.

E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

F. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
2. Be without blemish or defect.
3. Not be used for temporary light and power purposes.
4. Be in accordance with the latest applicable NEMA standards.
5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

G. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

H. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement if necessary shall be coordinated with Contractor who originally purchased the item.
5. Their field make up and internal wiring as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

I. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.21 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage, shall not be used and shall be removed from the site.

1.22 STAGING AND SCAFFOLDING

A. Sub Contractor shall provide all staging and scaffolding necessary to provide work.

1.23 EXTRA MATERIALS

A. Furnish extra materials described in following product specification sections that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1.24 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

A. During the execution of the work, required relocation, etc., of existing equipment and systems in the existing building areas where new work is to be installed or new connections are scheduled to be made, shall be performed by the Electrical Subcontractor, as required by job conditions and as determined by the Designer in the field, to facilitate the installation of the new system, while demolition, relocation work or new tie ins will be performed. Outages required for construction purposes shall be scheduled for the shortest practical periods of time, in coordination with the User Agency's designated representative, for specified, mutually agreeable periods of time, after each of which the interruption shall cease and the service shall be restored. This procedure shall be repeated to suit the User Agency's working schedule, as many times as required until all work is completed. Any outages of service shall be approved by DCAMM's Project Manager, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the DCAMM's Project Manager prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of two weeks in advance. User Agency shall make their best efforts to meet this request without adversely affecting the electric service to the existing building.

B. Prior to any deactivation and relocation or demolition work, consult the drawings and arrange a conference with the Designer and the DCAMM's Project Manager in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect all equipment designated to be relocated and reused or to remain in operation and be integrated with the new systems.

C. All deactivation, relocation and temporary tie ins of electrical systems and equipment shall be provided by the Electrical Subcontractor. All demolition and removal of electrical systems and equipment designed to be demolished shall be provided by the Electrical Subcontractor. Place all demolished electrical materials except hazardous materials (PCB lighting ballasts, fluorescent lamps, etc.) As determined by the Authority having jurisdiction in Construction Managers provided dumpster. All hazardous electrical materials shall be legally disposed by the electrical subcontractor.

D. DCAMM's Project Manager reserves the right to inspect the material scheduled for removal and salvage any items he deems usable as spare parts.

E. Phasing:

1. The Electrical Subcontractor shall follow phasing directions as stated on sheet E-0002 – Electrical Phasing Plan. The project shall be constructed in phases as directed by the Designer to suit the project progress schedule, as well as the completion date of the project.

2. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the mechanical drawings.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. Electrical metallic tubing (EMT) shall be zinc-coated steel that conforms to industry standards, by Republic Steel, Allied Tube and Conduit, Triangle/PWC or approved equal. EMT couplings and connectors shall be of the compression type.

B. Rigid Steel Conduit (RSC), couplings and elbows: ANSI C80.1 and UL 6; hot-dip galvanized, rigid mild steel, zinc-coated on interior and exterior surfaces.

C. Liquid-Tight Flexible Conduit: Plastic or plenum-rated jacket material, flexible, galvanized steel, Sealtite Type EF for general service areas or Type HC for high temperature locations.

D. Flexible metallic conduit shall be galvanized, spiral wrapped metallic conduit (Greenfield) or liquid-tight flexible metallic conduit as specified for specific equipment.

E. Conduit fire seal fittings shall have heat-activated intumescent material for fire rating equal to or higher than that of floor or wall by O.Z./Gedney or approved equal.

F. No aluminum conduit shall be used.

G. Special Fittings: Furnish conduit sealing, explosion proof, dust proof, and other types of special fittings as required by the drawings and these specifications, consistent with the area and equipment with which they are associated, and in accordance with the following requirements:
1. Fittings installed outdoors or in damp locations shall be sealed and gasketed.
2. Outdoor fittings shall be of heavy cast construction.
3. Hazardous area fittings and conduit sealing shall conform with Massachusetts Electrical Code requirements for the area classification.

2.2 OUTLET BOXES & FLOOR BOXES

A. Outlet boxes on concealed work shall be sized as required by the number of devices indicated on the plans, galvanized pressed steel with plaster rings as required. Outlet boxes for exposed conduit work shall be cast aluminum alloy with cast aluminum alloy covers. All outlet boxes to be recessed where possible including in concrete blocks.

B. Where installed in plaster, boxes shall be fitted with galvanized steel plaster covers of required depth to finish flush with finished wall or ceiling.

C. Switch boxes, receptacle boxes and other outlet boxes shall be sized as required with plaster rings or gang cover as required.

D. Cast-Metal Outlet and Device Boxes: Provide for wet locations, corrosive locations, and all locations where RGS conduit is required. Boxes shall be NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Outlet boxes shall be by Steel City Electric Company, Appleton Electric Company, National Electric Products Company or approved equal. Boxes on opposite sides of wall or partition shall not be installed back-to-back, even if shown that way on the plans. Boxes shall be offset 6" CL to CL.

F. Outlet boxes for various systems and components shall be as required by manufacturer.

G. Plastic boxes are not acceptable.

2.3 JUNCTION BOXES, PULL BOXES AND CABLE TROUGHS

A. Provide code gauge galvanized steel junction and pull boxes for conduit 1-1/4 in. trade size and larger, where indicated and as necessary to facilitate installation, of required dimensions, with accessible removable screw-on covers. Provide junction and pull boxes in special sizes and shapes determined in field where necessary.

B. Junction box covers shall be readily accessible.

C. Sheet metal pull boxes shall be supported adequately to maintain shape. Larger boxes shall have structural steel bracing welded into rigid assembly formed adequately to maintain alignment in shipment and installation. Secure covers with corrosion-resistant screws or bolts.
   1. Pull boxes exposed to rain or in wet locations shall be weatherproof.
   2. Provide clamps, grids and other appurtenances to secure cables. No cable shall be unsupported for more than 30 inches.
   3. No pull box shall be within 2 feet of another.

2.4 WIRE AND CABLE 600 V INSULATION

A. Provide single-conductor, annealed copper wire and cable with insulation rated 600 V, of sizes specified and scheduled on Drawings, by Rome, Okonite or approved equal, for secondary service, feeders, branch and system wiring. Wire insulated for 300 V may be used where voltage is less than 100V, if isolated from higher voltages. Wire sizes shown and specified are American Wire Gauge for copper.

B. All wiring shall be copper.

C. Wire #10 and larger shall be stranded; #12 and smaller shall be solid. Wire and cable shall have THW, THHN, THWN or XHHW insulation as required.

D. Motor control circuits and signal wiring may be #14 if NEC requirements are met. Branch circuits longer than 75 ft. for 120 V shall be at least #10 from panel. Electrical contractor shall be responsible for voltage drop adjustments.

E. Wiring within light fixtures and other high-temperature equipment shall have 150 degrees C insulation as required by NEC.

F. Minimum size wiring for power and lighting circuits shall be No. 12 AWG. Control wiring and low voltage systems shall be minimum No. 14 AWG.

G. Splices and Terminations
   1. Make splices in branch circuit wiring with UL-listed, solder less connectors rated 600V, of sizes and types required by manufacturer's recommendation with temperature rating equal to those of wires. Splice connectors shall be screw-on. Insulate splices with integral covers or with plastic or rubber friction tape to preserve characteristics of wire and cable insulation.
   2. Provide standard bolt-on lugs with hex screws to attach copper wire and cable to Panelboards, switchboards, disconnect switches and electrical equipment.
   3. Ampacity of splices and connectors shall be equal to those of associated wires and cables.

2.5 FEEDER IDENTIFICATION

A. Provide laminated phenolic identifying tags pressure-sensitive labels for cables, feeders, and power circuits in pull boxes, panelboards, at cable termination and in other locations.

B. Tags or labels shall be incised to show ½ inch high black letter on a white background. The operating voltage of the specific feeder and/or branch circuit shall determine background color. Suspended tags with two 1/32-inch diameter nylon 55-pound test shall be attached monofilament line or two slip-free plastic cable lacing units.

2.6 COLOR CODING

A. Colors shall be factory-applied entire length of conductors by one of the following methods except as noted and limited below:
   1. Solid color compound,
   2. Solid color coating,

B. Branch circuit conductors #12 and #10 shall have solid color compound, solid color coating or colored fibrous covering. Neutrals and equipment grounds shall have solid compound or solid color coating (white, gray and green).

2.7 WIRE PULLING EQUIPMENT

A. Provide polyethylene ropes for pulling wire.

B. Provide fish wires all empty conduit systems required, without splices and with ample exposed lengths at each end.

C. Provide wire pulling lubricants that meet applicable UL requirements as necessary.

2.8 WIRING DEVICES

A. Provide UL listed, heavy duty, specification grade wiring devices by single manufacturer: Arrow-Hart (Division of Crouse-Hinds), Leviton, Hubbell, Wiremold or approved equal. Devices shall be White.

B. Receptacles:
1. Duplex shall be 125 V, 20 A, 2-pole, 3 W, grounding.
2. GFI Devices shall be 125 V, 20 A, 2-pole, 3 W, grounding

2.9 WIRING DEVICE PLATES

A. Provide device plates by Arrow-Hart, Bryant, Hubbell, Wiremold or approved equal.

B. All device plates shall be White. In all other areas faceplates shall be plastic, color to match device.

C. Device plates shall be by manufacturer of wiring devices.

D. Receptacle device plates for circuits other than 120 V, 2-wire, shall be engraved with 1/4-inch letters, filled red, indicating voltage characteristics and circuit number of outlet.

E. Outlets shall be flush to surface and square.

F. All switches and receptacles shown for one location shall be grouped under one faceplate.

G. All exterior devices shall be provided with clear, plastic In-Use covers.

2.10 GROUNDING REQUIREMENTS

A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70 and the following:

B. The ground bus of the main switchboard shall be connected to the main grounding electrode specified below by means of insulated conductors run in conduit.

C. The main grounding electrode shall be an accessible point on the nearest metallic main water service pipe. Connection shall be made on the street side of the main valve utilizing a ground clamp of a type specifically manufactured for the purpose. Bonding jumpers shall be provided around the water meters and around insulating joints and/or sections.

D. Establish a ground bonding connection from the effectively grounded structural building steel to each cold water mains entering the building. Each bonding connection shall consist of insulated conductors run in conduit.

E. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.

F. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of each run utilizing grounding bushings and jumpers.

G. Provide grounding bonds for all metallic conduits of the light and power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.

H. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus. Exclude the jumpers where directed. This exclusion will be required where an isolated ground for electronic equipment is to be maintained.

I. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.

J. Bonding conductors on the load side of the service device and equipment grounding conductors shall be sized in relation to the fuses or trip size of the overcurrent device supplying the circuit.

K. Manufacturer; Furnish motor starters manufactured by one of the following:
1. Allen-Bradley Co.
2. General Electric
3. Square D Company
4. Cutler-Hammer

L. Disconnect Switches:

1. Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in "OFF" position. Three pole toggle switches are not acceptable as substitute for disconnect switches.
2. Disconnect switches shall be of fused with number of disconnecting poles indicated. The grounded conductor shall not be switched. Switches shall be for use with current limiting fuses with rejection type fuse clips and those shall be horsepower rated.
3. Enclosures shall be of proper NEMA type for the intended location and shall be phosphate coated or equivalent code gauge galvanized sheet steel with gray baked enamel finish.
4. Acceptable Manufacturers:
   a. General Electric

b. Cutler Hammer
c. Square D

2.11 MOLDED CASE CIRCUIT BREAKERS

A. Molded case type circuit breakers shall consist of manually operated quick make quick break mechanically trip free operating mechanisms for simultaneous operation of all poles, with contacts, arc interrupters and trip elements for each pole, all enclosed in molded phenolic plastic cases.

1. Their tripping units shall be of the "thermal magnetic" type having bimetallic elements for time delay overload protection and magnetic elements for short circuit protection.
2. They shall be manually operable by means of toggle type operating handles having "tripped" position midway between the "on off" position.
3. They shall each be contained in an individual case enclosing only the number of poles required for the particular breaker.
4. All panels and individually mounted circuit breakers shall have short circuit ratings exceeding the available short circuit or the values indicated in the Power System Studies in this section by a factor of 1.2 with a minimum as follows:
   a. 240V class panels/breakers
      1) 110 kAIC where shown fed by a 150 kVA or less transformer
      2) 222 kAIC where shown fed by a 300 kVA or less transformer
   b. 480V Class Panels/Breakers shall be 65 kAIC.
5. They shall be of the "bolted in" type.
6. Where necessary, to accommodate other requirements, their frame sizes shall be increased to conform to such requirements, frame sizes being indicated only as a reference to the minimum acceptable interrupting ratings noted above.
7. Where single pole in trip sizes 20 amps or less, they shall be rated for switching duty.
8. They shall be equipped with 5 milliamp sensitivity ground fault interrupting features where so indicated.

2.12 CARTRIDGE FUSES

A. Cartridge fuses shall be as follows:

1. Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses.
2. Secondary system fuses, rated at 600 volts or less, shall be UL listed and constructed in conformance with the applicable standards set forth by NEMA and ANSI. All fuses of a particular class shall be of same manufacturer.
3. Regardless of actual fault current, they shall, at full recovery voltage, be capable of safely interrupting fault currents of 200,000 amperes RMS symmetrical or 340,000 amperes RMS asymmetrical, deliverable at the line side of the fuse.
4. Circuits 0-600 amperes shall be protected by the equal of Bussman "Low Peak" current limiting fuses, LPN-RK (250 volts), LPS-RK (600 volts), UL class RK-1.
5. Fuses shall be suitable for application to fuse gaps which reject other types of fusing.

6. Supply 10 per cent spare fuses of each size and type 60 amps and less. Supply three spare fuses for each size and type over 60 amps.

B. Cartridge fuses shall be manufactured by Bussman, Gould or EFCO.

2.13 DISCONNECT SWITCHES

A. Quick make, quick break type distribution switches shall equal or exceed the performance required for NEMA type heavy duty horsepower rated switches.

1. They shall have arc quenchers and circuit breaker type pressure contacts.
2. Where of the fusible type, they shall be designed for use with "Class R" fuses up to 600 amps.

B. Distribution switches shall be manufactured by Square D, Eaton Cutler-Hammer, or General Electric.

2.14 HEAT TRACING AND FREEZE PROTECTION

A. Self regulating heat tape:
1. Basis-of-Design Product: Chromalox CPR. Subject to compliance with requirements, provide products from:
   a. Chromalox, Inc.; Wiegard Industrial Division; Emerson Electric Company.
   b. Delta-Therm Corporation.
   c. Penatair, a division of Tyco Thermal Controls.
2. Heating Element: Pair of parallel No. 16 AWG, nickel-coated stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.
3. Electrical Insulating Jacket: Flame-retardant polyolefin.
4. Overjacket: High temperature Fluoropolymer over entire cable assembly for enhanced corrosion resistance.
5. Cable Cover: Tinned-copper braid, and polyolefin outer jacket with UV inhibitor.
6. Maximum Operating Temperature (Power On): 150 deg F (65 deg C).
7. Maximum Exposure Temperature (Power Off): 185 deg F (85 deg C).
8. Maximum Operating Temperature: 300 deg F (150 deg C).
9. Capacities and Characteristics:
   a. Maximum Heat Output: 8 W/ft.
   b. Volts: 277V.

B. Controls
1. RTD Temperature Senso equal to Chromalox RTD-HT sensors used for measuring the surface temperature of process piping that is carrying products whose temperature must be controlled to prevent freeze-up, or to maintain viscosity level so that the inner medium

will flow. The RTD sensor element is made up with a 316 SS sheath and can be installed directly to a controller or junction box using the 1/2" conduit fitting.

2. Distribution/Controller: Equal to Chromalox CTC-2 series 2 circuit, NEMA 4X stainless steel, with BACnet communication.
3. Termination kits: Equal to Chromalox DL.
4. Heat trace labeling and fasteners from manufacture of heat tracing cable.

PART 3 - EXECUTION

3.1 SPECIAL RESPONSIBILITIE

A. Coordination: Coordinate work of this Section with work of other Sections.
   1. Perform work so that progress of project, including work of other Sections, is not delayed.
   2. Provide information about items furnished under this Section to be installed under other Sections, as necessary.
   3. Obtain detailed information from manufacturers of equipment provided under this Section as to proper methods of installation.
   4. Obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or by Owner.
   5. Keep fully informed of shape, size and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.
   6. Coordinate installation and pay backcharges to city building and fire department.

B. Maintenance of equipment and systems: Maintain Electrical equipment and systems until final acceptance by the Engineer and/or Owner, and ensure adequate protection of equipment and material during delivery, storage, installation and shutdown conditions. Responsibility shall include provisions required to meet conditions incidental to delays pending final test of systems and equipment under seasonal conditions.

C. Use of premises: Use of premises shall be restricted as directed by Architect and as required below.
   1. As required, during progress of work, remove and properly dispose of resultant dirt and debris, and keep premises reasonably clean. When work is complete, remove equipment and unused material and do cleaning and washing required, to provide acceptable appearance and operation of equipment to satisfaction of Architect.
   2. It shall be this contractors' responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on-site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.
   3. Do not interfere with function of existing sewers and water and gas mains. Prevent debris from entering conduit. Confer with the Engineer as to disruption of electric services or other utilities because of testing or connection of new work to existing.

D. Inspection: Periodic inspections by Engineer or designated agent shall not be construed as supervision of actual construction, nor make either responsible for providing safe place for performance of work of various trades or suppliers, or for visitors or occupants, or make either responsible for omission of safety devices called for by codes, ordinances, or specifications of equipment manufacturer.

E. Surveys and Measurements:
1. Base horizontal and vertical measurements on reference points established by Contractor and be responsible for correct laying out of work.
2. In the event of discrepancy between actual measurements and those indicated, notify Architect in writing and do not proceed with work until written instructions have been issued by Architect.

F. Temporary Utilities: Refer to requirements of Division 1 regarding temporary facilities.

G. Unload electrical materials and equipment delivered to site. Pay costs for rigging, hoisting, lowering and moving electrical equipment on-site, in building or on roof.

H. Refer to NEC requirements for mounting heights of switches and circuit breakers. Do not exceed 6-1/2 ft. above finished floor or platform.

I. Mount groups of electrical equipment or devices in same area (that is, switches, receptacles, and other devices) on common centerlines aligned horizontally and vertically.

3.2 MATERIALS AND WORKMANSHIP

A. All receptacles and switches shall be flush mounted in wall, including all masonry walls, unless otherwise indicated.

B. Work shall be rectilinear and shall run perpendicular or parallel to general construction. Wiring shall be run concealed unless specified otherwise. Exposed conduit shall run flush to structure, parallel or perpendicular to walls. Install material and equipment according to manufacturer's recommended best practice so that complete installation operates safely and efficiently.

C. Except as specified otherwise, material or equipment specified and shown on Drawings shall be new and shall meet requirements of latest standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA and applicable NFPA documents, and shall be UL-approved where applicable.

D. Despite references in Specifications or on Drawings to material or piece of equipment by name, make or catalog number, such reference shall be interpreted as establishing standards of quality for materials and performance.

E. Finish of materials, components and equipment shall not be less than industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, finish shall be as approved by Architect.

F. Owner will not be responsible for material and equipment before testing and acceptance.

3.3 TESTING, INSPECTION AND CLEANING

A. Test and inspect work provided under this Section as required by Contract Documents, codes, standards and authorities that have jurisdiction, to satisfaction of the Authority's site personnel. Notify Architect and authorities at least 48 hours before testing or inspection. Do not cover work before testing or inspection.

B. Employ the services of an independent Authority - approval testing company to perform specialized testing and to provide written certification for acceptance of specialized equipment and/or systems.

C. Furnish Architect with certificates of testing and inspection for electrical systems, indicating approval of authorities that have jurisdiction and conformance with requirements of Contract Documents.

D. Test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by Megger test as required. Insulation resistance between conductors and grounds for secondary distributions systems shall meet NEC requirements.

E. Verify and correct as necessary: voltages, tap settings, trip settings and phasing on equipment from secondary distribution system to points of use. Test secondary voltages at panelboards, and at other locations on distribution systems as necessary. Test secondary voltages under no-load and full-load conditions.

F. Test lighting fixtures with specified lamps in place for 10 hours; check fixtures in sections. Do not operate lamps other than for testing before final inspection by Architect. Replace lamps that fail within 90 days after acceptance by Architect within Contract Price.

G. Provide necessary testing equipment and testing.

H. Failure or defects in workmanship or materials revealed by tests or inspection shall be corrected promptly and retested. Replace defective material.

I. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.4 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.

c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

3.5 NAMEPLATES

A. Provide nameplates in or on panelboards, junction boxes and cabinets, and for special purpose switches, motor disconnect switches, remote control stations, starters or other controls furnished or installed under this Section. Nameplates shall designate equipment controlled and function.

B. Nameplates shall be a minimum of 3 inches long by 1-1/2 inches wide, with white face and black lettering screw on type. No adhesives will be allowed.

3.6 WIRING METHODS

A. Where specific approaches are not indicated on the drawings, provide circuiting and wiring approaches as indicated in the following schedule:

Type	Application/Locations
Rigid Galvanized Steel	1. Exterior exposed conduit runs. 2. Conduit penetrations of the floor slab or foundation wall.
EMT	1. For all locations except where RGS is required. 2. Do not use EMT for exterior runs, runs buried in concrete, in wet locations, or where conduit may be subject to mechanical abuse
Liquid tight Flexible Metal Conduit	1. Connections to electrical equipment and other equipment furnished under HVAC and Plumbing Sections that are subject to movement, vibration, or misalignment, where available space dictates, and where noise transmission must be eliminated or reduced. Limit length of flexible conduit in these applications to no more than 24 inches.

B. Install wire and cable in approved raceways as specified and as approved by authorities that have jurisdiction. Surface metal raceways shall not be used unless explicitly specified and shown on Drawings. Do not use surface raceways on floor.

C. Conduits installed on the interior of the exterior building walls shall be spaced off the wall surface a minimum of 1/4" using "Clamp-backs" or struts.

D. All receptacles and switches shall be flush mounted in walls.

E. Wire from point of service connection to receptacles, lighting fixtures, devices, equipment, outlets for future extension, and other electrical apparatas as shown on Drawings. Provide slack wire for connections. Tape ends of wires and provide blank covers for outlet boxes designated for future use. Do not install electrical outlets back to back on opposing sides of partitions.

F. Conductors #10 and smaller in branch circuit panelboards, signal cabinets, and signal control boards, shall be bundled. Conductors larger than #10 in pull boxes shall be labeled in individual circuits.

G. Two or more conduits installed instead of single conduit shall contain duplicate conductors, including neutrals and ground conductors where required; total capacity of duplicate conductors shall be at least equal to capacity of conductors replaced.

H. Follow homerun circuit numbers shown on Drawings to connect circuits to panelboards. Where circuit numbers are indicated on devices but homerun symbols are not indicated, interconnect devices and provide homerun to panel indicated from nearest device. Connect each branch circuit homerun with two or more circuits and common neutral to circuit breaker or switch in three-wire or four wire branch circuit panelboard so that no two circuits are fed from same bus.

I. Electrical metallic tubing may be used only in suspended ceiling and dry wall construction.

J. Install connectors and couplings as recommended by manufacturers. Compression fittings shall not be used with rigid steel, intermediate metallic or aluminum conduit.

K. Install sealing fittings at following points, and elsewhere as shown:
   1. Where conduits enter or leave hazardous areas equipped with explosion proof lighting fixtures, switches, receptacles, and other electrical devices.
   2. Where devices are called out on the drawings as explosion proof (“XP”)

L. Penetrate waterproof walls of structural slabs and foundation walls only where approved by Architect. Submit proposed penetrations points, size openings and penetration methods to Architect for approval.

M. Provide flexible conduits for connections to electrical equipment and to equipment furnished under Division 21, 22, and 23 that are subject to movement, vibration or misalignment; where available space dictates; and where noise transmission must be eliminated or reduced.

N. Provide cast metal outlet boxes for wet locations, corrosive locations, all locations where RGS conduit is required and for devices called out on drawings as explosionproof (“XP”) NEMA FB 1, ferrous alloy, Type FD, with gasketed cover

O. Run concealed conduit and EMT in as direct lines as possible with minimum number of bends of longest possible radius. Run exposed conduit and EMT parallel to or at right angles to building lines. Ends shall be free from dents or flattening.

P. Unless specified or shown on Drawings, install conduit and EMT concealed. Provide stand-off clips for conduits on exterior masonry walls.

Q. Install conduit systems complete before drawing in conductors. Blow through and swab after plaster is finished and dry, and before conductors are installed.

R. Expansion/Deflection Fittings: Conduit buried or secured rigidly on opposite sides of building expansion joints, seismic joints, and long runs of exposed conduit subject to stress shall have expansion fittings. Fittings shall safely deflect and expand to twice distance of structural movement.
1. Provide separate external copper bonding jumper secured with grounding straps on each end of firing
2. Conduits buried in concrete shall cross building expansion joints at right angles; provide expansion fittings as required by manufacturer's instructions. Provide insulated bushings at ends of conduits.

S. For all empty conduits called out on drawings, provide plastic bushings on conduit ends and pullstrings.

T. Attach pull ropes to conductors with basket-weave grips on pulling eyes. Pull cables that share conduit at same time.

U. Provide inserts, hangers, anchors and steel supports as necessary.

V. Provide pull boxes, sized per Code for job conditions as necessary.

3.7 BACKBOARDS

A. In all unfinished spaces, provide 3/4" fire rated plywood backboards for mounting of all panelboards and controls panels.

B. Provide additional backboards as indicated on drawings.

3.8 SLEEVES

A. Provide Schedule 40 steel sleeves as required. Fill slots, sleeves and other openings in floors or walls if not used. Fill spaces in openings after installation of conduit or cable.

B. Fill for floor penetrations shall be fire-resistant, compatible with floor material and finished to prevent passage of water, smoke and fumes. Fill in walls shall be similar to wall material, shall be fire-resistant in fire walls, and shall prevent passage of air, smoke and fumes.

C. Identify unused sleeves and slots for future installation.

D. Lay out conduit and openings in advance, to permit provision in work. Set sleeves and conduit in forms before concrete is poured. Provide remedial work where sleeves and conduits are omitted or improperly placed.

E. Sleeves for conduits that penetrate outside walls, basement slabs, footings and beams shall be waterproof. Extend sleeves in toilet and apparatus rooms floors 2 inches above finished floor.

3.9 MOTORS, CONNECTIONS AND CONTROLS

A. Provide motor starters where indicated on the drawings. Refer to mechanical drawings for motor sizes and provide motor starters sized according Section 2.15 Motor Starters.

B. Provide and wire motor disconnect switches except as specified or indicated on Drawings.

C. Motors 1/2 hp and larger shall be as scheduled; motors less than 1/2 hp shall be 120 V, single phase, 60 Hz, unless shown otherwise on Drawings.

D. Mount motor starters on new 3/4 inch exterior grade plywood mounting board finished to match starter enclosures. Mount boards 60 inches above finished floor on solid walls or columns in spaces not normally occupied. Obtain approval of starter locations from Architect.

E. Check electrical connections and sizing of motor circuit protection and prevent damage to motors and equipment from incorrect direction of rotation.

F. Consult Drawings and Specifications and shop drawings for verifications of size, speed and operation for motors furnished under this Section and other Sections.

G. Final connection to motors shall be made with flexible conduit (at least 16 in. long) with green ground wire installed.

3.10 GROUNDING

A. Provide equipment grounding system meeting all requirements of the NEC, and as shown on Drawings. Refer to plumbing and civil drawings for incoming piping required to be grounded by the NEC. Equipment grounding system shall be designed so metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits operate continuously at ground potential and provide low impedance path for possible ground fault currents

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

G. System shall meet NEC requirements, modified as shown on Drawings and as specified.

H. Provide separate green insulated equipment-grounding conductor for each single or three-phase feeder and each branch circuit. Install grounding conductor in common conduit with related phase or neutral conductors, or both. Parallel feeders installed in more than one raceway shall have individual full size green insulated equipment ground conductors.

I. Determine number and sizes of screw terminals for equipment grounding bars in panelboards and other electrical equipment. Provide screw terminals for active circuits, spares and spaces.

J. Provide green insulated grounding conductor in nonmetallic conduits or ducts unless specified otherwise.

3.11 INSTALLATION OF EQUIPMENT

A. Avoid interferences with structure and with work of other Sections. Preserve adequate headroom and clear doors and passageways, to satisfaction of Architect and as required by codes. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Install equipment to distribute equipment loads properly on building structural members provided for equipment support under other Sections. Roof mounted equipment shall be installed and supported on structural steel provided under other Sections.

C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section as shown on Drawings and as specified.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, and other devices.

E. Structural steel and hardware shall meet ASTM Standard Specifications requirements. Use of steel and hardware shall meet requirements of Code of Practice of American Institute of Steel Construction.

F. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly that nullifies warrantee. Report in writing to Architect, before purchase or shipment of equipment involved, on conditions that may prevent proper installation.

G. Repair damage to galvanized coatings with approved aluminum paint.

END OF SECTION