

SPECIFICATIONS

PROJECT:

**DANFORTH ON HIGH
PORTLAND, MAINE**

OWNER:

**DANFORTH ON HIGH, LP
309 CUMBERLAND AVE., SUITE 203
PORTLAND, MAINE 04101**

DEVELOPER:

**CHOM DEVELOPMENT CORPORATION, G.P.
309 CUMBERLAND AVE., SUITE 203
PORTLAND, MAINE 04101**

ARCHITECT:

**ARCHETYPE, P. A.
48 UNION WHARF
PORTLAND, MAINE 04101**

Bid Set

MaineHousing Project Number: MSHA RLP-1551

June 29, 2012

DANFORTH ON HIGH – PORTLAND, MAINE

INDEX TO PROJECT MANUAL

Section:

00100	Index to Project Manual
00200	Signature Page
00300	Invitation to Bid
00400	Bid Form
00500	Deduct Alternates
00600	Supplementary Conditions of the Contract for Construction
AIA 101	Standard Form or Agreement between Owner and Contractor
AIA 201	General Conditions of the Contract for Construction
AIA A312	Payment Bond
AIA A312	Performance Bond
AIA A701	Instruction to Bidders
AIA G702	Application and Certificate of Payment
AIA G703	Continuation Sheet
	MaineHousing Final Certificate and Release for Contractors/Subcontractors/Vendors
	MaineHousing Owner/Agency Certificate of Completion
	MaineHousing Construction Services Final Completion Checklist
	Incomplete Work Escrow (IWE)
	Geotechnical Report –“For Information Only”

Division 1 - General Requirements

01045	Cutting and Patching
01300	Submittals, Meetings & Record Documents
01330	Submittal Procedures
01400	Quality Control Services
01500	Temporary Facilities
01631	Products and Substitutions
01700	Project Closeout
01810	Commissioning
01815	Commissioning Agent Responsibilities

Division 2 - Site Work

02230	Site Clearing and Grubbing
02250	Dewatering
02315	Excavating, Embankment and Compaction
02317	Trenching
02510	Water Distribution
02525	Curbs and Sidewalks
02535	Sanitary Sewer Piping
02635	Storm Drainage Piping
02640	Manholes and Covers
02741	Bituminous Concrete Paving
02950	Planting
02970	Structural Soil Mix

DANFORTH ON HIGH – PORTLAND, MAINE

Division 3 - Concrete

03300 Cast-In-Place Concrete
03450 Architectural Pre-Cast Concrete

Division 4 - Masonry

04200 Unit Masonry

Division 5 - Metals

05120 Structural Steel
05500 Metal Fabrications

Division 6 - Wood & Plastics

06100 Rough Carpentry
06190 Metal Plate Connected Wood Trusses
06200 Finish Carpentry
06600 Plastic Fabrications

Division 7 - Thermal & Moisture Protection

07100 Damproofing and Waterproofing
07200 Moisture and Thermal Protection Spray Foam Insulation
07210 Thermal Insulation
07460 Siding
07500 Roofing and Flashing
07650 Flexible Flashing Active Drainage Plane System
07721 Roof Hatches
07860 Fire stopping and Smoke Seals
07920 Joint Sealers

Division 8 - Doors & Windows

08100 Steel Doors and Frames
08200 Interior Apartment Doors
08210 Wood Doors
08305 Ladder Safety Post
08360 Sectional Overhead Doors
08550 Clad Wood Windows
08710 Finish Hardware
08734 Overhead Sectional Door Operator
08800 Glazing

Division 9 - Finishes

09250 Gypsum Board
09300 Tile

DANFORTH ON HIGH – PORTLAND, MAINE

09510	Acoustical Ceilings
09650	Resilient Flooring and Vinyl Base Flooring Cut Sheets
09680	Carpeting Carpet Cut Sheets
09900	Painting

Division 10 - Specialties

10440	Signage
10550	Postal Specialties (Mailboxes)
10800	Toilet & Bath Accessories

Division 11 - Equipment

11450	Residential Equipment and Kitchens Bike Track Parking System
-------	---

Division 12 - Furnishings

12500	Window Treatment
-------	------------------

Division 13 - Special Construction

Division 14 - Conveying System

14240	Electric Traction Elevator
-------	----------------------------

Division 15 – Mechanical

15400	Plumbing
15600	Mechanical
15710	Fire Sprinklers

Division 16 – Electrical

16010	Electrical Requirements
16111	Conduit
16123	Wire & Cable
16130	Boxes
16141	Wiring Devices
16180	Equipment Wiring Systems
16190	Supporting Devices
16195	Electrical Identification
16421	Utility Service Entrance
16441	Enclosed Switches
16450	Secondary Grounding
16470	Panelboards
16481	Enclosed Motor Controllers

DANFORTH ON HIGH – PORTLAND, MAINE

16510	Interior Luminaires
16535	Emergency Lighting Equipment
16721	Fire Alarm and Detection Systems
16722	Door Entry Access Control System
16725	Carbon-Monoxide Detection Sensors
16742	Telephone System
16745	Cable Television System
16915	Gas Engine Driven Generator Sets
16950	Lighting Control System

The Maine Housing Green Building Standards 2011 & MaineHousing Design and Construction Standards 2011 are integral to the construction documents and can be found at the following web addresses.

<http://www.mainehousing.org/docs/housing-development/2011-green-building-standards.pdf>

<http://www.mainehousing.org/docs/housing-development/2011---design-construction-manual.pdf>

END OF SECTION

SIGNATURE PAGE

Owner: _____ Date: _____

Developer: _____ Date: _____

Architect: _____ Date: _____

Contractor: _____ Date: _____

Maine State Housing Authority: _____ Date: _____

Construction Lender: _____ Date: _____

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 00300

INVITATION TO BID

Proposal for the construction of Danforth on High, Portland, Maine will be available to the General Contractor on June 29, 2012. Proposals should be addressed to:

Danforth on High, L.P.
309 Cumberland Ave., Suite 203
Portland, ME 04101

Qualified bids will be rejected.

Performance and Payment Bonds are required. See AIA Document's A312 included in the Specifications.

Proposals will be received at the office of the Architect by July 26, 2012 at 1 PM. Bids will be received by the Architect. There will be a public opening. General Contractor will be contacted within three (3) working days.

Archetype, P.A
48 Union Wharf
Portland, ME 04101
(207) 772-6022
Fax (207) 772-4056

Contract Bid Documents may be viewed at the office of the Architect, Archetype, P.A. or at Xpress Copy, Portland, ME. One set of documents will be given to General Contractor, additional sets may be ordered from Xpress Copy, Portland, ME (207) 775-2444.

The Owner reserves the right to accept or reject any or all bids.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 00400

BID FORM

BIDDERS PROPOSAL

DATE: _____

TO: Danforth on High, L.P.
309 Cumberland Ave., Suite 203
Portland, ME 04101

In response to your invitation for bids, and subject to all the consideration thereof, the undersigned

A corporation organized and existing under the laws of the state of _____

a partnership consisting of _____

or an individual trading as _____

of the city or town of _____

state of _____: Hereby proposes to furnish all labor and

materials and to perform all work required for the construction of Danforth on High, Portland, ME.

In strict accordance with the specifications, plans and the articles of contract, therein and dated

_____ for the consideration of _____

_____ Dollars.

Construction Start Date: Contractor is required to hold Bid Price for a maximum of 60 days. During this 60 day period Owner will work to establish a start date.

Construction completion date to be nine months from Notice to Proceed, after which liquidated damages will be incorporated at a cost of \$600 per calendar day.

DANFORTH ON HIGH – PORTLAND, MAINE

The undersigned bidder agrees to execute the contract for the amount of the total of this bid within ten (10) calendar days from the date when the written notice to commence construction (Notice To Proceed) is delivered to him at the address given on this proposal.

Bidder acknowledges receipt of the following Addendums to the Drawings and Specifications, which have been incorporated into the bid figure.

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Bidder acknowledges the following Allowances: (These are included in Base Bid)

Allowance #1

Contractor

By: _____

Title: _____

Business Address: _____

END OF SECTION

SECTION 00500

Add/Deduct Alternates, Unit Pricing

Subcontractor acknowledges receipt of the following ADD alternates.

- 1. ADD: Under sidewalk heating coils as shown on Drawing M1 and Mechanical Specifications

ADD \$ _____

- 2. ADD: FOB Key – See Section 08710 Finish Hardware

ADD \$ _____

Subcontractor

By: _____

Title: _____

Business Address: _____

SUPPLEMENTARY CONDITION
OF THE CONTRACT FOR CONSTRUCTION

1. GENERAL

1.1 CHANGE ORDERS

A. Add 7.2.2 and 7.2.4:

7.2.2 The General Contractor will be allowed the following Profit and Overhead on Change Orders: OH&P General Contractor = 10% on own work, 5% on Subcontractors and Sub-subcontractors.

7.2.4 Change Orders require MaineHousing Signatures

1.2 APPLICATIONS FOR PAYMENT

A. Add 9.3.4:

9.3.4 Lien Waivers will be required to accompany requisitions for payment.

1.2 INSURANCE

A. Refer to General Conditions, Article 11, Insurance and Bonds for general provisions concerning insurance.

B. Amend, General Conditions, Article 11, as follows:

1. Add to Sub-sub-paragraph 11.1.1.7 the following: Liability insurance shall include all major lines of coverage, and be on a comprehensive basis including:

- a. Premises operations (including XCU as applicable).
- b. Independent contractors' protective.
- c. Products and completed operations.
- d. Personal injury liability including contractual liability (CG 22 74).
- e. Contractual, including specified provisions for Contractor's obligation under Paragraph 4.18.
- f. Owned, non-owned, and hired motor vehicles.
- g. Broad form property damage, including completed operations.
- h. Umbrella excess liability.

2. Sub-paragraph 11.1.2, add Sub-sub-paragraph 11.1.2.1 as follows: "11.1.2.1: Insurance required by Sub-paragraph 11.1.1 shall be written for not less than following, or greater if required by law:

DANFORTH ON HIGH – PORTLAND, MAINE

- a. Statutory Workman's Compensation with Employer's Liability limits of:
 - \$500,000 bodily injury – each accident
 - \$500,000 disease – each employee
 - \$500,000 disease – policy limit

- b. Comprehensive General Liability (CGL) policy on an occurrence form including coverage for premises exposure, owners and contractor's protective, contractual liability, independent contractors and completed operations.

General Aggregate (per project):	\$3,000,000
Products and Comp/Op Aggregate:	\$3,000,000
Each Occurrence:	\$1,000,000
Personal & ADV Injury	\$1,000,000
Fire Damage:	\$50,000
Medical Expenses:	\$5,000

- i. Coverage shall not limit liability arising from construction-related activities; and Residential work exclusions or limitations, or subcontractor warranty provisions shall not be permitted.
 - ii. Products and Completed Operations shall be maintained for three (3) years after the owner's final acceptance of the work.
 - iii. Property Damage Liability Insurance shall provide X, C, and U coverage (explosion, collapse, underground utilities) as applicable.
 - iv. A deductible greater than \$10,000 each occurrence is not permitted.
 - v. The Owner, Investor Limited Partner & the Special Limited Partner will be named as an additional insured.

- c. Comprehensive Automobile Liability (covering all owned, hired or non-owned autos):
 - i. Combined Single Limit - Bodily Injury & Property Damage: \$1,000,000 each accident
 - ii. Uninsured and underinsured motorists: Statutory limit

- d. Umbrella Excess Liability
 - i. \$5,000,000 following form over primary insurance

- e. Contractors Pollution Coverage for General Contractors
Occurrence Basis - Providing defense and indemnity coverage for bodily injury, property damage, and environmental investigation and clean-up costs for pollution conditions arising from contractor's operations.

MINIMUM LIMITS:

General Aggregate (per project):	\$2,000,000
Each Occurrence:	\$1,000,000

DANFORTH ON HIGH – PORTLAND, MAINE

- f. General Provisions
 - i. All insurance companies must have an A.M Best's Rating of at least A-IX or Standard & Poor's
 - ii. All certificates of insurance should include a 30 day notice of cancellation or material changes or 10 days for non-payment of premium.

END OF SECTION

AIA[®] Document A101[™] – 2007

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

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

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

Danforth on High, LP
309 Cumberland Ave. Suite 203
Portland, ME 04101

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

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

Danforth on High

The Architect:
(Name, legal status, address and other information)

Archetype, PA
48 Union Wharf
Portland, ME 04101

The Owner and Contractor agree as follows.

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

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

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

TABLE OF ARTICLES

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

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

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

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

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

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

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

Portion of Work

Substantial Completion Date

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

ARTICLE 4 CONTRACT SUM

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

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

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

Item	Units and Limitations	Price Per Unit (\$0.00)
------	-----------------------	-------------------------

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

Item	Price
------	-------

ARTICLE 5 PAYMENTS

§ 5.1 PROGRESS PAYMENTS

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

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

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

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

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

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

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

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

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

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

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

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

§ 5.2 FINAL PAYMENT

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

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

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

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 INITIAL DECISION MAKER

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 BINDING DISPUTE RESOLUTION

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

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

- Arbitration pursuant to Section 15.4 of AIA Document A201–2007
- Litigation in a court of competent jurisdiction
- Other *(Specify)*

ARTICLE 7 TERMINATION OR SUSPENSION

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

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

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

%

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

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

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

§ 8.6 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

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

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

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

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
----------	-------	------	-------

§ 9.1.4 The Specifications:

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

Section	Title	Date	Pages
---------	-------	------	-------

§ 9.1.5 The Drawings:

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

Number	Title	Date
--------	-------	------

§ 9.1.6 The Addenda, if any:

Number	Date	Pages
--------	------	-------

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

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

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

.2 Other documents, if any, listed below:

(Paragraph deleted)

MaineHousing Design and Construction Manual and Green Building Standards

ARTICLE 10 INSURANCE AND BONDS

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

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

Type of insurance or bond

Limit of liability or bond amount (\$0.00)

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

OWNER *(Signature)*

CONTRACTOR *(Signature)*

(Printed name and title)

(Printed name and title)

Additions and Deletions Report for **AIA[®] Document A101[™] – 2007**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 11:53:36 on 05/29/2012.

PAGE 1

Danforth on High, LP
309 Cumberland Ave. Suite 203
Portland, ME 04101

...

Danforth on High

...

Archetype, PA
48 Union Wharf
Portland, ME 04101

PAGE 6

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

Maine Housing Design and Construction Manual and Green Building Standards

AIA[®] Document A201[™] – 2007

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Danforth on High
Portland, ME

THE OWNER:

(Name, legal status and address)

Danforth on High, L.P.
309 Cumberland Ave. Suite 203
Portland, ME 04101

THE ARCHITECT:

(Name, legal status and address)

Archetype, PA
48 Union Wharf
Portland, ME

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

TABLE OF ARTICLES

- | | |
|----|--|
| 1 | GENERAL PROVISIONS |
| 2 | OWNER |
| 3 | CONTRACTOR |
| 4 | ARCHITECT |
| 5 | SUBCONTRACTORS |
| 6 | CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS |
| 7 | CHANGES IN THE WORK |
| 8 | TIME |
| 9 | PAYMENTS AND COMPLETION |
| 10 | PROTECTION OF PERSONS AND PROPERTY |
| 11 | INSURANCE AND BONDS |
| 12 | UNCOVERING AND CORRECTION OF WORK |
| 13 | MISCELLANEOUS PROVISIONS |
| 14 | TERMINATION OR SUSPENSION OF THE CONTRACT |
| 15 | CLAIMS AND DISPUTES |

Init.

AIA Document A201[™] – 2007. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997 and 2007 by The American Institute of Architects. All rights reserved. **WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This document was produced by AIA software at 15:29:01 on 06/28/2012 under Order No.9648457996_1 which expires on 02/08/2013, and is not for resale.

User Notes:

(1446070104)

INDEX

(Topics and numbers in bold are section headings.)

Acceptance of Nonconforming Work

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, **12.3**

Access to Work

3.16, 6.2.1, **12.1**

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.4.2, 13.7, 14.1, 15.2

Addenda

1.1.1, 3.11.1

Additional Costs, Claims for

3.7.4, 3.7.5, 6.1.1, 7.3.7.5, 10.3, 15.1.4

Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, **13.5**

Additional Insured

11.1.4

Additional Time, Claims for

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.5**

Administration of the Contract

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

Allowances

3.8, 7.3.8

All-risk Insurance

11.3.1, 11.3.1.1

Applications for Payment

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.6.3, 9.7, 9.10, 11.1.3

Approvals

2.1.1, 2.2.2, 2.4, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10, 4.2.7, 9.3.2, 13.5.1

Arbitration

8.3.1, 11.3.10, 13.1.1, 15.3.2, **15.4**

ARCHITECT

4

Architect, Definition of

4.1.1

Architect, Extent of Authority

2.4.1, 3.12.7, 4.1, 4.2, 5.2, 6.3, 7.1.2, 7.3.7, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.5.1, 13.5.2, 14.2.2, 14.2.4, 15.1.3, 15.2.1

Architect, Limitations of Authority and Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.3, 9.6.4, 15.1.3, 15.2

Architect's Additional Services and Expenses

2.4.1, 11.3.1.1, 12.2.1, 13.5.2, 13.5.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 4.2, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.4.1, 3.1.3, 3.5, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.5.2, 15.2, 15.3

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.5

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.5.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.4.2, 13.5, 15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3.7

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

Award of Subcontracts and Other Contracts for Portions of the Work

5.2

Basic Definitions

1.1

Bidding Requirements

1.1.1, 5.2.1, 11.4.1

Binding Dispute Resolution

9.7, 11.3.9, 11.3.10, 13.1.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.4.1

Boiler and Machinery Insurance

11.3.2

Bonds, Lien

7.3.7.4, 9.10.2, 9.10.3

Bonds, Performance, and Payment

7.3.7.4, 9.6.7, 9.10.3, 11.3.9, **11.4**

Building Permit

3.7.1

Init.

Capitalization
1.3
Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5
Certificates for Payment
4.2.1, 4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7,
9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.3
Certificates of Inspection, Testing or Approval
13.5.4
Certificates of Insurance
9.10.2, 11.1.3
Change Orders
1.1.1, 2.4.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11.1, 3.12.8, 4.2.8,
5.2.3, 7.1.2, 7.1.3, 7.2, 7.3.2, 7.3.6, 7.3.9, 7.3.10, 8.3.1,
9.3.1.1, 9.10.3, 10.3.2, 11.3.1.2, 11.3.4, 11.3.9, 12.1.2,
15.1.3
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.1, 3.11, 4.2.8, 7, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1,
11.3.9
Claims, Definition of
15.1.1
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, 15, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.7.4, 6.1.1, 7.3.9, 10.3.2, 15.1.4
Claims for Additional Time
3.2.4, 3.7.4.6.1.1, 8.3.2, 10.3.2, 15.1.5
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1,
11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6
Claims Subject to Arbitration
15.3.1, 15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3,
6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.3.1, 11.3.6, 11.4.1,
15.1.4
Commencement of the Work, Definition of
8.1.2
Communications Facilitating Contract
Administration
3.9.1, 4.2.4
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1,
9.10, 12.2, 13.7, 14.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2,
13.7

Compliance with Laws
1.6.1, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 10.2.2,
11.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14.1.1,
14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1,
9.10.2, 9.10.3, 11.3.1, 13.2, 13.4.2, 15.4.4.2
Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY
SEPARATE CONTRACTORS
1.1.4, 6
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, 7.3,
9.3.1.1
Construction Schedules, Contractor's
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.3
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR
SUSPENSION OF THE
5.4.1.1, 11.3.9, 14
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating
to
3.7.1, 3.10, 5.2, 6.1, 11.1.3, 11.3.6, 11.4.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.2.5, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
3.7.4, 3.8, 5.2.3, 7.2, 7.3, 7.4, 9.1, 9.4.2, 9.5.1.4, 9.6.7,
9.7, 10.3.2, 11.3.1, 14.2.4, 14.3.2, 15.1.4, 15.2.5
Contract Sum, Definition of
9.1
Contract Time
3.7.4, 3.7.5, 3.10.2, 5.2.3, 7.2.1.3, 7.3.1, 7.3.5, 7.4,
8.1.1, 8.2.1, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 14.3.2,
15.1.5.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2

Init.

Contractor's Construction Schedules
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2
Contractor's Employees
 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3,
 11.1.1, 11.3.7, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors and Owner's Forces
 3.12.5, 3.14.2, 4.2.4, 6, 11.3.7, 12.1.2, 12.2.4
Contractor's Relationship with Subcontractors
 1.2.2, 3.3.2, 3.18.1, 3.18.2, 5, 9.6.2, 9.6.7, 9.10.2,
 11.3.1.2, 11.3.7, 11.3.8
Contractor's Relationship with the Architect
 1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5,
 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.3, 4.2, 5.2, 6.2.2,
 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3,
 11.3.7, 12, 13.5, 15.1.2, 15.2.1
Contractor's Representations
 3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the Work
 3.3.2, 3.18, 5.3.1, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents
 3.2
Contractor's Right to Stop the Work
 9.7
Contractor's Right to Terminate the Contract
 14.1, 15.1.6
Contractor's Submittals
 3.10, 3.11, 3.12.4, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2,
 9.8.3, 9.9.1, 9.10.2, 9.10.3, 11.1.3, 11.4.2
Contractor's Superintendent
 3.9, 10.2.6
Contractor's Supervision and Construction Procedures
 1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3,
 7.3.5, 7.3.7, 8.2, 10, 12, 14, 15.1.3
Contractual Liability Insurance
 11.1.1.8, 11.2
Coordination and Correlation
 1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
 1.5, 2.2.5, 3.11
Copyrights
 1.5, **3.17**
Correction of Work
 2.3, 2.4, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.7
Costs
 2.4.1, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3,
 7.3.3.3, 7.3.7, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.3,
 12.1.2, 12.2.1, 12.2.4, 13.5, 14

Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate Contractors
 3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 11.1.1, 11.3,
 12.2.4
Damage to the Work
 3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4.1, 11.3.1, 12.2.4
Damages, Claims for
 3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1,
 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6
Damages for Delay
 6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
 3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 15.2, 6.3,
 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1,
 13.5.2, 14.2.2, 14.2.4, 15.1, 15.2
Decisions to Withhold Certification
 9.4.1, **9.5**, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of
 2.3.1, 2.4.1, 3.5, 4.2.6, 6.2.5, 9.5.1, 9.5.2, 9.6.6, 9.8.2,
 9.9.3, 9.10.4, 12.2.1
Definitions
 1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1,
 15.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1
Delays and Extensions of Time
 3.2, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7,
 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5
Disputes
 6.3, 7.3.9, 15.1, 15.2
Documents and Samples at the Site
3.11
Drawings, Definition of
1.1.5
Drawings and Specifications, Use and Ownership of
 3.11
Effective Date of Insurance
 8.2.2, 11.1.2
Emergencies
10.4, 14.1.1.2, 15.1.4
Employees, Contractor's
 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2,
 10.3.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1
Equipment, Labor, Materials or
 1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13.1, 3.15.1,
 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3,
 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2

Init.

Execution and Progress of the Work
 1.1.3, 1.2.1, 1.2.2, 2.2.3, 2.2.5, 3.1, 3.3.1, 3.4.1, 3.5,
 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.5, 8.2,
 9.5.1, 9.9.1, 10.2, 10.3, 12.2, 14.2, 14.3.1, 15.1.3
 Extensions of Time
 3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2,
 10.4.1, 14.3, 15.1.5, 15.2.5
Failure of Payment
 9.5.1.3, 9.7, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2
 Faulty Work
 (See Defective or Nonconforming Work)
Final Completion and Final Payment
 4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.3.1, 11.3.5,
 12.3.1, 14.2.4, 14.4.3
 Financial Arrangements, Owner's
 2.2.1, 13.2.2, 14.1.1.4
 Fire and Extended Coverage Insurance
 11.3.1.1
GENERAL PROVISIONS
1
Governing Law
13.1
 Guarantees (See Warranty)
Hazardous Materials
 10.2.4, 10.3
 Identification of Subcontractors and Suppliers
 5.2.1
Indemnification
 3.17, 3.18, 9.10.2, 10.3.3, 10.3.5, 10.3.6, 11.3.1.2,
 11.3.7
Information and Services Required of the Owner
 2.1.2, 2.2, 3.2.2, 3.12.4, 3.12.10, 6.1.3, 6.1.4, 6.2.5,
 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.4, 13.5.1,
 13.5.2, 14.1.1.4, 14.1.4, 15.1.3
Initial Decision
15.2
Initial Decision Maker, Definition of
 1.1.8
 Initial Decision Maker, Decisions
 14.2.2, 14.2.4, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
 Initial Decision Maker, Extent of Authority
 14.2.2, 14.2.4, 15.1.3, 15.2.1, 15.2.2, 15.2.3, 15.2.4,
 15.2.5
Injury or Damage to Person or Property
10.2.8, 10.4.1
 Inspections
 3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,
 9.9.2, 9.10.1, 12.2.1, 13.5
 Instructions to Bidders
 1.1.1
 Instructions to the Contractor
 3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.5.2
Instruments of Service, Definition of
1.1.7
 Insurance
 3.18.1, 6.1.1, 7.3.7, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 11

Insurance, Boiler and Machinery
11.3.2
Insurance, Contractor's Liability
11.1
 Insurance, Effective Date of
 8.2.2, 11.1.2
Insurance, Loss of Use
11.3.3
Insurance, Owner's Liability
11.2
Insurance, Property
 10.2.5, 11.3
 Insurance, Stored Materials
 9.3.2
INSURANCE AND BONDS
11
 Insurance Companies, Consent to Partial Occupancy
 9.9.1
 Intent of the Contract Documents
 1.2.1, 4.2.7, 4.2.12, 4.2.13, 7.4
Interest
13.6
Interpretation
 1.2.3, 1.4, 4.1.1, 5.1, 6.1.2, 15.1.1
 Interpretations, Written
 4.2.11, 4.2.12, 15.1.4
 Judgment on Final Award
 15.4.2
Labor and Materials, Equipment
 1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,
 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3,
 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
 Labor Disputes
 8.3.1
 Laws and Regulations
 1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13.1, 4.1.1, 9.6.4, 9.9.1,
 10.2.2, 11.1.1, 11.3, 13.1.1, 13.4, 13.5.1, 13.5.2,
 13.6.1, 14, 15.2.8, 15.4
 Liens
 2.1.2, 9.3.3, 9.10.2, 9.10.4, 15.2.8
 Limitations, Statutes of
 12.2.5, 13.7, 15.4.1.1
 Limitations of Liability
 2.3.1, 3.2.2, 3.5, 3.12.10, 3.17, 3.18.1, 4.2.6, 4.2.7,
 4.2.12, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 10.2.5, 10.3.3, 11.1.2,
 11.2, 11.3.7, 12.2.5, 13.4.2
 Limitations of Time
 2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7,
 5.2, 5.3.1, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,
 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 11.3.1.5,
 11.3.6, 11.3.10, 12.2, 13.5, 13.7, 14, 15
Loss of Use Insurance
11.3.3
 Material Suppliers
 1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.6, 9.10.5
Materials, Hazardous
 10.2.4, 10.3

Materials, Labor, Equipment and
1.1.3, 1.1.6, 1.5.1, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13.1,
3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3,
9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2

Means, Methods, Techniques, Sequences and
Procedures of Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2

Mechanic's Lien
2.1.2, 15.2.8

Mediation
8.3.1, 10.3.5, 10.3.6, 15.2.1, 15.2.5, 15.2.6, **15.3**,
15.4.1

Minor Changes in the Work
1.1.1, 3.12.8, 4.2.8, 7.1, 7.4

MISCELLANEOUS PROVISIONS
13

Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7,
10.3.2, 11.3.1

Mutual Responsibility
6.2

Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.3.1, 2.4.1, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4,
12.2.1

Notice
2.2.1, 2.3.1, 2.4.1, 3.2.4, 3.3.1, 3.7.2, 3.12.9, 5.2.1, 9.7,
9.10, 10.2.2, 11.1.3, 12.2.2.1, 13.3, 13.5.1, 13.5.2,
14.1, 14.2, 15.2.8, 15.4.1

Notice, Written
2.3.1, 2.4.1, 3.3.1, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 9.7,
9.10, 10.2.2, 10.3, 11.1.3, 11.3.6, 12.2.2.1, **13.3**, 14,
15.2.8, 15.4.1

Notice of Claims
3.7.4, 10.2.8, **15.1.2**, 15.4

Notice of Testing and Inspections
13.5.1, 13.5.2

Observations, Contractor's
3.2, 3.7.4

Occupancy
2.2.2, 9.6.6, 9.8, 11.3.1.5

Orders, Written
1.1.1, 2.3, 3.9.2, 7, 8.2.2, 11.3.9, 12.1, 12.2.2.1, 13.5.2,
14.3.1

OWNER
2

Owner, Definition of
2.1.1

Owner, Information and Services Required of the
2.1.2, **2.2**, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2,
9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.3, 13.5.1,
13.5.2, 14.1.1.4, 14.1.4, 15.1.3

Owner's Authority
1.5, 2.1.1, 2.3.1, 2.4.1, 3.4.2, 3.8.1, 3.12.10, 3.14.2,
4.1.2, 4.1.3, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3,
7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.1, 9.3.2, 9.5.1, 9.6.4,
9.9.1, 9.10.2, 10.3.2, 11.1.3, 11.3.3, 11.3.10, 12.2.2,
12.3.1, 13.2.2, 14.3, 14.4, 15.2.7

Owner's Financial Capability
2.2.1, 13.2.2, 14.1.1.4

Owner's Liability Insurance
11.2

Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2

Owner's Right to Carry Out the Work
2.4, 14.2.2

Owner's Right to Clean Up
6.3

Owner's Right to Perform Construction and to Award Separate Contracts
6.1

Owner's Right to Stop the Work
2.3
Owner's Right to Suspend the Work
14.3

Owner's Right to Terminate the Contract
14.2

Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.2.5, 3.2.2, 3.11.1, 3.17,
4.2.12, 5.3.1

Partial Occupancy or Use
9.6.6, **9.9**, 11.3.1.5

Patching, Cutting and
3.14, 6.2.5

Patents
3.17

Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1,
14.2.3, 14.2.4, 14.4.3

Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1,
9.10.3, 13.7, 14.1.1.3, 14.2.4

Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2

Payment, Final
4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 12.3.1,
13.7, 14.2.4, 14.4.3

Payment Bond, Performance Bond and
7.3.7.4, 9.6.7, 9.10.3, **11.4**

Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3

PAYMENTS AND COMPLETION
9

Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2

PCB
10.3.1

Init.

Performance Bond and Payment Bond
7.3.7.4, 9.6.7, 9.10.3, 11.4

Permits, Fees, Notices and Compliance with Laws
2.2.2, 3.7, 3.13, 7.3.7.4, 10.2.2

PERSONS AND PROPERTY, PROTECTION OF
10

Polychlorinated Biphenyl
10.3.1

Product Data, Definition of
3.12.2

Product Data and Samples, Shop Drawings
3.11, 3.12, 4.2.7

Progress and Completion
4.2.2, 8.2, 9.8, 9.9.1, 14.1.4, 15.1.3

Progress Payments
9.3, 9.6, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3

Project, Definition of
1.1.4

Project Representatives
4.2.10

Property Insurance
10.2.5, 11.3

PROTECTION OF PERSONS AND PROPERTY
10

Regulations and Laws
1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1,
10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14,
15.2.8, 15.4

Rejection of Work
3.5, 4.2.6, 12.2.1

Releases and Waivers of Liens
9.10.2

Representations
3.2.1, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.8.2,
9.10.1

Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.1, 4.2.2, 4.2.10, 5.1.1, 5.1.2,
13.2.1

Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.3, 5.3.1, 6.1.3, 6.2, 6.3, 9.5.1, 10

Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3

Review of Contract Documents and Field
Conditions by Contractor
3.2, 3.12.7, 6.1.3

Review of Contractor's Submittals by Owner and
Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2

Review of Shop Drawings, Product Data and Samples
by Contractor
3.12

Rights and Remedies
1.1.2, 2.3, 2.4, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1,
6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.2, 12.2.4,
13.4, 14, 15.4

Royalties, Patents and Copyrights
3.17

Rules and Notices for Arbitration
15.4.1

Safety of Persons and Property
10.2, 10.4

Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3.1, 10.1, 10.2, 10.4

Samples, Definition of
3.12.3

Samples, Shop Drawings, Product Data and
3.11, 3.12, 4.2.7

Samples at the Site, Documents and
3.11

Schedule of Values
9.2, 9.3.1

Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2

Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2

Shop Drawings, Definition of
3.12.1

Shop Drawings, Product Data and Samples
3.11, 3.12, 4.2.7

Site, Use of
3.13, 6.1.1, 6.2.1

Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.4.2, 9.10.1, 13.5

Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5

Special Inspections and Testing
4.2.6, 12.2.1, 13.5

Specifications, Definition of
1.1.6

Specifications
1.1.1, 1.1.6, 1.2.2, 1.5, 3.11, 3.12.10, 3.17, 4.2.14

Statute of Limitations
13.7, 15.4.1.1

Stopping the Work
2.3, 9.7, 10.3, 14.1

Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4

Subcontractor, Definition of
5.1.1

SUBCONTRACTORS
5

Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7

Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1

Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.7, 9.2, 9.3, 9.8,
9.9.1, 9.10.2, 9.10.3, 11.1.3

Submittal Schedule
3.10.2, 3.12.5, 4.2.7

Subrogation, Waivers of
6.1.1, 11.3.7

Init.

Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 13.7

Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
4.1.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8

Sub-subcontractor, Definition of
5.1.2
Subsurface Conditions
3.7.4

Successors and Assigns
13.2
Superintendent
3.9, 10.2.6

Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.7, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.3

Surety
5.4.1.2, 9.8.5, 9.10.2, 9.10.3, 14.2.2, 15.2.7

Surety, Consent of
9.10.2, 9.10.3

Surveys
2.2.3

Suspension by the Owner for Convenience
14.3
Suspension of the Work
5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14

Taxes
3.6, 3.8.2.1, 7.3.7.4

Termination by the Contractor
14.1, 15.1.6

Termination by the Owner for Cause
5.4.1.1, 14.2, 15.1.6

Termination by the Owner for Convenience
14.4
Termination of the Architect
4.1.3
Termination of the Contractor
14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT
14

Tests and Inspections
3.1.3, 3.3.3, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 11.4.1.1, 12.2.1, 13.5

TIME
8

Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, 8.3, 9.5.1, 9.7, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5

Time Limits
2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 12.2, 13.5, 13.7, 14, 15.1.2, 15.4

Time Limits on Claims
3.7.4, 10.2.8, 13.7, 15.1.2

Title to Work
9.3.2, 9.3.3

Transmission of Data in Digital Form
1.6

UNCOVERING AND CORRECTION OF WORK
12

Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 7.3.4
Use of Documents
1.1.1, 1.5, 2.2.5, 3.12.6, 5.3

Use of Site
3.13, 6.1.1, 6.2.1

Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.4.2
Waiver of Claims by the Contractor
9.10.5, 13.4.2, 15.1.6
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.4.2, 14.2.4, 15.1.6
Waiver of Consequential Damages
14.2.4, 15.1.6
Waiver of Liens
9.10.2, 9.10.4

Waivers of Subrogation
6.1.1, 11.3.7

Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.4, 12.2.2, 13.7

Weather Delays
15.1.5.2

Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2, 13.4.2, 15.4.4.2

Written Interpretations
4.2.11, 4.2.12

Written Notice
2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 5.2.1, 8.2.2, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 12.2.2, 12.2.4, 13.3, 14, 15.4.1

Written Orders
1.1.1, 2.3, 3.9, 7, 8.2.2, 12.1, 12.2, 13.5.2, 14.3.1, 15.1.2

Init.

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

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

§ 1.1.2 THE CONTRACT

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

§ 1.1.3 THE WORK

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

§ 1.1.4 THE PROJECT

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

§ 1.1.5 THE DRAWINGS

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

§ 1.1.6 THE SPECIFICATIONS

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

§ 1.1.7 INSTRUMENTS OF SERVICE

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

§ 1.1.8 INITIAL DECISION MAKER

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

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

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

Init.

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

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

§ 1.3 CAPITALIZATION

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

§ 1.4 INTERPRETATION

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

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

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

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

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

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

ARTICLE 2 OWNER

§ 2.1 GENERAL

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

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

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the

portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

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

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

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

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

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

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

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

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

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

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

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

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

Init.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

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

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

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

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

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

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

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

§ 3.4 LABOR AND MATERIALS

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

Init.

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

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

§ 3.5 WARRANTY

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

§ 3.6 TAXES

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

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

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

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

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

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

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

Init.

§ 3.8 ALLOWANCES

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 SUPERINTENDENT

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

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

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

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

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

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

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

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

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

Init.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

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

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

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

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

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

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

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

Init.

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

§ 3.13 USE OF SITE

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

§ 3.14 CUTTING AND PATCHING

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

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

§ 3.15 CLEANING UP

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

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

§ 3.16 ACCESS TO WORK

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

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

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

§ 3.18 INDEMNIFICATION

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

Init.

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

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

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

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

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

§ 4.2 ADMINISTRATION OF THE CONTRACT

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

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

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

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

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

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

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

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

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

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

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

§ 5.3 SUBCONTRACTUAL RELATIONS

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

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

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

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

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

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the

Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 MUTUAL RESPONSIBILITY

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

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

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

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

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

§ 6.3 OWNER'S RIGHT TO CLEAN UP

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

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

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

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

§ 7.2 CHANGE ORDERS

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

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

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

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

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

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

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

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

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

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

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount

for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

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

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

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

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

§ 7.4 MINOR CHANGES IN THE WORK

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

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

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

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

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

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

§ 8.2 PROGRESS AND COMPLETION

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

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

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

§ 8.3 DELAYS AND EXTENSIONS OF TIME

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

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

§ 9.2 SCHEDULE OF VALUES

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

§ 9.3 APPLICATIONS FOR PAYMENT

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

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

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

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

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or

encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

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

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

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

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

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

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

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

§ 9.6 PROGRESS PAYMENTS

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

Init.

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

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

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

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

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

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

§ 9.7 FAILURE OF PAYMENT

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

§ 9.8 SUBSTANTIAL COMPLETION

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

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

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

Init.

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

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

§ 9.9 PARTIAL OCCUPANCY OR USE

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

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

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

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

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

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

Init.

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

§ 10.2 SAFETY OF PERSONS AND PROPERTY

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

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

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

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

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

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

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

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

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

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

§ 10.3 HAZARDOUS MATERIALS

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

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

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

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

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

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

Init.

§ 10.4 EMERGENCIES

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

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

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

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

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

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

§ 11.2 OWNER'S LIABILITY INSURANCE

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

Init.

§ 11.3 PROPERTY INSURANCE

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

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

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

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

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

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

§ 11.3.2 BOILER AND MACHINERY INSURANCE

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

§ 11.3.3 LOSS OF USE INSURANCE

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

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

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment

Init.

property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

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

§ 11.3.7 WAIVERS OF SUBROGATION

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

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

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

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

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

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

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

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

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

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

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

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

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

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

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

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

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

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

§ 13.2 SUCCESSORS AND ASSIGNS

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

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

§ 13.3 WRITTEN NOTICE

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

§ 13.4 RIGHTS AND REMEDIES

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

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

§ 13.5 TESTS AND INSPECTIONS

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

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

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by

Init.

such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

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

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

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

§ 13.6 INTEREST

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

§ 13.7 TIME LIMITS ON CLAIMS

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

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

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

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

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

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

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

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

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

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

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

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

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

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

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

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

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

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

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

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

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

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

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

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

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

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

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

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

§ 15.2 INITIAL DECISION

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

Init.

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

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

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

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

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

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

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

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

§ 15.3 MEDIATION

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

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

Init.

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

§ 15.4 ARBITRATION

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

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

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

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

§ 15.4.4 CONSOLIDATION OR JOINDER

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

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

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

Additions and Deletions Report for **AIA[®] Document A201[™] – 2007**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 15:29:01 on 06/28/2012.

PAGE 1

Danforth on High
Portland, ME

...

Danforth on High, L.P.
309 Cumberland Ave. Suite 203
Portland, ME 04101

...

(Name, legal status and address)

Archetype, PA
48 Union Wharf
Portland, ME

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, David Lloyd, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 15:29:01 on 06/28/2012 under Order No. 9648457996_1 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2007, General Conditions of the Contract for Construction, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

AIA® Document A312™ - 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

« »
« »

SURETY:

(Name, legal status and principal place of business)

« »
« »

OWNER:

(Name, legal status and address)

« »
« »

CONSTRUCTION CONTRACT

Date: « »

Amount: \$ « »

Description:

(Name and location)

«Danforth on High»

« »

BOND

Date:

(Not earlier than Construction Contract Date)

« »

Amount: \$ « »

Modifications to this Bond: None See Section 18

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

SURETY

Company: (Corporate Seal)

Signature: _____

Name and « »

Title:

Signature: _____

Name and « »

Title:

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

« »
« »
« »

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

« »
« »
« »
« »
« »
« »

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

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

ELECTRONIC COPYING of any portion of this AIA Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company:

(Corporate Seal)

SURETY

Company:

(Corporate Seal)

Signature:

Name and Title:

« »« »

Address:

« »

Signature:

Name and Title:

« »« »

Address:

« »

AIA® Document A312™ - 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

« »
« »

SURETY:

(Name, legal status and principal
place of business)

« »
« »

OWNER:

(Name, legal status and address)

« »
« »

CONSTRUCTION CONTRACT

Date: « »

Amount: \$ « »

Description:

(Name and location)

«Danforth on High»

« »

BOND

Date:

(Not earlier than Construction Contract Date)

« »

Amount: \$ « »

Modifications to this Bond: None See Section 16

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

SURETY

Company: (Corporate Seal)

Signature: _____

Name and « »

Title:

Signature: _____

Name and « »

Title:

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

« »
« »
« »

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

« »
« »
« »
« »
« »
« »

ADDITIONS AND DELETIONS:

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

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

SURETY

Company: (Corporate Seal)

Company: (Corporate Seal)

Signature:

Signature:

Name and Title: « »« »

Name and Title: « »« »

Address: « »

Address: « »

AIA® Document A701™ - 1997

Instructions to Bidders

for the following PROJECT:

(Name and location or address)

«Danforth on High»

««Portland, ME»»

THE OWNER:

(Name, legal status and address)

« Danforth on High, L.P.

309 Cumberland Ave, Suite 203

Portland, ME 04101»« »

« »

THE ARCHITECT:

(Name, legal status and address)

«Archetype, PA

48 Union Wharf

Portland, ME 04101-»« »

« »

ADDITIONS AND DELETIONS:

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

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

TABLE OF ARTICLES

- 1 DEFINITIONS
- 2 BIDDER'S REPRESENTATIONS
- 3 BIDDING DOCUMENTS
- 4 BIDDING PROCEDURES
- 5 CONSIDERATION OF BIDS
- 6 POST-BID INFORMATION
- 7 PERFORMANCE BOND AND PAYMENT BOND
- 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

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

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

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

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

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

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

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

§ 3.3 SUBSTITUTIONS

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

§ 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

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

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

§ 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

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

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

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

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

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

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

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

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

§ 4.2 BID SECURITY

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

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

§ 4.3 SUBMISSION OF BIDS

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

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

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

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

§ 5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.2 OWNER'S FINANCIAL CAPABILITY

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

§ 6.3 SUBMITTALS

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

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

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

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.

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

§ 7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

§ 7.2 TIME OF DELIVERY AND FORM OF BONDS

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

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

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

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

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

DRAFT AIA® Document G702™ - 1992

Application and Certificate for Payment

TO OWNER: PROJECT: Danforth on High APPLICATION NO: 001 Distribution to:

OWNER: ARCHITECT: CONTRACTOR: FIELD:

PERIOD TO: CONTRACT FOR: General Construction CONTRACT DATE: PROJECT NOS:

FROM CONTRACTOR: VIA ARCHITECT:

CONTRACTOR'S APPLICATION FOR PAYMENT

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

- 1. ORIGINAL CONTRACT SUM..... \$0.00
- 2. NET CHANGE BY CHANGE ORDERS..... \$0.00
- 3. CONTRACT SUM TO DATE (Line 1 ± 2)..... \$0.00
- 4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)..... \$0.00

- a. 0 % of Completed Work (Column D + E on G703) = \$0.00
- b. 0 % of Stored Material (Column F on G703) = \$0.00

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

6. TOTAL EARNED LESS RETAINAGE..... \$0.00

(Line 4 Less Line 5 Total)

7. LESS PREVIOUS CERTIFICATES FOR PAYMENT..... \$0.00

(Line 6 from prior Certificate)

8. CURRENT PAYMENT DUE..... \$0.00

9. BALANCE TO FINISH, INCLUDING RETAINAGE

(Line 3 less Line 6) \$0.00

AMOUNT CERTIFIED..... \$0.00
(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

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

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

CONTRACTOR:

By:

Date:

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

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

AMOUNT CERTIFIED..... \$0.00
(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By:

Date:

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

AIA Document G702™ - 1992. Copyright © 1963, 1965, 1971, 1978, 1983 and 1992 by The American Institute of Architects. All rights reserved. This AIA Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 10:07:28 on 05/25/2012 under Order No. 9648457996_1 which expires on 02/08/2013, and is not for resale. User Notes:

AIA® Document G703™ - 1992

Continuation Sheet

AIA Document G702™-1992, Application and Certification for Payment, or G736™-2009, Project Application and Project Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
 In tabulations below, amounts are in US dollars.
 Use Column I on Contracts where variable retainage for line items may apply.

A ITEM NO.	B DESCRIPTION OF WORK	C SCHEDULED VALUE	D WORK COMPLETED		E THIS PERIOD	F MATERIALS PRESENTLY STORED (NOT IN D OR E)	G TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G ÷ C)	H BALANCE TO FINISH (C - G)	I RETAINAGE (IF VARIABLE RATE)
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD						
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	
GRAND TOTAL										
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00	

APPLICATION NO: 001
 APPLICATION DATE:
 PERIOD TO:
 ARCHITECT'S PROJECT NO:

AIA Document G703™ - 1992. Copyright © 1992. Copyright © 1963, 1965, 1966, 1967, 1970, 1978, 1983 and 1992 by The American Institute of Architects. All rights reserved. WARNING: This AIA® document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 10:07:59 on 05/25/2012 under Order No. 9648457996_1 which expires on 02/08/2013, and is not for resale.
 User Notes:



Maine Housing

Maine State Housing Authority

FINAL CERTIFICATE AND LIEN RELEASE for CONTRACTORS / SUBCONTRACTORS / VENDORS

Any subcontractor who supplied material or labor with a value greater than or equal to \$2,000 or any material supplier who supplied materials with a value greater or equal to \$10,000 must complete this form.

PROJECT _____
ADDRESS _____

Contract/Subcontract Date: _____
Contract/Subcontract Amt: \$ _____
Contract/Subcontract for (trade) _____

1. The undersigned certifies that there is due and payable under the above contract a final payment of \$_____.
2. The undersigned certifies that all work required under this contract has been performed in accordance with the terms of the contract and was completed on _____, 20__.
3. The undersigned certifies that, except as set forth above, there are no unpaid claims for materials, supplies or equipment and no claims of laborers or mechanics for unpaid wages arising out of the performance of the contract.
4. The undersigned releases any and all claims, other than for the final payment set forth above, arising under or by virtue of the contract and agrees to indemnify the Maine State Housing Authority and the owner against any such claims.
5. The undersigned has attached to this certificate all manufacturers' and suppliers' written guarantees and warranties covering materials and equipment furnished under the contract.

Contractor: _____
Signature: _____

Date: _____

State of Maine

County of _____, ss.

Date: _____

Personally appeared the above-named _____ and gave oath to the foregoing.

Before me,

Name

Notary Public of Maine/Attorney-at-Law

My Commission Expires: _____



OWNER/AGENCY CERTIFICATE OF COMPLETION

Owner(s): _____

Property Address: _____

MaineHousing Project No. _____ Number of Units _____

The undersigned Owner(s) certifies as follows:

1. The loan funds I have received from the Maine State Housing Authority to undertake property improvements have now been appropriately spent.
2. The improvements for which I used the money have been completed to my satisfaction and are the same improvements listed in Exhibit "A" of the Rehab Escrow or as listed in the Technical Services Document Sign Off, except as amended with the prior written consent of the Maine State Housing Authority.
3. The attached List of Tenants and Income is complete and accurate as of this date. (List all units, if vacant so note)

The undersigned Owner(s) swears under penalty of law that he/she/they have read and understood this Certificate and that to the best of his/her/their knowledge and belief it is true.

OWNER:

By: _____ Date: _____

Name: _____

By: _____ Date: _____

Name: _____

APPROVAL BY Maine State Housing Authority:

By: _____ Date: _____

MAINE STATE HOUSING AUTHORITY USE ONLY

Final Escrow Draw occurred on: _____ Remaining Escrow Funds _____
(Date)

Recommended Initial Annual Inspection _____ Remaining Funds to: _____
(Mo. / Yr.)

CC: Legal; Asset Management); Development Manager



Project:
Address:
Project No.

**CONSTRUCTION SERVICES
FINAL COMPLETION CHECKLIST**

1	*	Date	Architect	Certificate of Substantial Completion (AIA document normally prepared by architect)
2	*		Arch/Owner	Architects Certificate of Punch list Completion (MSHA Document or letter from Design Professional)
3	*		Contractor	Elevator License (if applicable)
4	*		Contractor	Fire Alarm system Test Report and Sign-off by System Manufacturer's Rep
5	*		Contractor	Sprinkler Test Report/Sign-off by qualified installer and SFMO permit signed-off by "RMS" (Responsible Managing Supervisor)
6	*		Contractor	Certificate of Occupancy from local municipality
7	**		Contractor	Electrical Permit Sign-off by state or local electrical inspector
8	**		Contractor	Plumbing Permit Sign-off by state or local plumbing inspector
9	*		Architect	Certificate of Completion of Design Professional (MSHA Document)
10	*		All	Incomplete Work Escrow in the Amount of: \$
11	*		Contractor	Requisition for all items not identified on Incomplete Work Escrow list (item #10)
12	*		Contractor	Lien Releases (typically using MSHA's Contractors Final Certificate and Release Form)
13	*		Contractor	O & M manuals (deliver to Owner) <i>as applicable</i>
14	*		Contractor	Warranty information to Owner (e.g. Roofing, Boilers.) <i>as applicable</i>
15	*		Contractor	As-built drawings (deliver to Owner, copy to MSHA)
16	*		Owner	As-built survey with MSHA Certification (may be waived if work did not increase building footprint)
17	*		Contractor	State Fire Marshal Inspection and Plan of Correction (if required)
18	*		Owner	Supportive Housing/One Write Project Certificate of Completion of Construction/Rehab Activities
19	NR		Contractor	Evidence of satisfactory Lead Based Paint Clearance testing (not required for new construction)
20	*		Contractor	Consent of Surety to release of final payment
21	*		Contractor	Blower Door Test
22	*		Owner	Commissioning Report
23	*		Owner	Green Std #10 Educational Materials (approved by Asset Management Division, MaineHousing)

* Required NR Not Required ** Required unless covered under local Certificate of Occupancy

Construction Services has received and reviewed the documents outlined above and find them suitable to satisfy closeout/completion requirements per Construction Services requirements:

/Construction Analyst :	Date:
Don McGilvery/Construction Services Manager :	Date:

Incomplete Work Escrow

Project name/address: _____

Owner/Developer: _____

MH project number: _____

Contractor: _____

Architect: _____

CA: _____

The following items represent project features that have been determined to be incomplete as the result of:

- Seasonal limitations.
 Extraordinary circumstances w/MSHA concurrence
 Other

The value of all incomplete items as determined by the project team, with concurrence by Maine Housing, shall be multiplied by a factor of 150% to establish the total amount to be subject to escrow in accordance with MaineHousing policy.

#	Description	\$ Value	x 150%	Notes:
1				
2				
3				
4				
Sub Total:				

The amount of \$ _____ shall be withheld by MaineHousing till such time that work has been completed and determined acceptable by the Owner and representative of MaineHousing. Work shall be completed by: _____
 Upon satisfactory completion of the items listed above, the Authority will prepare a release of funds being withheld against those work items. At no time shall an aggregate amount exceeding 50% of the total escrow amount be released prior to completion of all escrow items.

Contractor *Date* _____
Owner *Date* _____

Architect *Date* _____

MaineHousing CA *Date*

Request for Concurrence *for MaineHousing use only*

As the result of an inspection on _____, Construction Services finds:

- All work is complete/satisfactory
 Outstanding work remains as follows... _____

 Completion date exceeded
 Extend to: _____ No extension... MH/Owner to complete

Construction Analyst *Date* _____
Construction Services Manager *Date*

To: Development Assistant
RE: Request for check **Date:** _____
CC: AM, LO
 In accordance with CS findings/recommendations, please prepare check in the amount of \$ _____ made payable to:
 1st _____

 2nd _____

Request for Concurrence *for MaineHousing use only*

As the result of an inspection on _____, Construction Services finds:

- All work is complete/satisfactory
 Outstanding work remains as follows... _____

 Completion date exceeded
 Extend to: _____ No extension... MH/Owner to complete

Construction Analyst *Date* _____
Construction Services Manager *Date*

To: Development Assistant
RE: Request for check **Date:** _____
CC: AM, LO
 In accordance with CS findings/recommendations, please prepare check in the amount of \$ _____ made payable to:
 1st _____

 2nd _____

INCOMPLETE WORK ESCROW POLICY

Following represents the complete policy for the handling of incomplete work escrow and expressly supersedes any and all instructions to Authority personnel.

1. **MaineHousing** will establish the content, completion date and appropriate retainage for the incomplete work escrow at the time of the final inspection in consultation with the contractor and architect, and in accordance with policy herein.
2. Eligible escrow items shall be limited to seasonal items, and back-ordered items (if proof of ordering is provided at the final inspection), unless the Authority determines that extraordinary circumstances warrant inclusion of other, non-safety related items.
3. 150% times the actual escrow amount shall be held in escrow by **MaineHousing** to cover any and all escrow items.
4. All escrow work shall be completed in full within 60 days from date of agreement, unless a longer period is agreed upon initially for seasonal or back-ordered items. No more than two (2) 15-day extensions shall be allowed beyond the initial completion date.
5. The Owner shall notify **MaineHousing** in writing when all items of an escrow section are complete and ready for inspection. No inspections shall be made until said notification has been received. **MaineHousing** shall schedule an inspection within 5 working days after receipt of notice from the owner.
6. Any MaineHousing inspection which determines the necessity for a re-inspection due to an action, omission, or deficiency caused by the development team, *may* result in charges billable to the Developer to cover the costs of labor and expense to MaineHousing for the re-inspection. The rate of charge shall be **\$25.00** per man-hour for on-site time, **\$15.00** per man-hour for travel time from MaineHousing's office to site and return. A maximum charge per re-inspection shall not exceed **\$200.00**.
7. Upon acceptance of all items in an escrow section **MaineHousing** will prepare a release of those funds being withheld against those work items. **AT NO TIME SHALL AN AGGREGATE AMOUNT EXCEEDING 50% OF THE TOTAL ESCROW AMOUNT BE RELEASED PRIOR TO COMPLETION OF ALL ESCROW ITEMS.**
8. Upon the forfeiture of escrow monies to **MaineHousing**, **MaineHousing** shall proceed to have all incomplete work escrow items completed by a contractor, determined in the sole discretion of **MaineHousing** to be capable of completing said escrow items. Any escrow funds remaining, if any, after completing said escrow items shall be returned to the Developer.
9. **WAIVERS TO THE ABOVE POLICY MAY ONLY BE APPROVED BY MAINEHOUSING'S EXECUTIVE DIRECTOR.**



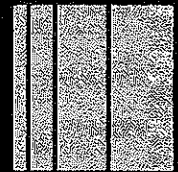
Report on Subsurface and Foundation Investigation

Proposed Danforth Apartments Portland, Maine

for

Random Orbit, Inc.
Chestnut Street
Portland, Maine 04101

July 17, 2007



July 17, 2007
07354

Mr. Peter Bass
Random Orbit, Inc.
17 Chestnut Street
Portland, ME 04101

**Report on Subsurface and Foundation Investigation
Proposed Danforth Apartments, Portland, Maine**

Dear Peter:

This report presents the results of our subsurface and foundation investigation for the proposed Danforth Apartments in Portland, Maine. These services are provided in accordance with our proposal dated June 6, 2007.

In summary, it is our opinion that the proposed building may be supported on spread and continuous footings bearing on undisturbed, naturally deposited sand, improved fill or on compacted structural fill placed after removal of unsuitable soil. In addition, an earth-supported slab-on-grade may be used for the lowest (ground) floor. Specific recommendations regarding foundation design and construction considerations are presented below.

Introduction

The site is located at the northwest corner of the intersection of Danforth and High Streets in Portland. The site is presently used as a parking lot. Ground surface slopes upward along High Street from Danforth Street. We understand that the project will consist of a 4-story building with parking on the first level with a daylight entrance from Danforth Street and 3 stories of apartments above. The building will have wood-framed construction and a plan area of approximately 6,300 square feet and will occupy most of the site.

It is our experience that many open parcels in this area of Portland were once occupied by structures. Therefore, there may be existing foundations or other construction below the ground surface that were not identified in the borings.

Subsurface Explorations

On June 25, 2007, Maine Test Borings, Inc. (MTB) of Brewer, Maine drilled four borings at the site, B1 to B4, at locations shown on Sheet 1, Boring Plan. MTB drilled the borings to depths below ground surface varying from 21.0 to 22.0 feet. Sebago Technics, Inc. monitored the borings and prepared the logs included in Appendix A. Table I summarizes the results of the borings. MTB backfilled the borings with the drilled material.

Borings were drilled using 2.5-inch inside diameter hollow stem augers. Samples were generally recovered at 5-foot intervals. Standard Penetration Resistance (N) was measured at each sample interval in accordance with ASTM Test D1586.

Sebago Technics, Inc. determined the locations of borings by taping from existing site features.

The boring logs and related information depict subsurface conditions and water levels only at their specific locations at the time of excavation. Soil conditions at other locations may differ from conditions at these locations. Also, the passage of time may result in a change in groundwater conditions at exploration locations.

Subsurface Conditions

The borings encountered two principal soil units: fill and marine fan deposits (sand). Encountered thickness and generalized descriptions of these units are presented below in order of increasing depth below ground surface.

Fill - Fill consists of loose to medium dense, brown to rust brown silty SAND with gravel (SM); to well-graded SAND with silt and gravel (SW-SM); to red BRICKS with trace of clinkers and wood. Encountered thickness varies from 3.0 feet to 8.0 feet.

Marine Fan Deposit - The marine fan deposit consists of medium dense to very dense, brown silty SAND with gravel (SM); to poorly-graded SAND with gravel (SP); to well-graded SAND with gravel (SW). Boring penetrated up to 19.0 feet into the sand.

Groundwater was observed in the borings at depths below ground surface varying from 8.0 feet to 11.5 feet. Observations of groundwater were made over a relatively short period of time and may not reflect the stabilized groundwater level. In addition, water levels at the site will vary with season, precipitation, temperature and construction activity in the area. Therefore, water levels during and following construction will vary from those observed in the borings.

Recommendations for Foundation Design

Recommended Foundation Type and Design Criteria

The existing fill, in its present condition, is not considered suitable for support of the building or ground floor. In addition, there could be portions of existing foundations buried below the ground surface. All existing fill containing debris and remains of foundations should be removed from within the limits of the building foundation. We recommend that the building be supported on spread and continuous footings bearing on the undisturbed marine fan deposit (sand), improved fill or on compacted structural fill placed after removal of the unsuitable material.

The existing fill consists of loose to medium dense sand and bricks. Borings did not encounter significant organics or void producing objects. In our opinion, footings may be founded on the existing fill that has been improved by over excavating a minimum of 2 feet below bearing

level, compaction of the existing sand fill with vibratory compaction equipment and replacement with compacted ¾-inch crushed stone. A non-woven geotextile fabric, similar to Mirafi 140N, should be placed on the subgrade below the crushed stone and up the sides.

Footings should be proportioned for an allowable bearing stress in pounds per square foot (psf) equal to 1,300 multiplied by the least lateral dimension of the footing in feet, up to a maximum of 4,000 psf. All footings should be at least 1.5 feet wide.

Footings should be founded at least 4.5 feet below the lowest adjacent ground surface exposed to freezing.

Crushed stone supporting footings should extend laterally from the footings to at least the limits defined by 1 horizontal to 1 vertical lines sloped outward and downward from points located at least 2 feet horizontally beyond the bottom edges of the footings.

At the recommended bearing stress, we anticipate that settlement for foundations will be less than 1 inch. We estimate that more than 50 percent of this settlement will occur during the construction period. We anticipate that settlement of this magnitude is acceptable. However, Structural Design Consulting, Inc. should determine final acceptability of settlement.

Lowest Level Floor

We understand that most of the lowest level floor will consist of bituminous concrete for parking. The remainder of the lowest level will consist of a lobby, elevator, mechanical room, storage and stairs. We recommend that the lowest level floor slabs in these areas be designed as an earth-supported slabs-on-grade bearing on a minimum 12-inch thickness of compacted structural fill. All existing fill containing debris and existing foundations, if present, should be removed from within the slab limits prior to placing fill. The subgrade should be improved by compacting with vibratory compaction equipment. All fill placed below the floor slabs for raise-in-grade should consist of compacted structural fill. Normal dampproofing and vapor barriers should be provided below the slabs.

We recommend the following pavement section for the lowest level parking:

- 3 inches bituminous concrete, placed in two layers
- 15 inches sand or gravel subbase course

Subbase course materials should conform to the following gradation:

Sand or Gravel (Maine DOT Standard Specification, Highways and Bridges; Section 703.06b, Type D)

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
4 inches	100
¾ inch	25-70
No. 40	0-30
No. 200	0-7

(Note: Type D aggregate should be modified to a maximum 4-inch size. Compacted structural fill may be substituted for gravel subbase course.)

All unsuitable material should be removed from within the limits of the building. Existing foundations, if present, should be removed to a minimum depth of 2 feet below final grade and replaced with compacted structural fill. Fill required below the pavement section should consist of compacted structural fill. The subgrade should be compacted with vibratory compaction equipment prior to placing fill and subbase. Compacted structural fill and pavement subbase should be placed in layers not exceeding 8 inches in thickness and compacted to a dry density of at least 95 percent of maximum dry density, as determined in accordance with ASTM Test Designation D1557.

It should be noted that the subgrade soils may be frost-susceptible. Therefore, pavement roughness due to non-uniform frost movement may occur. To eliminate such non-uniform frost movement would require approximately 4.5 feet of structural fill subbase. However, it is common practice to tolerate seasonal movement to avoid the high cost of the added thickness of subbase.

Seismic Design Considerations

We recommend that the building be designed in accordance with the seismic requirements of the latest edition of the International Building Code, the site classification is Class C; the site response coefficient F_a is 1.2 for a short period spectral response acceleration S_s of 0.37g; the site response coefficient F_v is 1.7 for the 1-second period spectral response acceleration S_1 of 0.10g. The subgrade soils are not considered liquefaction susceptible.

Lateral Foundation Loads

We recommend that lateral loads be resisted by bottom friction on footings. We recommend that a coefficient of friction equal to 0.40 be used for footings bearing on soil or crushed stone. If this does not provide sufficient resistance, we will study the problem in more detail to take into account other factors.

Backfill Materials

Structural fill used below foundations and floor slabs and for backfill adjacent to walls should consist of sandy gravel to gravelly sand. It should be free of organic material, loam, trash, snow, ice, frozen soil and other objectionable material, and should conform to the following gradation:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
3 inches	100
No. 4	30 to 90
No. 40	10 to 50
No. 200	0 to 8

Compacted structural fill should be placed in layers not exceeding eight inches in loose measure and compacted by self propelled vibratory equipment at the approximate optimum

moisture content to a dry density of at least 95 percent of the maximum dry density, as determined in accordance with ASTM Test Designation D1557. In confined areas, the loose layer thickness should be reduced to 6 inches and compaction performed by hand-guided vibratory equipment.

Construction Considerations

General

The primary purpose of this section of the report is to comment on items related to excavation, earthwork and related geotechnical aspects of proposed construction. It is written primarily for the engineer having responsibility for preparation of plans and specifications. Since it identifies potential construction problems related to foundations and earthwork, it will also aid personnel who monitor the construction activity. Prospective contractors for this project must evaluate the construction problems on the basis of their own knowledge and experience in the Portland, Maine area, and on the basis of similar projects in other localities, taking into account their proposed construction methods, procedures, equipment and personnel.

Excavation, Lateral Support and Control of Water

We anticipate that foundation excavation can be accomplished with sloped open excavation through the overburden soils provided safe side slopes can be maintained. Some sloughing and raveling should be anticipated in temporary slopes. Temporary excavations should be made in accordance with all OSHA and other applicable regulatory agency requirements. Existing foundations, if present within the limits of proposed foundations and floor slab, should be completely removed and the excavation to bearing level backfilled with compacted structural fill or crushed stone, as appropriate. Existing foundations below the parking area should be removed to at least 2 feet below the pavement.

We anticipate that groundwater may be encountered at proposed subgrade level or bearing level of footings. If encountered, open pumping from sumps can likely control groundwater. In general, the contractor should control groundwater and water from runoff and other sources by methods which prevent disturbance of bearing surfaces or adjacent soils and allow construction in-the-dry.

Subgrade Preparation

The subgrade soil is susceptible to disturbance from construction traffic. Equipment and personnel should not be permitted to travel across exposed footing bearing surfaces or exposed slab subgrades. Any subgrade areas that are disturbed should be recompacted or excavated and replaced with compacted structural fill prior to placing concrete. Subgrades should be protected against freezing temperatures if exposed during construction. Final excavation to subgrade should be performed using equipment with smooth-edge buckets.

Construction Monitoring

The foundation recommendations contained herein are based on the known and predictable behavior of a properly engineered and constructed foundation. Monitoring of the foundation

construction is required to enable the geotechnical engineer to keep in contact with procedures and techniques used in construction. Therefore, we recommend that a person qualified by training and experience be present to provide monitoring at the site during preparation of foundation bearing surfaces, rock blasting and placement of compacted structural fill.

Limitations of Recommendations

This report has been prepared for specific application to the subject project in accordance with generally accepted geotechnical engineering practices. In the event that any changes in the nature, design or location of the building are planned, the conclusions and recommendations contained in this report should not be considered valid, unless the changes are reviewed and the conclusions of this report modified or verified in writing.

The recommendations presented herein are based in part on the data obtained from the referenced test borings. The nature and extent of variations between the explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

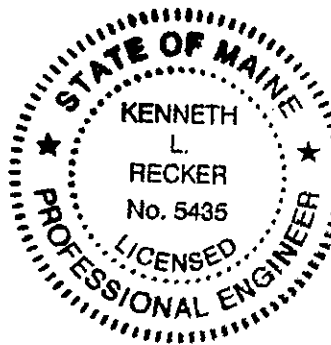
We request that we be provided the opportunity for a general review of the final design and specifications in order to determine that our earthwork and foundation recommendations have been interpreted and implemented in the design and specifications as they were intended.

It has been a pleasure to work with you on this project. Please do not hesitate to contact us if you have any questions or need additional information.

Sincerely,

SEBAGO TECHNICS, INC.

Kenneth L. Recker
Kenneth L. Recker, P.E.
Geotechnical Engineering Manager



KLR:klr/kn
Enclosures:

- Table I - Summary of Borings
- Sheet 1 - Boring Plan
- Appendix A - Logs of Test Borings

07354

**TABLE I
SUMMARY OF BORINGS
PROPOSED DANFORTH APARTMENTS
PORTLAND, MAINE**

Boring Number	Depth (Ft)	Depth to Water (Ft)	Strata Thickness (Ft)	
			Fill	Sand
B1	21.5	10.0	8.0	13.5*
B2	21.0	8.0	3.0	18.0*
B3	22.0	11.5	3.0	19.0*
B4	22.0	11.0	8.0	14.0*

NOTES:

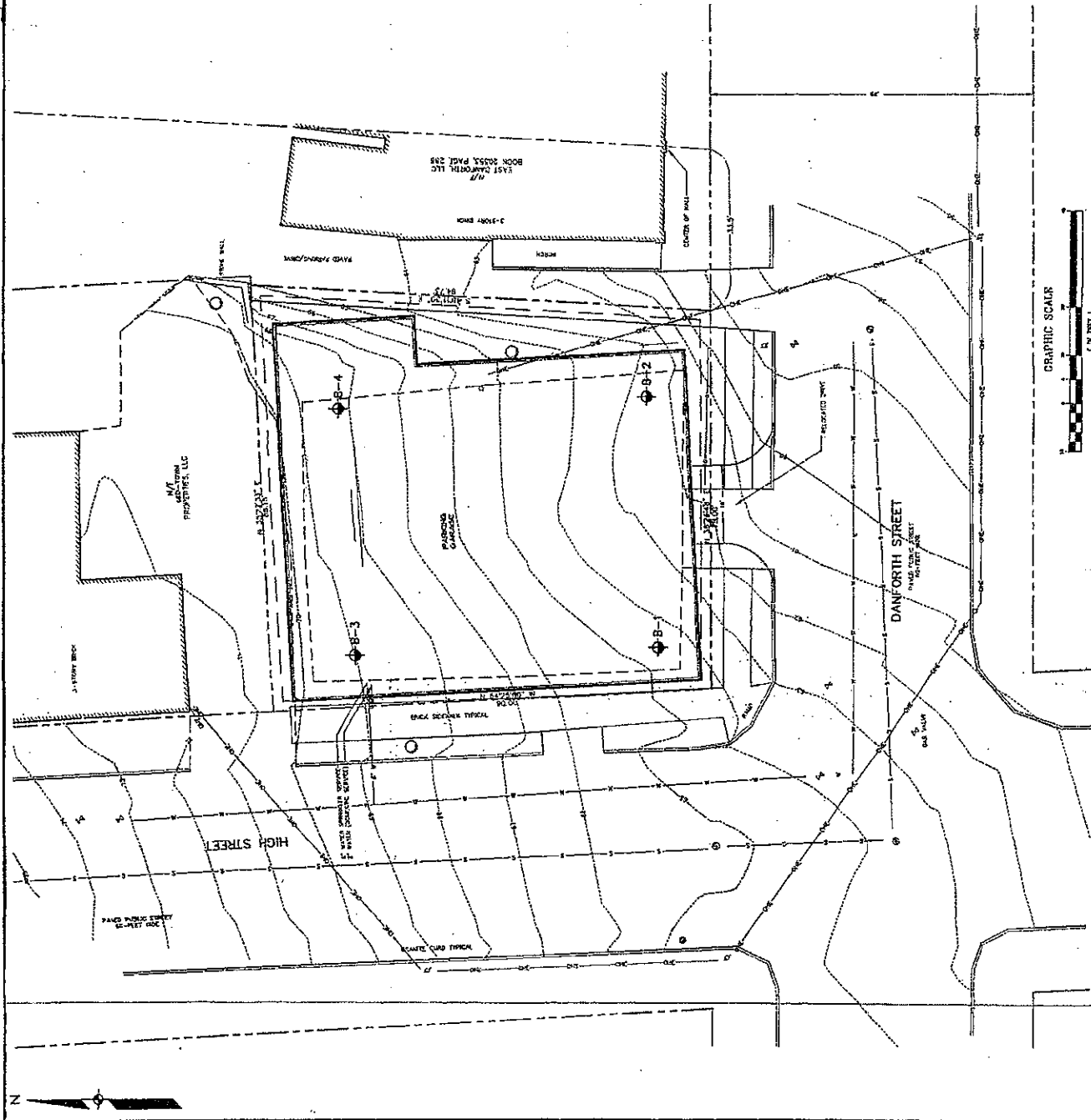
1. * INDICATES DEPTH OF PENETRATION INTO STRATUM.

Segago Technics
Engineering Services for Civil and
Structural Engineering

NO.	DATE	BY	CHKD	APP'D

NO.	DATE	BY	CHKD	APP'D

- LEGEND**
- NUMBER AND APPROXIMATE LOCATION OF BOREHOLE LOCATIONS TO BE MONITORED
 - LOCATION OF APPROXIMATE LOCATION OF BOREHOLE LOCATIONS TO BE MONITORED
- NOTES**
1. BOREHOLE MONITORING FROM ELECTRICAL AND MECHANICAL SERVICES SHALL BE PROVIDED BY SECTIVE P/A ASBESTOS TILED SHEET PILE SITE PLAN.
 2. BOREHOLE MONITORING BY SEGAGO TECHNICS, INC.
 3. LOCATIONS OF BOREHOLE MONITORING BY SEGAGO TECHNICS, INC. BY TAPPING AND PUNCH TEST METHODS BY CONTRACTOR.



0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99



Appendix A

Logs of Borings

PROJECT: PROPOSED DANFORTH APARTMENTS STI JOB NO. 07354
 LOCATION: DANFORTH/HIGH STREETS, PORTLAND, MAINE PROJECT MGR. K. RECKER
 CLIENT: ARCHETYPE, PA FIELD REP. K. B. STEPHENSON
 CONTRACTOR: MAINE TEST BORINGS, INC. DATE STARTED 6/25/2007
 DRILLER: D. McKEEN DATE FINISHED 6/25/2007

Elevation		ft. Datum		Boring Location		See Plan	
Item	Casing	Sampler	Core Barrel	Rig Make & Model	Mobile B47/53	Hammer Type	Drilling Mud
Type	HSA	SS		<input checked="" type="checkbox"/> Truck <input type="checkbox"/> Tripod		<input checked="" type="checkbox"/> Safety <input type="checkbox"/> Bentonite	Type Method Depth
Inside Diameter (in.)	2.5	1.375		<input type="checkbox"/> ATV <input type="checkbox"/> Geoprobe		<input type="checkbox"/> Doughnut <input type="checkbox"/> Polymer	HSA/Spin/20.0
Hammer Weight (lb.)		140		<input type="checkbox"/> Track <input type="checkbox"/> Air Track		<input type="checkbox"/> Automatic <input checked="" type="checkbox"/> None	
Hammer Fall (in.)		30		<input type="checkbox"/> Skid <input type="checkbox"/>		<input checked="" type="checkbox"/> Cutting Head	Drilling Notes:

Depth (ft.)	Sampler Blows per 6 In.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel		Sand			Field Test				
								% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0	2	S1	0.0		0.2	SM	Medium dense, gray-brown silty SAND (SM), mps = 0.5 in., dry -FILL-			30	20	30	15				
	8					SW	Medium dense, brown well-graded SAND with gravel (SW), mps = 1.0 in., dry	10	5	20	30	30	5				
	7																
	6	S1	2.0		2.0		-FILL-										
5	5	S2	5.0			SM	Medium dense to dense, brown silty SAND with gravel (SW), mps = 1.0 in., trace brick, damp	10	10	30	15	20	15				
	12																
	18																
	40	S2	7.0				-FILL-										
					8.0												
10	11	S3	10.0			SP	Dense, brown poorly-graded SAND with gravel (SP), occasional coarse to medium sand seams, trace silt, mps = 1.3 in., wet	10	5	5	5	75					
	16																
	16																
	18	S3	12.0				-MARINE FAN DEPOSITS-										
					14.0												
15	7	S4	15.0			SM	Dense, gray-brown silty SAND (SM), varved, mps = 0.02 in., wet					80	20				
	16				16.0		-MARINE FAN DEPOSITS-										
	15					SW	Dense, brown well-graded SAND (SW), rusty discolorations, mps = 0.2 in., wet			40	40	20					
	14	S4	17.0				-MARINE FAN DEPOSITS-										
					18.0												
20	19	S5	20.0			SM	Very dense, brown silty SAND (SM), varved, mps = 0.02 in., wet					80	20				
	30				21.5		-MARINE FAN DEPOSITS-										
	60	S5	21.5				Split spoon refusal at 21.5 ft. Bottom of exploration at 21.5 ft. below ground surface										
25																	
30																	

Water Level Data				Sample ID		Well Diagram		Summary								
Date	Time	Elapsed Time (hr.)	Depth in feet to:			O	T	U	S	G	Overburden (Linear ft.)		Rock Cored (Linear ft.)		Number of Samples	
			Bottom of Casing	Bottom of Hole	Water											
6/25/2007	1350		20.0	21.5	21.0							21.5	--	5S		
6/25/2007	1405		--	11.0	10.0											

Field Tests: Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
 Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High V - Very High
 *NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.
 NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.										TEST BORING REPORT										BORING NO. B2							
PROJECT PROPOSED DANFORTH APARTMENTS										STI JOB NO. 07354										Page 1 of 1							
LOCATION DANFORTH/HIGH STREETS, PORTLAND, MAINE										PROJECT MGR. K RECKER																	
CLIENT ARCHETYPE, PA										FIELD REP. K. B. STEPHENSON																	
CONTRACTOR MAINE TEST BORINGS, INC.										DATE STARTED 6/25/2007																	
DRILLER D. McKEEN										DATE FINISHED 6/25/2007																	
Elevation		ft.		Datum		Boring Location		See Plan																			
Item		Casing		Sampler		Core Barrel		Rig Make & Model		Mobile B47/53		Hammer Type		Drilling Mud		Casing Advance											
Type		H5A		SS				<input checked="" type="checkbox"/> Truck		<input type="checkbox"/> Tripod		<input type="checkbox"/> Cat-Head		<input checked="" type="checkbox"/> Safety		<input type="checkbox"/> Bentonite		Type Method Depth									
Inside Diameter (in.)		2.5		1.375				<input type="checkbox"/> ATV		<input type="checkbox"/> Geoprobe		<input checked="" type="checkbox"/> Winch		<input type="checkbox"/> Polymer		H5A/Spina/19.5											
Hammer Weight (lb.)				140				<input type="checkbox"/> Track		<input type="checkbox"/> Air Track		<input type="checkbox"/> Roller Bit		<input type="checkbox"/> Automatic													
Hammer Fall (in.)				30				<input type="checkbox"/> Skid		<input type="checkbox"/>		<input checked="" type="checkbox"/> Cutting Head		Drilling Notes:													
Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)										Gravel		Sand		Field Test						
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Consistency	Toughness	Plasticity	Strength											
0	4	S1	0.0			SW-SM	Loose, gray-brown to rust-brown well-graded SAND with silt and gravel (SW-SM), mps = 1.0 in., dry										10	5	30	30	15	10					
	4						-FILL-																				
	3						3.0																				
	5																										
5	4	S2	4.5			SM	Medium dense, brown silty SAND with gravel (SW), mps = 1.2 in., damp										5	10	30	20	20	15					
	6						-MARINE FAN DEPOSITS-																				
	13						14.0																				
	29																										
10	6	S3	9.5			SM	Dense, brown silty SAND with gravel (SW), mps = 1.2 in., damp										5	10	30	20	20	15					
	12						-MARINE FAN DEPOSITS-																				
	24						14.0																				
	23																										
15	10	S4	14.5			SW	Very dense, brown well-graded SAND with gravel (SW), mps = 1.2 in., damp										5	10	30	20	30	5					
	22						-MARINE FAN DEPOSITS-																				
	29						19.0																				
	37																										
20	22	S5	19.5			SP	Very dense, brown poorly-graded SAND (SM), occasional coarse to medium sand seams, trace silt, wet												5	5	90						
	36						-MARINE FAN DEPOSITS-																				
	57						Bottom of exploration at 21.0 ft. below ground surface																				
							No refusal																				
25																											
30																											

Water Level Data				Sample ID		Well Diagram		Summary											
Date	Time	Elapsed Time (hr.)	Depth in feet to:			O	T	U	S	G	Riser Pipe	Screen	Filter Sand	Cuttings	Grout	Concrete	Bentonite Seal	Overburden (Linear ft.)	
			Bottom of Casing	Bottom of Hole	Water													21.0	
6/25/07	1505		19.5	19.5	12.5													Rock Cored (Linear ft.)	
6/25/07	1515		-	16.5	8.0													Number of Samples	
																	BORING NO. B2		

Field Tests		Dilatancy: R - Rapid S - Slow N - None				Plasticity: N - Nonplastic L - Low M - Medium H - High				Toughness: L - Low M - Medium H - High				Dry Strength: N - None L - Low M - Medium H - High V - Very High			
*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.																	
NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.																	

SEBAGO TECHNICS, INC.		TEST BORING REPORT						BORING NO. B3																		
PROJECT PROPOSED DANFORTH APARTMENTS		LOCATION DANFORTH/HIGH STREETS, PORTLAND, MAINE				STI JOB NO. 07354																				
CLIENT ARCHETYPE, PA		CONTRACTOR MAINE TEST BORINGS, INC.				PROJECT MGR. K. RECKER																				
DRILLER D. McKEEN		FIELD REP. K. B. STEPHENSON				DATE STARTED 6/25/2007																				
		DATE FINISHED 6/25/2007				Page 1 of 1																				
Elevation		ft. Datum		Boring Location		See Plan																				
Item		Casing		Sampler		Core Barrel		Rig Make & Model		Mobile B47/53		Hammer Type		Drilling Mud		Casing Advance										
Type		HSA		SS				<input checked="" type="checkbox"/> Truck		<input type="checkbox"/> Tripod		<input type="checkbox"/> Cat-Head		<input checked="" type="checkbox"/> Safety		<input type="checkbox"/> Bentonite										
Inside Diameter (in.)		2.5		1.375				<input type="checkbox"/> ATV		<input type="checkbox"/> Geoprobe		<input checked="" type="checkbox"/> Winch		<input type="checkbox"/> Doughnut		<input type="checkbox"/> Polymer										
Hammer Weight (lb.)				140				<input type="checkbox"/> Track		<input type="checkbox"/> Air Track		<input type="checkbox"/> Roller Bit		<input type="checkbox"/> Automatic		<input checked="" type="checkbox"/> None										
Hammer Fall (in.)				30				<input type="checkbox"/> Skid		<input type="checkbox"/>		<input checked="" type="checkbox"/> Cutting Head		Drilling Notes:		Type Method Depth HSA/Spin/20.0										
Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size, structure, odor, moisture, optional descriptions, geologic interpretation)						Gravel		Sand			Field Test								
													% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength				
0	7	S1	0.0		0.2	SM	Medium dense, brown silty SAND with gravel (SM), mps = 1.0 in., dry-FILL						10	10	30	20	15	15								
	9				1.5	SW-SM	Medium dense, brown well-graded SAND with silt (SW-SM), mps = 1.0 in., dry -FILL-						5	10	20	25	30	10								
	8						Medium dense, red BRICK, dry																			
	20	12	2.0		3.0		Note: probable cobbles to 3.0 ft. -FILL-																			
5	12	S2	5.0			SW	Medium dense to dense, brown well-graded SAND with gravel (SW), mps = 1.0 in., dry						10	10	25	20	30	5								
	13						-MARINE FAN DEPOSITS-																			
	17																									
	20	16	7.0																							
10	9	S3	10.0		10.5	SW	Dense, brown well-graded SAND with gravel (SW), mps = 1.0 in., wet						10	10	25	20	30	5								
	16					SP	Dense, brown poorly-graded SAND with silt (SP), trace coarse sand and gravel, mps = 0.38 in., wet									5	90	10								
	26						-MARINE FAN DEPOSITS-																			
	30	16	12.0		13.0																					
15	14	S4	15.0			SW	Medium dense, brown well-graded SAND (SW), mps = 0.2 in., wet								30	20	50									
	12						-MARINE FAN DEPOSITS-																			
	11																									
	22	20	17.0																							
20	7	S5	20.0		21.0	SM	Very dense, brown well-graded SAND (SW), mps = 0.3 in., wet						5	40	40	15										
	23						-MARINE FAN DEPOSITS-																			
	38					SM							Very dense, brown silty SAND (SM), mps = 0.02 in., varved, wet									80	20			
	50	24	22.0				-MARINE FAN DEPOSITS-																			
													Bottom of exploration at 22.0 ft. below ground surface No refusal													
25																										
30																										
Water Level Data				Sample ID			Well Diagram			Summary																
Date	Time	Elapsed Time (hr.)	Depth in feet to:			O	T	U	S	G	<input type="checkbox"/> Riser Pipe	<input type="checkbox"/> Screen	<input type="checkbox"/> Filter Sand	<input type="checkbox"/> Cuttings	<input type="checkbox"/> Grout	<input type="checkbox"/> Concrete	<input type="checkbox"/> Bentonite Seal	Overburden (Linear ft.)			BORING NO.					
			Bottom of Casing	Bottom of Hole	Water													22.0			B3					
6/25/2007	1100		20.0	22.0	14.7																					
6/25/2007	1115		--	12.5	11.5																					
Field Tests		Dilatancy: R - Rapid S - Slow N - None			Plasticity: N - Nonplastic L - Low M - Medium H - High			Toughness: L - Low M - Medium H - High			Dry Strength: N - None L - Low M - Medium H - High V - Very High															
*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.																										
NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.																										

SEBAGO TECHNICS, INC.		TEST BORING REPORT					BORING NO. B4													
							Page 1 of 1													
PROJECT		PROPOSED DANFORTH APARTMENTS			STI JOB NO.		07354													
LOCATION		DANFORTH/HIGH STREETS, PORTLAND, MAINE			PROJECT MGR.		K. RECKER													
CLIENT		ARCHETYPE, PA			FIELD REP.		K. B. STEPHENSON													
CONTRACTOR		MAINE TEST BORINGS, INC.			DATE STARTED		6/25/2007													
DRILLER		D. McKEEN			DATE FINISHED		6/25/2007													
Elevation		ft. Datum		Boring Location		See P12n														
Item		Casing	Sampler	Core Barrel	Rig Make & Model	Mobile B47/53	Hammer Type													
Type		HSA	SS		<input checked="" type="checkbox"/> Truck	<input type="checkbox"/> Tripod	<input type="checkbox"/> Cat-Head													
Inside Diameter (in.)		2.5	1.375		<input type="checkbox"/> ATV	<input type="checkbox"/> Geoprobe	<input checked="" type="checkbox"/> Winch													
Hammer Weight (lb.)			140		<input type="checkbox"/> Track	<input type="checkbox"/> Air Track	<input type="checkbox"/> Roller Bit													
Hammer Fall (in.)			30		<input type="checkbox"/> Skid	<input type="checkbox"/>	<input checked="" type="checkbox"/> Cutting Head													
						Drilling Notes:														
Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel					Sand					Field Test		
								% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength			
0	9	S1	0.0			SM	Medium dense, brown silty SAND with gravel (SM), bituminous concrete, mps = 1.0 in., dry	5	10	20	20	30	15							
	9				0.7		-FILL-													
	9						Medium dense, red BRICK, dry													
	8	14	2.0				-FILL-													
							Note: brick and probable cobbles to 5.0 ft.													
					5.0															
5	1	S2	5.0			SM	Loose, brown silty SAND with gravel (SW), clinker, trace wood, mps = 1.0 in., damp	10	10	15	20	30	15							
	2																			
	2																			
	2	12	7.0				-FILL-													
					8.0															
10	13	S3	10.0			SW	Dense, brown well-graded SAND with gravel (SW), mps = 1.2 in., damp	10	10	30	25	20	5							
	19																			
	22																			
	20	24	12.0				-MARINE FAN DEPOSITS-													
					13.0															
15	25	S4	15.0			SP	Very dense, brown poorly-graded SAND with gravel (SP), trace coarse to medium sand, mps = 1.2 in., damp	10	10		75	5								
	44																			
	38																			
	32	20	17.0				-MARINE FAN DEPOSITS-													
					18.5															
20	13	S5	20.0			SW	Dense, brown well-graded SAND with gravel (SW), mps = 1.0 in., wet	5	10	30	40	15								
	21																			
	19																			
	19	18	22.0				-MARINE FAN DEPOSITS-													
							Bottom of exploration at 22.0 ft. below ground surface													
							No refusal													
25																				
30																				
		Water Level Data			Sample ID		Well Diagram		Summary											
Date	Time	Elapsed Time (hr.)	Depth in feet to:			O	T	U	S	G	<input type="checkbox"/> Riser Pipe	<input type="checkbox"/> Screen	<input type="checkbox"/> Filter Sand	<input checked="" type="checkbox"/> Cuttings	<input type="checkbox"/> Grout	<input type="checkbox"/> Concrete	<input type="checkbox"/> Bentonite Seal	Overburden (Linear ft.)	22.0	
			Bottom of Casing	Bottom of Hole	Water														Rock Cored (Linear ft.)	--
6/25/2007	1205		20.0	22.0	13.0													Number of Samples	55	
6/25/2007	1215		--	17.5	11.0													BORING NO.	B4	
Field Tests		Dilatancy: R - Rapid S - Slow N - None			Plasticity: N - Nonplastic L - Low M - Medium H - High			Toughness: L - Low M - Medium H - High V - Very High			Dry Strength: N - None L - Low M - Medium H - High V - Very High									
*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.																				
NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.																				

SECTION 01045

CUTTING AND PATCHING

1. GENERAL

1.1 REFERENCES

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.
- B. Divisions 2 through 16.

1.2 DESCRIPTION OF WORK

- A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition. This section does not apply to new work that has been installed as part of the Work.
- B. Structural Work: Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio.
- C. Operational/Safety Limitations: Do not cut-and-patch operational elements and safety components in a manner resulting in decreased performance, shortened useful life, or increased maintenance.
- D. Visual/Quality Limitations: Do not cut-and-patch work exposed to view (exterior and interior) in a manner resulting in noticeable reduction of aesthetic qualities and similar qualities, as judged by the Architect/Engineer.
- E. Limitation on Approvals: The Architect/Engineer's approval to proceed with cutting and patching does not waive right to later require removal/replacement of work found to be cut-and-patched in an unsatisfactory manner, as judged by the Architect/Engineer.
- F. Materials marked to be removed and reused shall be repaired as necessary to maintain their existing condition. When repair is not sufficient, existing materials shall be disposed of and new materials installed to match existing materials.
- G. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.
- H. Unless otherwise specified, requirements of this Section apply to Mechanical and Electrical work. Refer to Divisions 15 and 16 for additional requirements and limitations on cutting and patching of mechanical and electrical work.

DANFORTH ON HIGH – PORTLAND, MAINE

1.3 QUALITY ASSURANCE

- A. Refer to Section 01631, Products and Substitutions, for general provisions covering product selection, substitutions, material storage and installation.
- B. Refer to Section 01400, Quality Control Services, for provisions for testing and inspections.
- C. Refer to specific Specification Section covering subject in question for quality assurance requirements.

1.4 SUBMITTALS

- A. Issue submittals in accordance with Section 01300, Submittals.
- B. Refer to specific Specification Section covering subject in question for submittal requirements.

2. PRODUCTS

2.1 GENERAL

- A. Use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal-or-better performance characteristics.
- B. Fire-stopping:
 - 1. Seal openings in fire-rated walls and floors to make a tight fit with penetrating items, using appropriate non-combustible filler material. to provide a rating equivalent to wall/floor assemble.
 - 2. Acceptable filler materials include:
 - a. Concrete
 - b. Cementitious proprietary product: Zonolite Firestop ZF-1
 - c. Blanket-type mineral-fiber or ceramic-fiber insulation (glass-fiber insulation is not acceptable)
 - d. Fire-resistant sealant: Domtar Fire-Halt, Dow Corning Fire Stop, Hilti CS 240 Firestop, or Nelson CLK or CMP
 - e. Fire-resistant silicone foam: Dow Corning RTV Foam Penetration Seal System, Hilti CB 120 Adhesive Filling and Sealing Foam, Tremco Fyre-Sil
 - f. Flexible intumescent strip wrapped around pipe penetrations: Dow Corning Fire Stop Intumescent Wrap, Hilti CS 24720 Intumescent Wrap, Nelson RSW, Tremco TREMstop WS

DANFORTH ON HIGH – PORTLAND, MAINE

- g. Intumescent fibrous material enclosed in a polyethylene envelope: Nelson PLW, Tremco TREMstop PS
- h. Pliable intumescent putty: Nelson FSP Flameseal, Tremco TREMstop WBM
- i. Water-based intumescent fire-protective coating for electrical cables: Nelson CTG

- 3. Neatly patch and seal exposed-to-view openings, using sealants, tooled mortar joints, escutcheons, or flanged collars, as appropriate.

3. EXECUTION

3.1 INSPECTION

- A. Before cutting, examine surfaces to be cut and patched and conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

3.2 TEMPORARY SUPPORT

- A. To prevent failure provide temporary support of work to be cut.

3.3 PROTECTION

- A. Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.4 PERFORMANCE

- A. Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the Architect/Engineer, proceed with cutting and patching at the earliest feasible time and complete work without delay.
- B. Cutting:
 - 1. Cut the work using methods that are least likely to damage work to be retained or adjoining work. Provide dust barriers to prevent dust from entering existing building beyond immediate work area. Where possible, review proposed procedures with the original installer; comply with original installer's recommendations.
 - 2. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.

DANFORTH ON HIGH – PORTLAND, MAINE

3. Comply with requirements of applicable sections of Division 2 where cutting and patching requires excavating and backfilling.
4. By-pass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated or abandoned. Cut-off conduit and pipe in walls or partitions to be removed. After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.

C. Patching:

1. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
2. Where feasible, inspect and test patched areas to demonstrate integrity of work.
3. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.
4. Where removal of walls or partitions extends one finished area into another finished area, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. If necessary to achieve uniform color and appearance, remove existing floor and wall coverings and replace with new materials.
5. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coat.
6. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.5 MAINTENANCE OF TRAFFIC, ACCESS, AND UTILITIES

- A. Maintain accessibility from street at all times to any fire hydrants within construction area. Ensure that utilities serving adjacent buildings remain in service.

END OF SECTION

SECTION 01300

SUBMITTALS, MEETINGS AND RECORD DOCUMENTS

1. GENERAL

1.1 PRE-CONSTRUCTION MEETING

A. Architect Owner and MaineHousing representative will schedule a pre-construction meeting within 15 days of issuance of Notice to Proceed, to be attended by the owner, all project managers, Contractor's field superintendent, and representatives of major sub-contractors. At this time, Contractor shall make specified pre-construction submittals including following:

1. Typed list of sub-contractors with addresses and telephone numbers.
2. Certificates of insurance.
3. Approved construction schedule. See General Conditions, Paragraph 3.10.
4. Schedule of values.
5. Start-up authorization or certificates.

B. Pre-construction meeting agenda will include following:

1. Processing application for payment.
2. Processing and distribution of submittals.
3. Maintenance of record documents.
4. Procedure for field changes, change estimates, change orders, etc.
5. Site and building security.
6. Location and maintenance of temporary storage areas, field offices, vehicular parking and access, waste disposal, etc.
7. Safety and first-aid procedures.
8. Date and time for regular monthly coordination and progress meeting (to be coordinated with monthly application for payment).
9. MaineHousing agenda

1.2 CONSTRUCTION SCHEDULE

- A. Refer to General Conditions, Paragraph 3.10, for general provisions concerning construction progress schedule. Schedule shall show activities, itemized according to specification Section, and be organized in bar-chart or graph form so as to show both projected and actual progress of work.
- B. Arrange schedule to indicate required sequencing of units, and to show time allowances for submittals, inspections, and similar time margins.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Show critical submittal dates related to each time bar, or prepare a separate coordinated listing of critical submittal dates.
- D. Show phases of work within each time bar for major elements which involve purchase lead-time, fabrication, seasonal treatment, mockups, testing, or similar phases as well as installation.
- E. Submit updated schedule monthly, together with application for payment.

1.3 SCHEDULE OF VALUES

- A. Refer to General Conditions, Paragraph 9.2 for general provisions concerning schedule of values.
- B. For these submittals, use AIA Document G702/703, Application and Certificate for Payment.
- C. Use specifications Sections as listed in Table of Contents as basis for format for listing costs.
- D. Itemize separately general cost items, such as bonds and allowances.
- E. Itemize change orders separately as they are approved.

1.4 MEETINGS AND REPORTING

- A. Contractor shall conduct general progress and coordination meetings at least twice each month, attended by a representative of each primary entity engaged for performance of work. Record discussions and decisions, and distribute copies to those attending and others affected, including Architect/Engineer.
- B. Date and time of at least one regular monthly progress and coordination meeting shall be determined at the pre-construction meeting. Timing of this monthly meeting shall be coordinated with payment requests.

1.5 APPLICATION FOR PAYMENT

- A. Refer to General Conditions, Paragraph 9.3, for general provisions concerning applications for payment.
- B. Use AIA Form G702/703, fully completed and executed.
- C. Submit the forms in triplicate including attachment of waivers and similar documentation with one copy.

1.6 SHOP DRAWINGS, PROJECT DATA, SAMPLES

DANFORTH ON HIGH – PORTLAND, MAINE

- A. Refer to General Conditions, Product Data and Samples, paragraph 3.12, for general provisions covering this type of submittal.
- B. Coordinate the preparation and processing of work-related submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities that require sequential activity. Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the necessity of reviewing a related submittal.
- C. Architect/Engineer Review:
 - 1. Allow ten working days for the Architect/Engineer's initial processing of each submittal. Allow one week for reprocessing each submittal. No extension of time will be authorized because of failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.
 - 2. The Architect/Engineer will stamp each submittal to be returned with a uniform, self-explanatory action stamp, appropriately marked and executed to indicate the status of the submittal.
- D. Mark each submittal with a permanent label for identification. Provide project name, date, name of Architect/Engineer, name of Contractor, number and title of appropriate specification section and similar definitive information. Provide a space on the label for Contractors and Architect/Engineer's review markings.
- E. Package each submittal appropriately for transmittal and handling. Send each submittal from the Contractor to the Architect/Engineer and other destinations using AIA Transmittal Form G810.
- F. Provide additional copies of submittals required by governing authorities that are in addition to copies specified for submittal to the Architect/Engineer.
- G. Where it is necessary to provide intermediate submittals between the initial and final submittals, provide and process intermediate submittals in the same manner as for initial submittals.
- H. Submit as follows:
 - 1. Shop drawings (original drawings prepared by Contractor or sub-contractor illustrating fabrication, layout, erection details, etc.): six prints, or one reproducible transparency and one opaque print, to Architect.
 - 2. Manufacturers' specifications, installation instructions, charts, schedules, catalogs, brochures, etc.: number of copies required by Contractor for distribution, plus one copy for Architect's retention.
 - 3. Samples: one sample to Architect only, unless otherwise specified.

DANFORTH ON HIGH – PORTLAND, MAINE

4. In submitting shop drawings and product data to Architect, use separate transmittals for material in different specification Sections, with applicable specification Section clearly numbered.
- I. Architect will review submittals within ten working days, measured from date of receipt by Architect until date of mailing. Contractor shall promptly make corrections and resubmit when so directed. Where submittal is marked "Approved as Noted" or similar, assume that all items are approved other than those to which specific exception is taken. Do not delay fabrication, assembly and delivery pending receipt of entirely "Approved" submittal.
- J. Distribute approved submittals to job site and record document files, and to suppliers and sub-contractors as required. Samples not designated by Contractor for incorporation into Work shall be kept on file until job completion. Any sample not reclaimed within 30 days after job completion will be considered unclaimed, and will be disposed of as directed by Architect.

1.7 PROJECT RECORD DOCUMENTS

- A. Keep on file at job site one complete set of up-to-date Contract Documents, including drawings and specifications, addenda, shop drawings and product data, testing data, change orders, field orders, and other modifications. Documents shall be neatly and securely stored in files or on racks, clearly indexed by trade activity or specification Section, and shall not be used for construction purposes.
- B. Legibly mark significant field changes such as following, using colored pencils or felt-tipped pens:
 1. Drawings: locations of concealed utilities, field changes of dimension and detail, changes resulting from change order or field order, and details not on original drawings.
 2. Specifications: manufacturer and model number of equipment actually installed.
 3. Shop drawings and manufacturers' literature: changes made after Architect's review.
- C. At completion of Work, deliver completed record documents to Architect. Final payment for Project will not be made until Architect reviews and approves these documents.

1.8 SUBSTANTIAL COMPLETION

- A. Refer to General Conditions, Article 9, Substantial Completion, for general provision concerning substantial Completion.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Following issuance by Architect/Engineer of Certificate of Substantial Completion, Contractor may submit special payment request, provided the following have been completed:
1. Obtain permits, certificates of inspection and other approval and releases by governing authorities, required for Owner's occupancy and use of project.
 2. Submit warranties and similar documentation.
 3. Submit maintenance manuals and provide instruction of Owner's operational/maintenance personnel.
 4. Complete final cleaning of the work.
 5. Submit record documents.
 6. Submit listing of work to be completed before final acceptance.
- C. Following completion of the following requirements, final payment request may be submitted:
1. Complete work listed as incomplete at time of substantial completion, or otherwise assure Owner of subsequent completion of individual incomplete items.
 2. Settle liens and other claims, or assure Owner of subsequent settlement.
 3. Submit proof of payment on fees, taxes and similar obligations.
 4. Transfer operational, access, security and similar provisions to Owner; and remove temporary facilities, tools and similar items.
 5. Completion of requirements specified in "Project Closeout" section.
 6. Obtain consent of surety for final payment.

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Section Includes:
 - 1. Submittal procedures.
 - 2. Product Data, Shop Drawings, and Samples.
 - 3. Assurance/Control submittals.
 - a. Certificates.
 - b. Manufacturer's installation instructions.
 - 4. Architect's action.
- B. Related Documents: The Contract Documents, as defined in Section 01110 - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

1.2 SUBMITTALS

- A. Submit two copies of proposed Schedule of Submittals to Contracting Officer Representative within 30 days after receipt of Notice to Proceed. List all items require submittal for review and approval by Contracting Officer.
- B. Submit two copies of final Schedule of Submittals to Contracting Officer Representative within 2 days after receipt of proposed Schedule of Submittals review from Contracting Officer.
- C. Submit schedule on Contracting Officer approved form provided to Contractor by Contracting Officer Representative.
- D. Schedule of Submittals: Include the following.
 - 1. Indicate type of submittal; product data, shop drawing, sample, certificate, or other submittal.
 - 2. Identify by Specification Section number, Specification paragraph number where item is specified, and description of item being submitted.
 - 3. Indicate scheduled date for initial submittal, date for approval, and date for possible resubmittal for each submittal.
- E. Coordinate Schedule of Submittals with Construction Schedule. Revise and update Schedule of Submittals when required by changes in the Construction Schedule. Provide Contracting Officer Representative with updated schedules within 2 days of date schedule is revised.

1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Contracting Officer accepted form. Submit 3 copies of each transmittal.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Sequentially number transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Lessor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to comply with scheduling requirements of Construction Schedule
- F. For each submittal for review, allow 10 days excluding delivery time to and from the Contractor.
- G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- H. Provide space for Contractor and Architect of Record review stamps.
- I. Revise and resubmit, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with provisions.
- K. Submittals not requested will not be recognized or processed.

1.4 PRODUCT DATA

- A. Product data includes printed information such as catalog cuts, manufacturer's published instructions, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, performance curves and other similar items.
- A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by Contracting Officer Representative and Architect of Record.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
- C. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.5 SHOP DRAWINGS

- A. Submit in the form of one reproducible transparency and one opaque reproduction.
- B. Shop Drawings: Submit for review. After review, produce copies and distribute in accordance with the SUBMITTAL PROCEDURES article above.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.5 SAMPLES

- B. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- C. Submit samples of finishes in colors selected, textures, and patterns for Contracting Officer selection.
- D. Include identification on each sample, with full Project information.
- E. Submit the number of samples specified in individual specification sections; one of which will be retained by the Contracting Officer.

1.6 CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer to Contracting Officer, in quantities specified for Product Data.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Contracting Officer.

1.7 MANUFACTURER INSTALLATION INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Contracting Officer Representative in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.8 CONTRACTING OFFICER ACTION

- A. For submittals where action and return is required or requested, Contracting Officer Representative will review each submittal, mark to indicate action taken, and return promptly; generally within 10 calendar days from date of receipt.
 - 1. Compliance with specified characteristics is the Lessor's responsibility.
 - 2. Submittals for information, closeout documents, record documents and other submittals for similar purposes, no action will be taken.
- B. Action Stamp: Architect of Record will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken.

DANFORTH ON HIGH – PORTLAND, MAINE

1. "Accepted": Final Unrestricted Release. Where submittals are marked "Accepted", that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
2. "Accepted as Noted": Final-But-Restricted Release. When submittals are marked "Accepted as Noted", that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
3. "Rejected: Submit Specified Item" or "Revise and Resubmit": Returned for Resubmittal. When submittal is marked "Rejected: Submit Specified Item", "Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - a. Do not permit submittals marked "Rejected: Submit Specified Item" or "Revise and Resubmit," to be used at the Project site, or elsewhere where Work is in progress.
4. "Returned - Not Required": Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Returned - Not Required".

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01400

QUALITY CONTROL SERVICES

1. GENERAL

1.1 DESCRIPTION

- A. Quality control services include inspections and tests performed by independent agencies and governing authorities, as well as by the Contractor.
- B. Inspection and testing services are intended to determine compliance of the work with requirements specified.
- C. Specific quality control requirements are specified in individual specification sections.

1.2 RESPONSIBILITIES

- A. Except where indicated as being the Owner's responsibility, quality control services are the Contractor's responsibility, including those specified to be performed by an independent agency and not by the Contractor.
- B. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.
- C. The Owner will engage and pay for services of an independent agency to perform the inspections and tests that are specified as Owner's responsibilities.
- D. Where results of inspections or tests do not indicate compliance with contract document, retests are the Contractor's responsibility.
- E. The Contractor shall cooperate with independent agencies performing inspections or tests. Provide auxiliary services as are reasonable. Auxiliary services include:
 - 1. Provide access to the work.
 - 2. Assist taking samples.
 - 3. Deliver samples to test laboratory.

1.3 COORDINATION

- A. The Contractor and independent test agencies shall coordinate the sequence of their activities. Avoid removing and replacing work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections and tests.

1.4 QUALIFICATIONS FOR SERVICE AGENCIES

DANFORTH ON HIGH – PORTLAND, MAINE

- A. Engage inspection and test service agencies which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories.
- B. Each agency shall be employed with the approval of the Architect/Engineer.

1.5 SUBMITTALS

- A. Notify the Architect/Engineer of the testing schedule.
- B. Submit a certified written report of each inspection test or similar service, in duplicate to the Architect/Engineer. Submit additional copies of each report to governing authority, when the authority so directs.

1.6 REPORT DATA

- A. Written inspection or test reports shall include:
 - 1. Name of testing agency or test laboratory.
 - 2. Dates and locations of samples, tests or inspections.
 - 3. Names of individuals present.
 - 4. Complete inspection or test data.
 - 5. Test results.
 - 6. Interpretations.
 - 7. Recommendations.
- B. Reports shall be provided to the Architect/Engineer in a timely manner.

1.7 REPAIR AND PROTECTION

- A. Upon completion of inspection or testing repair damaged work and restore substrates and finishes. Comply with requirements for "Cutting and Patching".

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES

1. GENERAL

- 1.1 DESCRIPTION OF REQUIREMENTS: Provide temporary services and facilities ready for use when first needed to avoid delay in the work. Maintain, expand and modify as needed. Do not remove until no longer needed, or replaced by authorized use of permanent facilities.
- 1.2 USE CHARGES: Usage charges for temporary services or facilities are not chargeable to the Owner or Architect/Engineer.
- 1.3 REGULATIONS: Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities.
- 1.4 STANDARDS: Comply with the requirements of NFPA Code 241, "Building Construction and Demolition Operations", the ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and the NECA National Joint Guideline NJG-6 "Temporary Job Utilities and Services".
- 1.5 INSPECTIONS: Inspect and test each service before placing temporary utilities in use. Arrange for inspections and tests by governing authorities, and obtain certifications and permits for use.
- 1.6 SUBMITTALS: Submit copies of reports and permits required or necessary for installation and operation, including reports of tests, inspections and meter readings performed on temporary utilities, and permits and easements necessary for installation, use and operation.
- 1.7 MATERIALS AND EQUIPMENT
 - A. Provide materials and equipment that are suitable for the intended use.
 - B. Provide new materials and equipment for temporary services and facilities; if acceptable to the Architect/Engineer, used materials and equipment that are undamaged may be used.
- 1.8 INSTALLATION
 - A. Use qualified tradesmen for installation.
 - B. Locate temporary services and facilities where they will serve the project adequately and result in minimum interference with the work.
- 1.9 TEMPORARY UTILITY INSTALLATION

DANFORTH ON HIGH – PORTLAND, MAINE

- A. Engage, or make arrangements if necessary with, the local utility company to make connections to existing service.
- B. Arrange with the companies and existing users for an acceptable time when service can be interrupted to make connections.
- C. Establish a service implementation and termination schedule. As early as possible change to use of permanent service, to enable removal of the temporary utility and eliminate possible interference with completion of the work.
- D. Provide adequate capacity at each stage of construction. Prior to availability at the site, provide, trucked-in services for start up of construction operations.
- E. Obtain and pay for easements required to bring temporary utilities to the site, where the Owner's easement cannot be utilized for that purpose.

1.10 ELECTRIC POWER SERVICE

- A. Coordinate with Owner to use existing electrical service during construction.
- B. Comply with applicable requirements of NEMA, NECA and UL standards and governing regulations.
- C. Install temporary lighting of adequate illumination levels to perform the work specified.
- D. Comply with NEC pertaining to installation of temporary wiring service and grounding. Provide meters, transformers, and overcurrent protective devices at main distribution panel for power and light circuitry. Provide disconnects for equipment circuits.

1.11 POWER DISTRIBUTION SYSTEM

- A. Provide circuits of proper sizes, characteristics, and ratings for each use indicated.
- B. Install wiring overhead, and risers vertically where least exposed to damage.
- C. Provide rigid steel conduit to protect wiring on grade, floors, decks or other areas exposed to possible damage.
- D. Provide 20 amp, 4-gang receptacle outlets, equipped with ground-fault circuit interrupters, reset button and pilot light, spaced that a 100 foot extension cord can reach each area of work. Use only grounded extension cords; use "hard- service" cords where exposed to abrasion and traffic.
- E. Provide warning signs at power outlets that are other than 110/120 volt. Provide outlets of proper NEMA configuration to prevent insertion of 110/120 volt plugs into higher voltage outlets.

DANFORTH ON HIGH – PORTLAND, MAINE

1.12 TEMPORARY LIGHTING

- A. Provide general service incandescent lamps of wattage required for adequate illumination.
- B. Protect lamps with guard cages or tempered glass enclosures, where exposed to breakage.
- C. Provide exterior type fixtures where exposed to weather or moisture.
- D. Provide one 200-watt incandescent lamp per 1000 square feet of floor area for general construction lighting, one 100-watt incandescent lamp every 50 feet in corridors, and one lamp per story, located to illuminate each landing and flight in stairways.
- E. Install temporary lighting to fulfill security and protection requirements, without having to operate the entire temporary lighting system.

1.13 TEMPORARY TELEPHONES

- A. Install telephone for each temporary office and first aid station.
- B. At each telephone location post a list of operational and emergency telephone numbers.

1.14 TEMPORARY HEAT

- A. Provide temporary heat where needed for performance of work, for curing or drying of recently installed work or for protection of work in place from adverse effects of low temperatures or high humidity.
- B. Provide UL or FM tested and labeled heating units known to be safe and without adverse effect upon work in place or being installed. Coordinate with ventilation requirements to produce the ambient condition.
- C. Maintain a minimum temperature of 45 deg. F (7 deg. C) in permanently enclosed portions of the building and areas where finished work has been installed.
- D. Except where use of the permanent heating system is available and authorized, provide properly vented self-contained LP gas or fuel oil heaters with individual space thermostatic control for temporary heat. Do not use open burning or salamander type heating units.

1.15 FIELD OFFICES

- A. Provide standard prefabricated or mobile units, or the equivalent job-built field offices of sufficient size to accommodate required office personnel at the site.
- B. Provide insulated, weathertight units with lockable entrances.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Provide vented space heater, capable of maintaining an indoor temperature of 68 deg. F (20 deg. C).

1.16 SANITARY FACILITIES

- A. Sanitary facilities include temporary toilets.
- B. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities.
- C. Supply toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each facility. Provide covered waste containers for used material.
- D. Install single occupant self-contained toilet units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with glass fiber reinforced polyester shell. Use of pit-type privies will not be permitted.
- E. Provide separate toilet facilities for male and female construction personnel.
- F. Provide drinking water fountains where and when piped potable water, approved by local authorities, is reasonably accessible from permanent or temporary lines. Otherwise, provide containerized tap-dispenser bottled-water type drinking water units.

- 1.17 FIRST AID SUPPLIES: Comply with governing regulations and recognized recommendations within the construction industry.

1.18 DEWATERING FACILITIES AND DRAINS

- A. For temporary drainage and dewatering facilities and operations not directly associated with performance of work included under other sections, comply with dewatering requirements of applicable Division-2 sections. Where feasible, utilize the same facilities.
- B. Maintain the site, excavations and construction free of water.
- C. Dispose of rainwater in a lawful manner which will not result in flooding and project or adjoining property, nor endanger either permanent work or temporary facilities.

1.19 TEMPORARY ENCLOSURE

- A. Provide temporary enclosure of materials, equipment, work in progress and completed portions of the Work to provide protection from exposure, foul weather, other construction operations, and similar activities.
- B. Provide enclosures where temporary heat is needed and the permanent building enclosure is not completed, and there is no other provision for containment of heat.

DANFORTH ON HIGH – PORTLAND, MAINE

Coordinate with ventilating and material drying or curing requirements to avoid dangerous conditions.

- C. Provide temporary enclosures by installing waterproof, fire-resistant, UL labeled tarpaulins with a flame-spread rating of 15 or less, using a minimum of wood framing. Use translucent nylon reinforced laminated polyethylene tarpaulins to admit the maximum amount of daylight. Individual openings of 25 square feet or less may be closed with plywood or similar materials.
- D. Close openings through the floor or roof decks and other horizontal surfaces with substantial load-bearing wood-framed or similar construction.

1.20 COLLECTION AND DISPOSAL OF WASTES

- A. Establish a system for daily collection and disposal of waste materials. Do not hold collected materials longer than 7 days.
- B. Handle waste materials that are hazardous, dangerous, or unsanitary separately from other waste by containerizing.
- C. Burying or burning of waste materials on the site or washing waste material down sewers will not be permitted.
- D. Waste management recycling per MaineHousing Green Standards.

1.21 MISCELLANEOUS SERVICES AND FACILITIES

- A. Contractor required to provide waste management recycling plan and provide reports.
- B. Design, construct, and maintain miscellaneous services and facilities as needed to accommodate performance of the work, including temporary stairs, ramps, ladders, staging, shoring, scaffolding, temporary partitions, waste chutes and similar items.

1.22 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Provide a neat and uniform appearance in security and protection facilities acceptable to the Architect/Engineer and the Owner.
- B. Maintain site in a safe, lawful and publicly acceptable manner.
- C. Take necessary measures to prevent erosion.
- D. Except for utilization of permanent fire protection facilities, as soon as available, do not change over to use of permanent facilities until substantial completion.

DANFORTH ON HIGH – PORTLAND, MAINE

1.23 TEMPORARY FIRE PROTECTION

- A. Until fire protection needs may be fulfilled by permanent facilities, install and maintain temporary fire protection of the types needed to protect against losses.
- B. Comply with recommendations of NFPA Standard 10.
- C. Locate fire extinguishers where most effective; provide not less than one on each floor at or near each stairwell.
- D. Provide type "A" fire extinguishers for temporary offices and spaces where there is minimal danger of electrical or flammable liquid fires, and type "ABC" dry chemical extinguishers elsewhere.
- E. Store combustible materials in containers in fire-safe locations.
- F. Review fire prevention and protection needs with local fire department officials and establish procedures to be followed in the event of fire. Instruct personnel in procedures and post warnings and information.
- G. Maintain unobstructed access to fire extinguishers, temporary fire protection facilities, stairways and other access routes.
- H. Prohibit smoking in hazardous areas.
- I. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of ignition.
- J. At temporary water outlets provide hoses of sufficient length to reach construction areas. Hang hoses with a warning sign, indicating that hoses are for fire protection purposes and are not to be removed.
- K. At the earliest feasible date complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel at the site on how to use facilities which may not be self-explanatory.

1.24 BARRICADES, WARNING SIGNS AND LIGHTS

- A. Comply with recognized standards and code requirements for erection of substantial, barricades where needed to prevent accidents.
- B. Paint with appropriate colors and warning signs to inform personnel at the site and the public, of the hazard being protected against.
- C. Provide lighting where needed, including flashing red lights where appropriate.

DANFORTH ON HIGH – PORTLAND, MAINE

1.25 SECURITY ENCLOSURE AND LOCKUP: Where materials and equipment must be temporarily stored, and are of substantial value or attractive for possible theft, provide a secure lockup.

1.26 ENVIRONMENTAL PROTECTION

- A. Conduct construction activities, and by methods that comply with environmental regulations, minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result from the performance of work at the site.
- B. Avoid the use of tools and equipment which produce harmful noise.
- C. Restrict the use of noise making tools and equipment to hours of use that will minimize complaints.

1.27 OPERATION, TERMINATION AND REMOVAL

- A. Limit availability of temporary services and facilities to essential and intended uses to minimize waste and abuse. Do not permit temporary installations to be abused or endangered.
- B. Operate and maintain temporary services and facilities in good operating condition and in a safe and efficient manner until removal is authorized. Do not overload services or facilities. Protect from damage by freezing temperatures and similar elements.
- C. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.
- D. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24- hour basis where required to achieve indicated results and avoid the possibility of damage to the Work or to temporary facilities.
- E. Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation.
- F. Remove each temporary service and facility promptly when need has ended, or when replaced by use of a permanent facility, but no later than substantial completion. Complete, or, if necessary, restore permanent work delayed because of interference with the temporary service or facility. Repair damaged work, clean exposed surfaces and replace work which cannot be repaired.
- G. At substantial completion, clean and renovate permanent services and facilities that have been used to provide temporary services and facilities during the construction period.

END OF SECTION

SECTION 01631

PRODUCTS AND SUBSTITUTIONS

1. GENERAL

1.1 PROCEDURAL REQUIREMENTS

A. Source Limitations:

1. To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work. Where it is not possible to do so, match separate procurements as closely as possible.
2. To the extent that the product selection process is under the Contractor's control, provide products that are compatible with previously selected products.
3. Where standard products are available that comply with specified requirements, provide those standard products that have been used successfully before in similar applications, and that are recommended by the manufacturers for the applications indicated.

1.2 PRODUCT SELECTION LIMITATIONS

A. Product Selections: Comply with the following requirements in the selection of products, materials and equipment:

1. Single Product Name: Where only a single product or manufacturer is named, provide the product, unless it is not available, is incompatible with existing work, or does not comply with specified requirements or governing regulations.
2. Two or More Products Named: Where two or more products or manufacturers are named, the selection is at the Contractor's option, provided the product selected complies with specified requirements.
3. "Or Approved Equal" Provisions": Where products or manufacturers are specified by name accompanied by the term "or approved equal", provide either the product named, or comply with the requirements for gaining approval of "substitutions" for the use of an unnamed product.
4. Compliance with Standards: Where the specifications require only compliance with an imposed standard, code or regulation, the Contractor has the option of selecting any product that complies with specified requirements provided no product names are indicated.

DANFORTH ON HIGH – PORTLAND, MAINE

5. Performance Requirements: Where the specifications require compliance with indicated performance requirements, the Contractor has the option of selecting any product that complies with the specific performance requirements, provided no product names are indicated.
 6. Visual Requirements: Where the specifications indicate that a product is to be selected from the manufacturer's standard options, without naming the manufacturer, the Architect/Engineer has the option of making the selection, after the Contractor has determined or selected the manufacturer.
- B. Nameplates: Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on the exterior of the completed project.

1.3 SUBSTITUTIONS

- A. Conditions: The Contractor's requests for substitutions will be considered when they are reasonable, timely, fully documented, and when they qualify under one or more of the following circumstances.
1. The proposed substitution is related to an "or approved equal" or similar provision in the contract documents.
 2. The required product cannot be supplied in time for compliance with Contract Time requirements.
 3. The required product is acceptable to governing authorities.
 4. The required product cannot be properly coordinated with other materials in the work, or cannot be warranted or insured as specified.
 5. The proposed substitution will offer a substantial advantage to the Owner after deducting offsetting disadvantages including delays, additional compensation to the Architect/Engineer for redesign, evaluation and other necessary services, and similar considerations.
- B. Submittals: Include the following information, as appropriate, in each request for substitution:
1. Provide complete product documentation, including product data and samples, where appropriate.
 2. Provide detailed performance comparisons and evaluation, including testing laboratory reports where applicable.

DANFORTH ON HIGH – PORTLAND, MAINE

3. Provide coordination information indicating the effect of the substitution on other work and the time schedule.
4. Provide cost information for the proposed change order.
5. Provide the Contractor's general certification of the recommended substitution.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Receive, store and handle products, materials and equipment in a manner which will prevent loss, deterioration and damage.
- B. Schedule deliveries so as to minimize long-term storage at the project site.

END OF SECTION

SECTION 01700

PROJECT CLOSEOUT

1. GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. Provisions of this section apply to the procedural requirements for the actual closeout of the Work, not to administrative matters such as final payment or the change over of insurance.
- B. Closeout requirements relate to both substantial and final completion of the Work; they also apply to individual portions of completed work as well as the total Work.
- C. Specific requirements contained in other sections have precedence over the general requirements contained in this section.

1.2 PROCEDURES AT SUBSTANTIAL COMPLETION

- A. Prerequisites: Comply with General Conditions and complete the following before requesting Architect's/Engineer's inspection of the Work, or a designated portion of the Work, for certification of substantial completion.
 - 1. Submit executed warranties, workmanship bonds, maintenance agreements, inspection certificates and similar required documentation for specific units of work, enabling owner's unrestricted occupancy and use.
 - 2. Submit record documentation, maintenance manuals, tools, spare parts, keys and similar operational items.
 - 3. Complete instruction of Owner's operating personnel, and start-up of systems.
 - 4. Complete final cleaning, and remove temporary facilities and tools.
- B. Inspection Procedures:
 - 1. Upon receipt of Contractor's request, Architect/Engineer will either proceed with inspection or advise Contractor of prerequisites not fulfilled.
 - 2. Following initial inspection, Architect/Engineer will either prepare certificate of substantial completion, or advise Contractor of work which must be performed prior to issuance of the certificate of substantial completion.
 - 3. The Architect/Engineer will repeat the inspection when requested and assure that the Work has been substantially completed.

DANFORTH ON HIGH – PORTLAND, MAINE

4. Results of the completed inspection will form the initial "punch-list" for final acceptance.

1.3 PROCEDURES AT FINAL ACCEPTANCE

A. Reinspection Procedure:

1. The Architect/Engineer will reinspect the Work upon receipt of the Contractor's notice that, except for those items whose completion has been delayed due to circumstances that are acceptable to the Architect/Engineer, the Work has been completed, including punch-list items from earlier inspections.
2. Upon completion of reinspection, the Architect/Engineer will either recommend final acceptance and final payment, or will advise the Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, this procedure will be repeated.

1.4 RECORD DOCUMENTATION

A. Record Drawings:

1. Maintain a complete set of either blue- or black-line prints of the contract drawings and shop drawing for record mark-up purposes throughout the Contract Time.
2. Mark-up these drawings during the course of the work to show both changes and the actual installation, in sufficient detail to form a complete record for the Owner's purposes. Give particular attention to work which will be concealed and difficult to measure and record at a later date, and work which may require servicing or replacement during the life of the project.
3. Require the entities marking prints to sign and date each mark-up.
4. Bind prints into manageable sets, with durable paper covers, appropriately labeled.

B. Maintenance Manuals:

1. Provide 3-ring vinyl-covered binders containing required maintenance manuals, properly identified and indexed.
2. Include operating and maintenance instructions extended to cover emergencies, spare parts, warranties, inspection procedures, diagrams, safety, security, and similar appropriate data for each system or equipment item.

1.5 GENERAL CLOSEOUT REQUIREMENTS

- A. Operator Instructions: Require each Installer of systems requiring continued operation and maintenance by owner's operating personnel, to provide on-location instruction to

DANFORTH ON HIGH – PORTLAND, MAINE

Owner's personnel, sufficient to ensure safe, secure, efficient, non-failing utilization and operation of systems. Provide instructions for the following categories of work:

1. Mechanical/electrical/electronic systems (not limited to work of Divisions 15 and 16).
 2. Live plant materials and lawns.
 3. Roofing, flashing, joint sealers.
 4. Floor finishes.
- B. Final Cleaning: At the time of project close out, clean or reclean the Work to the condition expected from a normal, commercial building cleaning and maintenance program. Complete the following cleaning operations before requesting the Architect/Engineer's inspection for certification of substantial completions.
1. Remove non-permanent protection and labels.
 2. Polish glass.
 3. Clean exposed finishes.
 4. Touch-up minor finish damage.
 5. Clean or replace mechanical systems filters.
 6. Remove debris.
 7. Broom-clean unoccupied spaces.
 8. Sanitize plumbing and food service facilities.
 9. Clean light fixtures and replace burned-out lamps.
 10. Sweep and wash paved areas.
 11. Police yards and grounds

END OF SECTION

SECTION 01810

COMMISSIONING

PART 1 GENERAL

1.01 SUMMARY

- A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
 - 1. Verify that the work is installed in accordance with the Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
 - 2. Verify and document that functional performance is in accordance with the Contract Documents: Functional Tests executed by Contractor and witnessed by Commissioning Agent are utilized to achieve this.
 - 3. Verify that operation and maintenance manuals submitted to Community Housing of Maine are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
 - 4. Verify that the Community Housing of Maine's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.
- B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion
- C. Commissioning Agent directs and coordinates all commissioning activities; this section describes some but not all of Commissioning Agent's responsibilities.
- D. Commissioning Agent is employed by Community Housing of Maine.

1.02 SCOPE OF COMMISSIONING

- A. The following are to be commissioned:
- B. Plumbing Systems:
 - 1. Water heaters.
 - 2. Booster pumps.
- C. Building air tightness and sealing (as applicable)
 - 1. Blower Door testing
 - 2. Maximum building envelope leakage is not to exceed 0.25 cubic feet per minute per square foot at 50 pascals negative pressure (0.25 CFM/SF@50PA).
- D. HVAC System, including:
 - 1. Major and minor equipment items.
 - 2. Piping systems and equipment.
 - 3. Control system.
 - 4. Vibration control devices.
 - 5. Variable frequency drives.
- E. Electrical Systems:
 - 1. Emergency power systems if required.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Lighting controls other than manual switches.
- F. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.03 RELATED SECTIONS

- A. Section 01815 - Commissioning Agent Responsibilities.

1.04 REFERENCES

- A. PECEI (Samples) - Sample Forms for Prefunctional Checklists and Functional Performance Tests; Portland Energy Conservation, Inc.; located at <http://www.peci.org/library/mcpgs.htm>; current edition or approved alternate forms generated and provided by Commissioning Agent.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures; except:
 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to Commissioning Agent, unless they require review by Archetype Architects; in that case, submit to Archetype Architects first.
 2. Submit one copy to Commissioning Agent, not to be returned.
 3. Make commissioning submittals on time schedule specified by Commissioning Agent.
 4. Submittals indicated as "Draft" are intended for the use of Commissioning Agent in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2003 preferred.
 5. As soon as possible after submittals made to Archetype Architects are approved, submit copy of approved submittal to Commissioning Agent.
- B. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.
- C. Product Data: If submittals to Archetype Architects do not include the following, submit copies as soon as possible:
 1. Manufacturer's product data, cut sheets, and shop drawings.
 2. Manufacturer's installation instructions.
 3. Startup, operating, and troubleshooting procedures.
 4. Fan and pump curves.
 5. Factory test reports.
 6. Warranty information, including details of Community Housing of Maine's responsibilities in regard to keeping warranties in force.
- D. Startup Plans and Reports.
- E. Completed Prefunctional Checklists.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Community Housing of Maine.
- B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test

DANFORTH ON HIGH – PORTLAND, MAINE

and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:

1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
 2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
 3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Community Housing of Maine; such equipment, tools, and instruments are not to become the property of Community Housing of Maine.
- D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
1. Dataloggers required to for Functional Tests will be provided by Commissioning Agent and will not become the property of Community Housing of Maine.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

- A. Commissioning Agent has prepared the Commissioning Plan.
1. Attend meetings called by Commissioning Agent for purposes of completing the commissioning plan.
 2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.
- B. Contractor is responsible for compliance with the Commissioning Plan.
- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.
- D. Commissioning Schedule:
1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Agent within 60 days after award of Contract.
 2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
 3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
 4. Provide sufficient notice to Commissioning Agent for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 DOCUMENTATION IDENTIFICATION SYSTEM

- A. Give each submitted form or report a unique identification; use the following scheme.
- B. Type of Document: Use the following prefixes:
1. Startup Plan: SP-
 2. Startup Report: SR-
 3. Prefunctional Checklist: PC-
 4. Functional Test Procedure: FTP-

DANFORTH ON HIGH – PORTLAND, MAINE

5. Functional Test Report: FTR-.
- C. System Type: Use the first 4 digits from CSI/CSC MasterFormat, 2004 Edition, that are applicable to the system; for example:
 1. 2300: HVAC system as a whole.
 2. 2320: HVAC Piping and Pumps.
 3. 2330: HVAC Air Distribution.
- D. Component Number: Assign numbers sequentially, using 1, 2, or 3 digits as required to accommodate the number of units in the system.
- E. Test, Revision, or Submittal Number: Number each successive iteration sequentially, starting with 1.
- F. Example: PC-2320-001.2 would be the Prefunctional Checklist for equipment item 1 in the HVAC piping system, probably a pump; this is the second, revised submittal of this checklist.

3.03 STARTUP PLANS AND REPORTS

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.
- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to Commissioning Agent.

3.04 PREFUNCTIONAL CHECKLISTS

- A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
 1. No sampling of identical or near-identical items is allowed except for room control (IE thermostats and or zone controls) whereas, a representative sampling will be commissioned.
 2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
 3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
 - a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
 - b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
 - c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
 - d. Serial number of installed unit.
 - e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer's start-up checklist items and minor testing.
 - f. Sensor and actuator calibration information.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Commissioning agent is responsible for filling out Prefunctional Checklists, after completion of installation and before startup.
 - 1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
 - 2. Checklists with incomplete items may be submitted for correction provided the Contractor. Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
 - 3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
 - 4. If any Checklist line item is not relevant, record reasons on the form.
 - 5. Contractor may independently perform startup inspections and/or tests, at his option.
 - 6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
 - 7. Submit completed Checklists to Commissioning Agent within two days of completion.
- C. Commissioning Agent is responsible for furnishing the Prefunctional Checklists.
 - 1. Provide all additional information to aid in preparation for functional testing. Such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
 - 2. Commissioning Agent may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in the Contract Documents or not.
 - 3. When asked to review the proposed Checklists, do so in a timely manner.
- D. Commissioning Agent Witnessing: Required for:
 - 1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
 - 2. A sampling of non-primary equipment, as allowed by the commissioning plan.
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Community Housing of Maine.
 - 1. If difficulty in correction would delay progress, report deficiency to Commissioning Agent immediately.

3.05 FUNCTIONAL TESTS

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.
- C. Commissioning Agent is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
- D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Community Housing of Maine; if a deficiency is not corrected and re-tested immediately, Commissioning Agent will document the deficiency and the Contractor's stated intentions regarding correction.
 - 1. Deficiencies are any condition in the installation or function of a component, piece of

DANFORTH ON HIGH – PORTLAND, MAINE

- equipment or system that is not in compliance with the Contract Documents or does not perform properly.
2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to Commissioning Agent; Commissioning Agent will reschedule the test and the Contractor shall re-test.
 3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
 4. Contractor shall bear the cost of Community Housing of Maine and Commissioning Agent personnel time witnessing re-testing.
- E. Functional Test Procedures:
1. Some test procedures are included in the Contract Documents; where Functional Test procedures are not included in the Contract Documents, test procedures will be determined by Commissioning Agent with input by and coordination with Contractor.
 2. Examples of Functional Testing:
 - a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods 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 setpoint).
 - b. 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.
 - c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
 - d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to Commissioning Agent is Functional Testing.
- F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.06 SENSOR AND ACTUATOR CALIBRATION

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gages, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
- B. Calibrate using the methods described below; alternate methods may be used, if approved by Community Housing of Maine beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.
- C. All Sensors:
 1. Verify that sensor location is appropriate and away from potential causes of erratic operation.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Verify that sensors with shielded cable are grounded only at one end.
 3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
 4. Tolerances for critical applications may be tighter.
- D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
 2. Verify that the sensor reading, via the permanent thermostat, gage or building automation system, is within the tolerances in the table below of the instrument-measured value.
 3. If not, install offset, calibrate or replace sensor.
- E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.
 2. Connect a signal generator in place of sensor.
 3. Connect ammeter in series between transmitter and building automation system control panel.
 4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
 5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
 6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
 7. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
 8. Reconnect sensor.
 9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
 10. Verify that the sensor reading, via the permanent thermostat, gage or building automation system, is within the tolerances in the table below of the instrument-measured value.
 11. If not, replace sensor and repeat.
 12. For pressure sensors, perform a similar process with a suitable signal generator.
- F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
 2. Pressure, Air, Water, Gas: 3 percent of design.
 3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
 4. Relative Humidity: 4 percent of design.
 5. Barometric Pressure: 0.1 inch of Hg (.).
 6. Flow Rate, Air: 10 percent of design.
 7. Flow Rate, Water: 4 percent of design.
 8. AHU Wet Bulb and Dew Point: 2.0 degrees F.
- G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.
- H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 2. Set pump/fan to normal operating mode.

DANFORTH ON HIGH – PORTLAND, MAINE

3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 4. Command valve/damper to open; verify position is full open and adjust output signal as required.
 5. Command valve/damper to a few intermediate positions.
 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
 2. Use an ultra-sonic flow meter to detect flow or leakage.

3.07 TEST PROCEDURES - GENERAL

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional 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.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.
- C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
 2. Sampling is not allowed for:
 - a. Major equipment.
 - b. Life-safety-critical equipment.
 - c. Prefunctional Checklist execution.
 3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
 4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
 5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
 6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
 7. If YY percent of the units in the second sample fail, test all remaining identical units.
 8. If frequent failures occur, resulting in more troubleshooting than testing, Commissioning Agent may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.
- D. Manual Testing: Use 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").
- E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

DANFORTH ON HIGH – PORTLAND, MAINE

- F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.
- G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.
- H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.
- I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
 - 1. All points that are monitored by the relevant control system shall be trended by Contractor; at Commissioning Agent's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
 - 2. Other points will be monitored by Commissioning Agent using data loggers.
 - 3. At the option of Commissioning Agent, some control system monitoring may be replaced with datalogger monitoring.
 - 4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
 - 5. Graphical output is desirable and is required for all output if the system can produce it.
 - 6. Monitoring may be used to augment manual testing.

3.08 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01780 for additional requirements.
- B. Add design intent documentation furnished by Archetype Architects to manuals prior to submission to Community Housing of Maine.
- C. Submit manuals related to items that were commissioned to Commissioning Agent for review; make changes recommended by Commissioning Agent.
- D. Commissioning Agent will add commissioning records to manuals after submission to Community Housing of Maine.

END OF SECTION

SECTION 01815

COMMISSIONING AGENT RESPONSIBILITIES

PART 1 GENERAL

1.01 SUMMARY

- A. Commissioning is intended to achieve the following specific objectives; this section covers Commissioning Agent's responsibilities for commissioning:
 - 1. Verify that the work is installed in accordance with the Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists are utilized to achieve this.
 - 2. Verify and document that functional performance is in accordance with the Contract Documents: Functional Tests performed by Contractor and witnessed by Commissioning Agent are utilized to achieve this.
 - 3. Verify that operation and maintenance manuals submitted to Community Housing of Maine are complete: Detailed O&M data submittals are specified.
 - 4. Verify that the Community Housing of Maine's operating personnel are adequately trained: Formal training conducted by Contractor is specified.
- B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.
- C. Coordinate and direct all 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.

1.02 SCOPE OF COMMISSIONING

- A. The following are to be commissioned:
- B. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.03 REFERENCES

- A. ASHRAE Guideline 1 - The HVAC Commissioning Process; 1996
- B. PECE (MCP) - Model Commissioning Plan; Portland Energy Conservation, Inc.; located at <http://www.peci.org/library/mcpgs.htm>; current edition.

1.04 SUBMITTALS

- A. Commissioning Plan:
 - 1. Submit preliminary draft for review by Community Housing of Maine and Archetype Architects within 30 days after commencement of Commissioning Agent contract.
 - 2. Submit revised draft to be included in the construction contract documents, not less than 4 weeks prior to bid date.
 - 3. Submit final plan not more than 90 days after commencement of construction, for issuance to all parties.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. List of Prefunctional Checklists to be developed:
 - 1. Submit preliminary list at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
 - 2. Submit revised list not less than 6 weeks prior to bid date, for inclusion in the construction contract documents.
 - 3. Submit final list not more than 60 days after start of construction.
- C. Prefunctional Checklists:
 - 1. Submit preliminary draft at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
 - 2. Submit revised draft for review by Community Housing of Maine and Archetype Architects not less than 6 weeks prior to bid date, for inclusion in the construction contract documents.
 - 3. Submit final draft to Contractor not less than 4 weeks prior to startup of particular items to be commissioned.
- D. List of Functional Test procedures to be developed:
 - 1. Submit preliminary list at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
 - 2. Submit revised list not less than 6 weeks prior to bid date, for inclusion in the Contract Documents; this is intended to be a list of titles, not full description of the tests.
 - 3. Submit final list not more than 60 days after start of construction.
- E. Functional Test Procedures:
 - 1. Submit preliminary draft at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
 - 2. Submit revised draft for review by Community Housing of Maine and Archetype Architects not less than 6 weeks prior to bid date, for inclusion in the construction contract documents.
 - 3. Submit final draft to Contractor not less than 4 weeks prior to startup of particular items to be commissioned.
- F. Training Plan.
- G. Commissioning Record: Submit to Contractor for inclusion with O&M manuals.
- H. Final Commissioning Report: Submit to Community Housing of Maine.
- I. Recommissioning Manual: Submit within 60 days after receipt of Community Housing of Maine's instructions to proceed with preparation.

PART 3 EXECUTION

2.01 COMMISSIONING PLAN

- A. Prepare and maintain the Commissioning Plan, covering commissioning schedule, Prefunctional Checklist and Functional Test procedures, coordination requirements, and forms to be used, for all parties in the commissioning process.
 - 1. Call and chair meetings of the Commissioning Team when appropriate.
 - 2. Give Contractor sufficient notice for scheduling commissioning activities.
 - 3. Develop a comprehensive start-up and initial systems checkout plan with cooperation of Contractor and subcontractors.

DANFORTH ON HIGH – PORTLAND, MAINE

4. The PECE Model Commissioning Plan may be used as a guide for the Commissioning Plan.
 5. ASHRAE Guideline 1 may be used as a guide for the Commissioning Plan.
 6. Avoid replication of information included in the construction contract documents to the greatest extent possible.
- B. Review the construction contract documents for Contractor submittals of draft checklists, draft test procedures, manufacturer startup procedures, and other information intended for the use of Commissioning Agent in preparing the Commissioning Plan.
- C. Commissioning Schedule:
1. Coordinate with Contractor anticipated dates of startup of each item of equipment and system.
 2. Contractor's scheduling responsibilities are specified in the construction contract documents.
 3. Revise and re-issue schedule monthly.
 4. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
 5. Deliver relevant Prefunctional Checklists and Functional Test Procedures to Contractor in time to avoid delay.

2.02 CONSTRUCTION CONTRACT DOCUMENTS

- A. General Commissioning Specifications: Archetype Architects has prepared general commissioning specifications for inclusion in the construction contract documents; review and submit comments to Community Housing of Maine.
1. These specifications include:
 - a. Procedures applicable to all types of items to be commissioned.
 2. Prepare specifications for any of the following that would be recommended, for incorporation into the construction contract documents by Archetype Architects:
 - a. Additional Contractor submittals needed for purposes of commissioning, such as startup procedures, draft test procedures, draft training plans, etc.
 - b. Additional Community Housing of Maine personnel training.
 - c. Additional operation or maintenance data that should be submitted.
- B. Prefunctional Checklists: Develop detailed Checklists for each item to be commissioned.
1. List of Checklists to be Developed: Prepare and maintain a detailed list of titles, not full text.
 2. The Checklist forms are intended to be part of the Contractor's Contract Documents.
- C. Functional Testing: Develop detailed procedures for each item to be commissioned; submit for review by Community Housing of Maine and Archetype Architects.
1. List of Test Procedures to be Developed: Prepare and maintain a detailed list of titles, not full text.
 2. The forms Commissioning Agent will use to report Functional Test results are not intended to be part of Contractor's Contract Documents, but the Functional Test Procedures that must be executed by the Contractor must be made part of the Contract Documents, by modification if necessary.
- D. Develop any other reporting forms Contractor will be required to use; if they are likely to require a substantially different amount of work than the Contractor can reasonably anticipate, they must be included in the construction contract documents.

DANFORTH ON HIGH – PORTLAND, MAINE

- E. If any part of the documents described above have not been developed by the bid date, coordinate with Archetype Architects the issuance of modifications to the construction contract documents

2.03 PREFUNCTIONAL CHECKLISTS

- A. Prefunctional Checklists - Content: Prepare forms for Contractor's use, in sufficient detail to document that the work has been installed in accordance with the Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup.
 - 1. Prepare separate Checklists for each type of equipment, system, or other assembly, customized to the item.
 - 2. Identify each Checklist by using the contract documents identification number or name, if any; if none, create unique identifiers for each Checklist; do not rely on Contractor to number checklists.
 - 3. Multiple identical or near-identical items may appear on a single Checklist provided there is space to record all required data for each separately; label each set of data uniquely.
 - 4. Include space to record manufacturer name, model number, serial number, capacity and other relevant characteristics, and accessories and other features as applicable; include space to record "as specified", "as submitted", and "as installed" data.
 - 5. Include space to record whether or not the required submittals have been received; list each separate type of submittal.
 - 6. Include line items for each physical inspection to be performed.
 - 7. Include line items for each operational inspection to be performed, such as checking switch operation, fan rotation, valve and damper stroke, and measuring actual electrical loads.
 - 8. Include separate section for sensors and actuators, with space for documenting actual physical location and calibration measurements; provide a separate generic calibration checklist identified wherever referenced.
 - 9. Include spaces to record that related Checklists for related work upon which this work depends have been completed.
- B. Prefunctional Checklists - Format:
 - 1. Provide a cover sheet showing name of equipment item or system, documentation identification number (see Documentation Identification Scheme), names of accessory components involved, and identification of related checklists.
 - 2. Include on cover sheet space for Contractor's use in attesting to completeness; provide spaces for the signatures of the general contractor and each subcontractor or other entity responsible, customized to the project and the type of item.
 - 3. Include on the cover sheet, above the signature block, the following statement: "The work referenced in this Checklist and other work integral to or dependent on this work is complete and ready for functional testing. The checklist items are complete and have been checked off only by parties having direct knowledge of the event." Include two checkboxes:
 - a. "This Checklist is submitted for approval with no exceptions."
 - b. "This Checklist is submitted for approval, subject to the attached list of outstanding items, none of which preclude the performance of safe and reliable functional tests. A statement of completion will be submitted upon completion of the outstanding items."

DANFORTH ON HIGH – PORTLAND, MAINE

4. Use a consistent, tabular format for all Checklists, with one line per checklist activity.
5. For each line item, provide space for initials and date, and identification of the subcontractor or other entity responsible.

2.04 FUNCTIONAL TEST PROCEDURES

- A. Develop test procedures in sufficient detail to show that functional performance is in accordance with the Contract Documents and shows proper operation through all modes of operation where there is a different system response, including seasonal, unoccupied, warm-up, cool-down, part- and full-load.
 1. Obtain assistance and review by installing subcontractors.
 2. Itemize each test sequence in step-by-step order, with acceptance criteria for each step and for the test as a whole.
 3. Include test setup instructions, description of tools and apparatus, special cautions, and.
 4. Avoid procedures that would void or otherwise limit warranties; review with Contractor prior to execution.
 5. For HVAC systems, procedures may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing.
 6. Obtain explicit approval of Contractor in regard to feasibility and safety prior to execution.
- B. Functional Test Report Forms: Prepare forms in advance of testing, using a consistent format; include all test procedure information given to Contractor and:
 1. Report Identifier (see Documentation Identification Scheme).
 2. Test prerequisites.
 3. Formulas to be used in calculations.
 4. Yes/No check boxes for each step of test.
 5. Space to record results, document deficiencies, and make recommendations.
 6. Signature and date block for Commissioning Agent.
- C. Functional Test Prerequisites: Include space to verify all of the following items on each Functional Test Report Form, unless truly inapplicable:
 1. All related equipment has been started up and start-up reports and Prefunctional Checklists submitted and approved ready for Functional Testing.
 - a. For hydronic systems, check that:
 - 1) Piping system flushing is complete and required report approved.
 - 2) Water treatment system is complete and operational.
 - 3) Test and balance (TAB) is complete and approved.
 2. All control system functions for this and all interlocking systems are programmed and operable in accordance with the Contract Documents, including final set points and schedules with debugging, loop tuning and sensor calibrations completed, with space for signature of controls installer.
 3. Incomplete items identified by Archetype Architects during closeout inspections have been corrected or completed.
 4. Safeties and operating ranges have been reviewed.
 5. A copy of the specified sequence of operation is attached.
 6. A copy of applicable schedules and setpoints is attached.
 7. A copy of the specified Functional Test Procedures is attached.
 8. The Functional Test Procedures have been reviewed and approved by the applicable installer.

DANFORTH ON HIGH – PORTLAND, MAINE

9. Vibration control report approved (if required).
10. False loading equipment, system and procedures ready.
11. Sufficient clearance around equipment for servicing.
12. Original values of pre-test setpoints that need to be changed to accommodate testing have been recorded, with a check box provided to verify return to original values (include control parameters, limits, delays, lockouts, schedules, etc.).
13. Any other items on the Prefunctional Checklist or Start-up Reports that need to be re-verified.

2.05 CONSTRUCTION PHASE

- A. Coordinate the commissioning work with Contractor and Construction Manager, ensure that commissioning activities are being incorporated into the master schedule.
- B. Perform site visits, as necessary, to observe component and system installations. Attend planning and job-site meetings to obtain information on construction progress. Review Contractor's meeting minutes for issues relating to the commissioning process. Assist in resolving discrepancies.
- C. Commissioning Kick-Off Meeting: Plan and conduct a meeting early in the construction phase to review commissioning activities and responsibilities with all parties involved. Require attendance by all members of the Commissioning Team.
- D. Conduct periodic meetings as necessary to coordinate, resolve planning issues, and aid in resolution of deficiencies, minimizing the time spent by Contractor and Community Housing of Maine personnel; hold meetings at least monthly.
- E. Submit periodic progress reports to Community Housing of Maine and Contractor.
- F. Review Contractor shop drawing submittals applicable to systems being commissioned for compliance with commissioning needs; verify that Community Housing of Maine's responsibilities are clearly defined in warranties.
- G. Review and approve submittals directly related to commissioning.
- H. Deliver Prefunctional Checklists and Functional Test procedures to Contractor.
- I. Verify satisfactory completion of Prefunctional Checklists by Contractor by reviewing checklists and by site observation and spot checking; provide formal approval when satisfactory.
- J. Verify startup of all systems by reviewing start-up reports and by site observation; provide formal approval when satisfactory.
- K. Coordinate, witness and approve Functional Tests performed by Contractor. Coordinate retesting until satisfactory performance is achieved.
- L. HVAC Commissioning:
 1. Gather and review the control sequences and interlocks and work with Contractor and design engineers until sufficient clarity has been obtained, in writing, to be able to prepare detailed Functional Test procedures.
 2. Witness all or part of HVAC piping test and flushing procedures, sufficient to be confident that proper procedures were followed; document testing and include documentation in O&M manuals.

DANFORTH ON HIGH – PORTLAND, MAINE

3. Witness all or part of duct testing and cleaning procedures, sufficient to be confident that proper procedures were followed; document testing and include documentation in O&M manuals.
 4. Review TAB Plan prepared by Contractor.
 5. Before TAB is executed, witness sufficient Functional Testing of the control system to approve it to be used for TAB.
 6. Verify air and water systems balancing by spot testing, by reviewing completed reports, and by site observation; provide formal approval when satisfactory.
 7. Analyze trend logs and monitoring data to verify performance.
- M. Witness and document testing of systems and components over which Commissioning Agent does not have direct control, such as smoke control systems, tests contracted directly by Community Housing of Maine, and tests by manufacturer's personnel; include documentation in O&M manuals.
- N. Perform Functional Testing for systems and equipment so specified, without assistance of Contractor.
- O. Maintain a master deficiency and resolution log and a separate testing record. Provide written progress and test reports with recommended actions.
- P. O&M Data: Review submitted operation and maintenance data for completeness; provide formal approval if satisfactory.
- Q. Notify Contractor and Community Housing of Maine of deficiencies in procedures or results; suggest solutions.

2.06 TRAINING

- A. Training Plan: Prepare a comprehensive Training Plan, incorporating draft training plans submitted by Contractor.
1. Include a ____ hour session by the HVAC design engineer covering the overall HVAC system and equipment design concepts, with one-line schematic drawings.
 2. Include a ____ hour session by Commissioning Agent on the use of the blank Prefunctional Checklists and Functional Test report forms for re-commissioning purposes.
 3. Establish criteria for determining satisfactory completion of training.
- B. Verify that training was satisfactorily completed; provide formal approval if satisfactory.

2.07 CLOSEOUT

- A. Commissioning Record: Use the same format and organization as specified for the O&M manuals.
1. Include the Final Commissioning Plan and Final Report.
 2. For each product or system and equipment item, include the following organized as indicated, with separator tabs:
 - a. Design intent documentation, furnished by Archetype Architects or others.
 - b. Detailed operational sequences.
 - c. Startup plan and approved startup reports.
 - d. Filled out Prefunctional Checklists.
 - e. Filled out Functional Test reports; trend logs and monitoring reports and analysis; other verification documentation.

DANFORTH ON HIGH – PORTLAND, MAINE

- f. Training plan and training records.
 - g. Recommissioning recommendations, including time schedule and procedures; include blank copies of all Prefunctional Checklists and Functional Test report forms.
- B. Final Commissioning Report: Include:
- 1. Executive summary.
 - 2. List of participants and roles.
 - 3. Brief facility description.
 - 4. Overview of commissioning scope and general description of testing and verification methods.
 - 5. For each item commissioned, an evaluation of adequacy of:
 - a. The product itself; i.e. compliance with the contract documents.
 - b. Installation.
 - c. Functional performance; include a brief description of the verification method used and observations and conclusions from the testing.
 - d. O&M documentation, including design intent.
 - e. Operator training.
 - 6. List of all outstanding non-compliance items, referenced to the specific functional test, inspection, trend log, etc., where the deficiency is documented.
 - 7. List of unresolved issues, seasonal or deferred testing, and other concerns that could affect facility operation.
 - 8. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. (about four to six pages).
 - 9. Attach appendices containing all commissioning documentation, including logs, minutes, reports, deficiency lists, communications, findings, etc., except that specified to be part of the Commissioning Record.
- C. Recommissioning Manual: Revise the Commissioning Plan documents, checklists, and Functional Test forms as necessary based on accepted recommendations of the final Commissioning Report. Provide step-by-step instructions for recommissioning, blank forms, and cross-references to O&M data needed during recommissioning.

2.08 POST-OCCUPANCY PHASE

- A. Coordinate deferred and seasonal Functional Tests; verify correction of deficiencies.
- B. On-Site Review: 10 months after Substantial Completion conduct on-site review with Community Housing of Maine's staff.
 - 1. Review the current facility operation and condition of outstanding issues related to the original and seasonal commissioning.
 - 2. Interview staff to identify problems or concerns they have operating the facility as originally intended.
 - 3. Make suggestions for improvements and for recording these changes in the O&M manuals.
 - 4. Identify areas of concern that are still under warranty or are the responsibility of the original construction contractor.
 - 5. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 02230

SITE CLEARING AND GRUBBING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Removal of surface debris.
- B. Clear site of plant life and grass.
- C. Removal of trees, shrubs, and other plants.
- D. Remove root system of trees, brush and shrubs.
- E. Removal of paving, curbs, and existing gravel.
- F. Removal of culverts, catch basins, manholes and other drainage features.
- G. Removal of fences, posts, bollards, poles, signs, gates and other minor structures.
- H. Removal and stockpiling of topsoil.

1.02 RELATED SECTIONS

- A. Section 02250 - Dewatering
- B. Section 02315 - Common Excavation, Embankment and Compaction
- C. Section 02320 - Slope Protection and Erosion Control.

1.03 DEFINITIONS

- A. Loam
 - 1. Friable clay loam surface soil found in depth of not less than 4 inches.
 - 2. Satisfactory topsoil is free of subsoil, clay lumps, stones, and other objects over 2 inch in diameter, and without weeds, roots and other objectionable material.

1.04 REGULATORY REQUIREMENTS

- A. Obtain required permits from authorities.
- B. Notify affected utility companies before starting work and comply with their requirements.
- C. Do not close or obstruct roadways without permits. Contractor to meet with and obtain approval for closing off site and providing for pedestrian movement past site during

DANFORTH ON HIGH – PORTLAND, MAINE

construction.

- D. Conform to applicable code for disposal of debris.
- E. Conform to applicable regulatory procedures when hazardous or contaminated materials are discovered.

1.05 PROJECT CONDITIONS

- A. Conform to applicable regulations relating to environmental requirements, disposal of debris, and use of herbicides.
- B. Coordinate clearing work with utility companies.
- C. Protect utilities to remain from damage.
- D. Provide traffic control as required, in accordance with the U.S. Department of Transportation "Manual of Uniform Traffic Control Devices" and Maine Department of Transportation (MDOT) requirements.
- E. Conduct site clearing operations to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Streets and roadways shall be thoroughly cleaned and/or swept on a daily basis or more frequently as required by the governing authority
- F. Maintain adequate access to the existing school when school is in session
- J. Promptly repair damage to adjacent facilities caused by the clearing and grubbing operations, at no cost to the Owner.
- H. Protect bench marks, survey control points, and existing structures from damage or displacement.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Snow Fence: Beacon Plus Orange Construction Fence by Geotenax Corporation, 4800 Monument Street, Baltimore, Maryland, 21205 or approved equal. Snow or Construction Fence shall be supported with 1" steel posts spaced at a maximum of 8'-0" on center.

PART 3 EXECUTION

3.01 PREPARATION

- A. Locate and identify utilities to remain.

DANFORTH ON HIGH – PORTLAND, MAINE

3.02 PROTECTION

- A. Protect utilities to remain from damage.
- B. Protect existing trees and other vegetation indicated or directed by the Owner to remain in place, against unnecessary cutting, breaking, or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within the drip line, excess foot or vehicular traffic, or parking of vehicles within dripline.
- C. Pollution Controls: Use water sprinkling to limit to the lowest practical level the amount of dust and dirt rising and scattering in the air. Do not use water when it may create hazardous conditions, ice, flooding or pollution

3.03 CLEARING

- A. Clear areas required for access to site and execution of Work.

3.04 REMOVAL

- A. Remove paving, curbs, poles, posts, signs, fences, gates, culvert and minor structures to facilitate construction. Where required by these Drawings, or directed by Owner, preserve those curbs, poles, posts, signs, fences, gates, culverts, minor structures, and other features called for to be reset. Reset removed objects immediately upon completion of backfilling, unless otherwise directed by Owner.
- B. Remove portions of existing pavement; as indicated. Neatly saw cut edges at right angle to surface with a paving saw or compressed air cutter satisfactory to Owner.
- C. Excavate and remove underground storage tanks, retaining straps, associated plumbing piping, and foundation pad.
- D. Remove debris from site.

3.05 DISPOSAL

- A. Burning of Materials: Burning will not be permitted.
- B. Removal: Remove material, debris, rock and extracted plant life from site daily as it accumulates and legally dispose of.
- C. Dumping: Dispose of material in an approved off site legally operated disposal area.
- E. Trucks removing demolition debris from the site shall be covered or shall be of a closed body design to prevent the accidental throwing upon any way of tacks, nails, wire, scrap metal, glass, crockery, or other substances injurious to the feet of persons or animals or to tires or wheels of vehicles.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 02250

DEWATERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnish, operate and maintain dewatering equipment for control, collection, and disposal of ground and surface water entering trenches and excavations.

1.02 RELATED SECTIONS

- A. Section 02315- Common Excavation, Embankment and Compaction.
- B. Section 02317- Trenching.
- C. Section 02320 - Slope Protection and Erosion Control.

1.03 DESIGN REQUIREMENTS

- A. Design dewatering facilities including drains, piping and pumping.

1.04 SUBMITTALS

- A. Prior to start of excavation and trenching, submit dewatering design and methods to Owner for review.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Provide pumps, drains, piping and other facilities necessary to keep excavations and trenches free of water including spare units available for immediate use in the event of equipment failure.

PART 3 EXECUTION

3.01 PROTECTION

- A. Protect watercourses, sewer systems and adjacent properties from siltation by use of sediment ponds, Siltsacks™ or other measures acceptable to Owner.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Keep excavations clear of groundwater, surface water, seepage, sewage and storm water.

3.02 INSTALLATION

- A. Install, construct and maintain equipment and facilities required for work of this section.
- B. Dispose of water removed from Work in a suitable manner which will not interfere with other work, cause erosion, damage pavements, other surfaces or property and is acceptable to Owner:
- C. Remove dewatering equipment and facilities when no longer required.
- D. Backfill excavations in accordance with 02315.
- E. Repair damage resulting from dewatering operations.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 02315

EXCAVATION, EMBANKMENT AND COMPACTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Common excavation, stockpile subsoil for later reuse. Remove excess from site.
- B. Construct embankments with excavated subsoil and borrow.
- C. Grade and rough contour site.
- D. Prepare subsoil and borrow to receive subbase and base gravels and topsoil materials.
- E. Place, grade and compact subbase and base gravels to receive pavement.
- F. Compaction requirements.
- G. Dust control.

1.02 RELATED SECTIONS

- A. Section 02250 - Dewatering: Dewatering of Excavations and water control.
- B. Section 02317 - Trenching
- C. Section 02320 - Slope Protection.
- D. Section 02741- Bituminous Concrete Paving.

1.03 REFERENCES

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 1997.
- B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 1996a.
- C. ASTM D 698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 1991.
- D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-

DANFORTH ON HIGH – PORTLAND, MAINE

- Cone Method; 1990 (Reapproved 1996).
- E. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 1991.
 - F. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994.
 - G. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System); 1998.
 - H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 1996.
 - I. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 1996.
 - J. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 1998.

1.04 DEFINITIONS

- A. Common excavation: Excavated material meeting the description of MDOT Specification Section 203.01, except common excavation shall include the removal and disposal of boulders, solid mortared stone masonry, and concrete masonry when each is less than 2 cubic yards in volume.
- B. Rock Excavation
 - 1. Rock excavation includes removal and disposal of solid rock, boulders over 1 cu. yd., ledge rock, rock-hard cementitious deposits and other materials or obstructions which cannot be dislodged and excavated with modern, heavy-duty, track-mounted excavating equipment defined as follows:
 - a. For trenches less than 10' in width or pits in excess of 30' in either length or width: Caterpillar Model 215 or equivalent hydraulic excavator.
 - b. For open excavation (all excavations other than above): Caterpillar Model No. 973 or 977K or equivalent loader.
 - 2. If encountered, rock excavation will be paid for in accordance with contract conditions relative to changes in work. Rock payment lines are limited to the following:
 - a. Two feet outside of concrete work for which forms are required, except footings.
 - b. One foot outside perimeter of footings.
 - c. In pipe trenches, 6" below invert elevation of pipe and 2 ft. wider than inside diameter of pipe, but not less than 3 ft. minimum trench width.
 - d. Neat outside dimensions of concrete work where no forms are required.
 - e. Under slabs on grade, 6" below bottom of concrete slab.
- C. Unauthorized excavation (removal of materials beyond indicated subgrade elevations) may be filled with compacted structural fill.

DANFORTH ON HIGH – PORTLAND, MAINE

1.05 SUBMITTALS

- A. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.06 PROJECT CONDITIONS

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Protect plants, lawns, and other features to remain.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Protect above or below grade utilities which are to remain.
- E. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- F. Notify Owner of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
- G. Protect excavations and soil adjacent to and beneath foundations from frost.
- H. Grade excavation top perimeter to prevent surface water runoff into excavations.
- I. Protect excavations by shoring, bracing, sheet piling, underpinning or other methods required to prevent cave-in or loose soil from falling into excavation.
- J. Maintenance of existing flows:
 - 1. Keep existing sewers and drains in operation.
 - 2. If existing sewers and drains are disturbed, provide for maintenance of such flows until work is completed.
 - 3. Do not allow raw sewage to flow on ground surface or stand in excavation.
- K. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.

DANFORTH ON HIGH – PORTLAND, MAINE

- L. When fill materials need to be stored on site, locate stockpiles where indicated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Subsoil: Reused, meeting the requirements of Common Borrow.
- B. Common Borrow: MDOT 703.18; Earth, suitable for embankment construction, free from frozen material, perishable rubbish, peat and other unsuitable material, with sufficient moisture content to provide the required compaction and stable embankment, moisture content shall not exceed 4 percent above optimum. Determine optimum moisture content in accordance with AASHTO T 180, Method C or D.
- C. Granular Borrow: MDOT 703.19; Sand or gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that portion passing a 3 inch sieve shall meet the following requirements:
 - 1. No. 40 sieve: 0 to 70 percent passing by weight.
 - 2. No. 200 sieve: 0 to 20 percent passing by weight.
- D. Granular borrow shall contain no particles or fragments with a maximum dimension in excess of one-half of the compacted thickness of the layer being placed.
- E. Gravel Borrow: MDOT 703.20; Uniformly graded granular material having no rocks with a maximum dimension of over 6 inches. The gradation of that portion passing a 3 inch sieve shall contain not more than 70 percent passing by weight a 1/4 inch mesh sieve and not more than 10 percent passing by weight a No. 200 mesh sieve.
- F. Aggregate Base: Crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that part that passes a 3 inch sieve shall meet the gradation requirements of MDOT Specification Section 703.06, Type A aggregate, with the following limits:
 - 1. 1/2 inch sieve: 45 to 70 percent passing by weight
 - 2. 1/4 inch sieve: 30 to 55 percent passing by weight
 - 3. No. 40 sieve: 0 to 20 percent passing by weight
 - 4. No. 200 sieve: 0 to 5 percent passing by weight
 - 5. Type A aggregate shall not contain particles of rock which will not pass the 2 inch square mesh sieve.
- G. Aggregate Subbase: Sand or gravel of hard durable particles free from vegetable matter,

DANFORTH ON HIGH – PORTLAND, MAINE

lumps or balls of clay and other deleterious substances. The gradation of that part that passes a 3 inch sieve shall meet the gradation requirements of MDOT Specification Section 703.06, Type D aggregate, with the following limits:

1. 1/4 inch sieve: 25 to 70 percent passing by weight
2. No. 40 sieve: 0 to 30 percent passing by weight
3. No. 200 sieve: 0 to 7 percent passing by weight
4. Type D aggregate shall not contain particles of rock which will not pass the 6 inch square mesh sieve.

H. Select Fill: Screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that part that passes a 4 inch sieve shall meet the following requirements:

1. 4 inch sieve: 100 percent passing by weight
2. 3 inch sieve: 90 to 100 percent passing by weight
3. 1/4 inch sieve: 25 to 90 percent passing by weight
4. No. 40 sieve: 0 to 30 percent passing by weight
5. No. 200 sieve: 0 to 5 percent passing by weight

I. Structural Fill: Granular soils with good drainage characteristics free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that part that passes a 4-inch sieve shall meet the following requirements:

1. 6 inch sieve: 100 percent passing by weight.
2. No. 40 sieve: 0 to 70 percent passing by weight.
3. No. 200 sieve: 0 to 20 percent passing by weight.

2.02 ACCESSORIES

- A. Water for sprinkling: Fresh and free from oil, acid, and injurious alkali or vegetable matter.
- B. Calcium chloride: ASTM D98 commercial grade except as waived by Owner.

2.03 SOURCE QUALITY CONTROL

- A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

DANFORTH ON HIGH – PORTLAND, MAINE

- A. Identify required lines, levels, contours, and datum locations.
- B. Examine the areas and conditions under which excavating and filling is to be performed and notify Owner in writing of conditions detrimental to proper and timely completion of work
- C. Correct unsatisfactory conditions in a manner acceptable to Owner prior to proceeding with work
- D. Maintain in operating condition existing utilities, active utilities and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.
- E. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- F. Verify structural ability of unsupported walls to support imposed loads by the fill.

3.02 INSPECTION

- A. Verify stockpiled fill to be reused is approved.
- B. Verify areas to be backfilled are free of debris, snow, ice or water, and surfaces are not frozen.

3.03 PREPARATION

- A. When necessary, compact subgrade surfaces to density requirements for embankment, aggregate base and aggregate subbase materials.
- B. Identify known underground utilities. Stake and flag locations.
- C. Identify and flag surface and aerial utilities.
- D. Notify utility companies of work to be done.
- E. Locate, identify, and protect utilities that remain and protect from damage.
- F. Scarify subgrade surface to a depth of 6 inches to identify soft spots.
- G. Cut out soft areas of subgrade not capable of compaction in place. Backfill with granular borrow or crushed stone.
- H. The building pad shall be constructed in such a manner as to provide positive drainage of surface water off the pad and to protect the pad surface and subgrade. Temporary ditches shall be constructed to carry any surface runoff away from the pad area, as directed by the Owner. At the start of building construction, the pad shall be prepared for foundations and

DANFORTH ON HIGH – PORTLAND, MAINE

temporary ditches properly backfilled.

- I. Surface preparation shall be performed in accordance with the soils report and the requirements of the Geotechnical Engineer.
- J. Soil fill placed adjacent to foundations (interior and exterior) within 8 inches of floor slabs and as backfill around exterior foundations (including features such as bollards and light pole bases) shall be select fill and shall be placed in lift thickness such that the desired density is achieved throughout the lift thickness 3 to 5 passes of the compaction equipment.
- K. Soil fill placed within the proposed building area, below select fill, shall be structural fill. Where structural fill is below footing grade, the zone of 95 percent compaction (maximum dry density as determined by ASTM D-1557) shall extend laterally beyond the foundation at least 1 foot for each foot of depth below foundation grade.

3.04 EXCAVATING

- A. Underpin adjacent structures which may be damaged by excavating work.
- B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Excavate materials encountered when establishing required subgrade elevations in accordance with MDOT Specification Section 203.04 and 203.05.
- D. Remove lumped subsoil, boulders, solid mortared stone masonry, concrete masonry and rock up to 2 cubic yards, measured by volume.
- E. Conform to elevations, contours, dimensions, line and grade shown on the Drawings.
- F. When excavation through roots is necessary, perform work by hand and cut roots with a sharp axe.
- G. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored. All excavations shall be consistent with OSHA regulations.
- H. Do not excavate wet subsoil.
- I. Remove all existing fill soils from beneath foundations.
- J. Do not interfere with 45 degree bearing splay of foundations.
- K. Correct areas that are over-excavated and load-bearing surfaces that are disturbed at no cost to Owner.

DANFORTH ON HIGH – PORTLAND, MAINE

- L. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- M. Remove excavated material that is unsuitable for re-use from site.
- N. Surplus Material:
 - 1. Make arrangements to provide suitable disposal areas off-site
 - 2. Deposit and grade material to the satisfaction of the owner of the property on which the material is deposited.
 - 3. Obtain any necessary permits for disposal.
 - 4. Provide suitable watertight vehicles to haul soft or wet materials over streets or pavements to prevent deposits on same.
 - 5. Keep crosswalks, streets, and pavements clean and free of debris.
 - 6. Clean up materials dropped from vehicles as often as directed by Owner.

3.05 FILLING AND SUBGRADE PREPARATION

- A. Subgrades shall be proof-rolled using a vibratory roller-compactor weighing at least 15 kips. Any areas that continue to yield after 3 to 5 passes of the compaction equipment shall be over-excavated and replaced with clean granular fill.
- B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- C. Place and compact fill materials in continuous layers not exceeding 12 inches loose depth upon compacted material.
- D. Fill to contours and elevations indicated using unfrozen materials.
- E. Fill up to subgrade elevations unless otherwise indicated.
- F. Employ a placement method that does not disturb or damage other work.
- G. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- H. Maintain optimum moisture content of fill materials to attain required compaction density.
- I. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- J. Correct areas that are over-excavated.
 - 1. Load-bearing foundation surfaces: Use select fill, flush to required elevation, compacted to 95 percent of maximum dry density.
 - 2. Other areas: Use common borrow, flush to required subgrade elevation, compacted to minimum 95 percent of maximum dry density.

DANFORTH ON HIGH – PORTLAND, MAINE

- K. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density.
 - 2. At other locations: 90 percent of maximum dry density.
- L. Leave stockpile areas completely free of excess fill materials.
- M. Reshape and re-compact fills subjected to vehicular traffic.
- N. Frost:
 - 1. Do not excavate to full indicated depth when freezing temperatures may be expected unless fill material or structures can be constructed immediately after the excavation has been completed. Protect the excavation from frost if placing of fill or structure is delayed.
 - 2. Fill shall not be placed over frozen soil. Soil that is frozen shall be removed prior to placement of compacted fill. Remove all frozen uncompacted soil prior to placing additional fill for compaction.
- O. Native soils can undergo substantial strength loss when subjected to construction traffic and excavation activities, particularly during periods of precipitation and shallow groundwater levels. Care must be exercised to minimize disturbance of the bearing soils. Should the subgrade become yielding or difficult to work, disturbed areas shall be excavated and backfilled with select fill or crushed stone. Select fill shall be placed in lifts and compacted to at least 95 percent of its maximum dry density as determined by ASTM-1557.

3.06 CONSTRUCTION OF AGGREGATE BASE AND SUBBASE COURSE

- A. Place and compact aggregate base and subbase course materials in continuous layers not exceeding 8 inches loose depth upon compacted material.
- B. Employ a placement method so not to disturb or damage structures and utilities.
- C. Spread materials well mixed having no pockets of either fine or coarse material.
- D. Do not segregate large or fine particles.
- E. Compact by mechanical means to obtain 95 percent of maximum dry density as determined in accordance with ASTM Test Designation D1557. Base course material shall be compacted with a minimum of two coverages with self propelled vibratory compaction equipment.
- F. Maintain surface, compaction and stability until pavement course has been placed.
- G. Conform to elevations, contours, dimensions, line and grade shown on the Drawings.

DANFORTH ON HIGH – PORTLAND, MAINE

3.07 DUST CONTROL

- A. Upon request of Owner, implement the following dust control measures:
 - 1. Apply water and calcium chloride as directed by Owner.
 - 2. Spread calcium chloride uniformly over designated area.
 - 3. Apply water with equipment having a tank with pressure pump and nozzle equipped spray bar acceptable to Owner.

3.08 TOLERANCES

- A. Top surface of base and subbase course: Plus or minus 3/8 inch.

3.09 FIELD QUALITY CONTROL

- A. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D2922. Contractor shall be responsible for conducting and paying for all necessary compaction density testing.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 1557 ("modified Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Frequency of Tests:
 - 1. Building subgrade areas, including 10'-0" outside exterior building lines: In cut areas, not less than one compaction test for every 2,500 square feet. In fill areas, same rate of testing for each lift.
 - 2. Areas of construction exclusive of building subgrade: In cut areas, not less than one compaction test for every 10,000 square feet. In fill areas, same rate of testing for each lift.

3.10 PROTECTION

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect newly graded areas from traffic and erosion and keep free of trash and debris.
- D. Repair and re-establish grades in settled, eroded and rutted areas within specified tolerances.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 02317

TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating trenches for utilities.
- B. Excavating for manholes, catch basins and other structures.
- C. Compacted bedding and compacted backfilling over utilities to subgrade elevations.
- D. Compacted base and compacted backfilling for manholes, catch basins and other structures to subgrade elevations.
- E. Compaction requirements.
- F. Dust control.

1.02 RELATED SECTIONS

- A. Section 02250 - Dewatering.
- B. Section 02315 - Common Excavation, Embankment and Compaction.
- C. Section 02510 - Water Distribution.
- D. Section 02535 - Sanitary Sewer Piping.
- E. Section 02635 - Storm Drainage Piping.

1.03 REFERENCES

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 1997.
- B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 1996a.
- C. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2000a.
- D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-

DANFORTH ON HIGH – PORTLAND, MAINE

Cone Method; 2000.

- E. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2000.
- F. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994.
- G. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2000.
- H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 1996.
- I. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 1996.
- J. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2000.

1.04 INTENT

- A. It is the Owner's intent for the project to be constructed in a manner which will minimize either trench settlement or frost heaving due to differential soils. It is also the Owner's intent to use in-situ materials to accomplish these objectives when conditions permit. The Contractor shall recognize the varying compactive efforts required to compact in-situ materials and include the compaction in their bid for the effort since no additional payment will be made. The Owner will determine when off-site backfill materials shall be used.

1.05 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.

1.06 SUBMITTALS

- A. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

DANFORTH ON HIGH – PORTLAND, MAINE

1.07 PROJECT CONDITIONS

- A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where designated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.
- C. Verify that survey bench marks and intended elevations for the Work are as indicated.
- D. Protect plants, lawns, and other features to remain.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- F. Protect excavations by shoring, bracing, sheet piling, underpinning or other methods required to prevent cave-in or loose soil from falling into excavation.
- G. Protect above or below grade utilities which are to remain.
- H. Repair damage.
- I. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- J. Protect excavations and soil adjacent to and beneath foundations from frost.
- K. Grade excavation top perimeter to prevent surface water runoff into excavations.
- L. Maintenance of existing flows:
 - 1. Keep existing sewers and drains in operation.
 - 2. If existing sewers and drains are disturbed, provide for maintenance of such flows until work is completed.
 - 3. Do not allow raw sewage to flow on ground surface or stand in excavation.

PART 2 PRODUCTS

2.01 PIPE BEDDING

- A. Bedding for ductile iron pipe or concrete pipe shall be a granular material meeting the requirements of AASHTO Specification M145 49 as revised, Classification A-3 or better.
- B. Bedding for pvc conduit or direct bury cable: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter.

DANFORTH ON HIGH – PORTLAND, MAINE

1. Graded in accordance with the following limits:
 - a. 3/8 Inch sieve: 85 to 100 percent passing by weight
 - b. No. 200 sieve: 0 to 5 percent passing by weight.
- C. Bedding for all other pipe materials shall be 3/4 inch crushed stone. Aggregate for crushed stone shall be hard durable crushed stone free from friable materials, lumps or balls of clay, shale or other deleterious substances.
 1. Graded in accordance with the following limit
 - a. 1" sieve: 100 percent passing by weight
 - b. 3/4 Inch sieve: 90 to 100 percent passing by weight
 - c. 1/2 Inch sieve: 45 to 80 percent passing by weight
 - d. 3/8 Inch sieve: 20 to 55 percent passing by weight
 - e. 1/4 Inch sieve: 5 to 20 percent passing by weight
 - f. No. 4 sieve: 0 to 10 percent passing by weight
 - g. No. 8 sieve: 0 to 5 percent passing by weight
 - h. No. 200 sieve: 1.5 percent maximum passing by weight
- D. Heavy gravel: Bank run, uniformly graded, free of soil, subsoil, clay, shale, frozen material or foreign matter, stones larger than 8 inches, 20% maximum passing a #200 sieve. Gradation to provide a firm stable base upon compaction by normal vibratory or compressed air compaction equipment to satisfaction of Owner.

2.02 TRENCH BACKFILL

- A. Special backfill shall be a granular material meeting the requirements of AASHTO Specification M145 49 as revised, Classification A-3 or better.
- B. Select backfill shall be a granular material meeting the requirements of AASHTO Specification M145 49 as revised, Classification A-3 or better.
- C. Excavated material shall be granular in nature, free of gravel larger than 6 inch size, organic matter, roots, frozen material, debris and other objectionable material, and that can be compacted by vibratory means to obtain 92% of the optimum density.

2.03 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, non-woven, Mirafi 600x.
- B. Water for sprinkling: Fresh and free from oil, acid and injurious alkali or vegetable matter.
- C. Calcium Chloride: ASTM D98 commercial grade except as waived by the Owner.

2.04 SOURCE QUALITY CONTROL

- A. If tests indicate materials do not meet specified requirements, change material and retest.

DANFORTH ON HIGH – PORTLAND, MAINE

PART 3 EXECUTION

3.01 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Examine the areas and conditions under which excavating and filling is to be performed and notify Owner in writing of conditions detrimental to proper and timely completion of work.
- C. Correct unsatisfactory conditions in a manner acceptable to Owner prior to proceeding with work.
- D. Maintain in operating condition existing utilities, active utilities and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.
- E. Locate, identify, and protect utilities that remain and protect from damage.
- F. Notify utility company to remove and relocate utilities.

3.02 INSPECTION

- A. Verify stockpiled fill to be reused is approved.
- B. Verify areas to be backfilled are free of debris, snow, ice or water, and surfaces are not frozen.

3.03 PREPARATION

- A. When necessary, compact subgrade surfaces to density requirements for embankment, aggregate base and aggregate subbase materials.
- B. Identify known underground utilities. Stake and flag locations.
- C. Identify and flag surface and aerial utilities.
- D. Notify utility companies of work to be done.
- E. Cut out soft areas of subgrade not capable of compaction in place. Backfill with heavy gravel and compact to density equal to requirements for subsequent backfill material.
- F. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

DANFORTH ON HIGH – PORTLAND, MAINE

- G. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.04 GENERAL REQUIREMENTS

- A. Refer to Section 02315 Common Excavation, Embankment and Compaction.
- B. Provide trenching and backfilling for water service, sewerage pipes, conduits and structures. Water and sewerage lines separation shall be minimum 10 feet horizontally and 18 inches vertically. Lay all piping in open trench. Maintain access to fire hydrants by fire-fighting equipment.
- C. Excavate trenches of sufficient width for proper installation of the work. When the depth of backfill over sewer pipe exceeds 10 feet, keep the trench below the level of the top of the pipe as narrow as practical.
- D. Sheet and brace trenches and remove water as necessary to fully protect workmen and adjacent facilities, in keeping with local regulations or, in the absence thereof, with the provisions of the "Manual of Accident Prevention in Construction," of the Associated General Contractors of America, Inc. Under no circumstances lay pipe or install appurtenances in water. Keep the trench free from water until pipe joint material has hardened. Sheeting left in place shall be cut off not less than 2 feet below finished grade. Sheeting shall not be removed until the trench is substantially backfilled.
- E. It shall be noted that excavation under this contract shall be unclassified.
- F. Grade the bottom of the trenches evenly to insure uniform bearing for full length of all pipes. Excavate all rock, cemented gravel, old masonry, or other hard material to at least 6 inches below the pipe at all points. Refill such space and all other cuts below grade with sand or fine gravel firmly compacted.
- G. Should soil conditions necessitate special supports for piping and/or appurtenances, including the removal of unsuitable material and refilling with gravel or other material, such work shall be performed as necessary.
- H. Backfill trenches only after piping has been inspected, tested and the locations of pipe and appurtenances have been recorded. Backfill by hand around pipe and for a depth of 1 foot above the pipe. Use earth without rock fragments or large stones and tamps, as specified, in layers not exceeding 6 inches in thickness, taking care not to disturb the pipe or injure the pipe coating. Compact the remainder of the backfill as specified with a rammer of suitable weight, or with an approved mechanical tamper, provided that under pavements, walks and other surfacing, the backfill shall be tamped as specified. Exclude all cinders, rubbish and scrap metal from trenches in which metal pipes are laid. Special care shall be used to properly tamp backfill under lower half of sewer pipe.

DANFORTH ON HIGH – PORTLAND, MAINE

3.05 ELECTRICAL/TELEPHONE

- A. Refer to the Handbook of Standard Requirements for Electric Service and Meter Installation for installation requirements for primary electric service, secondary electric service, telephone service and cable services. Pull ropes shall be installed in all conduits.

3.06 TRENCHING

- A. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored. All excavations shall be consistent with OSHA requirements.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Excavate subsoil required for piping and appurtenances.
- E. Cut trenches wide enough to enable installation and allow inspection of installed utilities.
- F. Hand trim excavations. Remove loose matter.
- G. Remove large stones and other hard matter which could damage piping or impede consistent backfilling or compaction.
- H. Remove excavated material that is unsuitable for re-use from site.
- I. Stockpile excavated material to be re-used in area designated on site. Do not store excavated materials adjacent to excavations where they would surcharge sideslopes.
- J. Correct unauthorized excavation with heavy gravel or as directed by Owner at no cost to Owner.
- K. Fill over-excavated areas under pipe bearing surfaces with heavy gravel or as directed by Owner.
- L. Do not store excavated material adjacent to excavations where they could surcharge sideslopes.
- M. Remove excess excavated material from site.
- N. Surplus Material:
 - 1. Make arrangements to provide suitable disposal areas off-site
 - 2. Deposit and grade material to the satisfaction of the owner of the property on which the material is deposited.
 - 3. Obtain any necessary permits for disposal.

DANFORTH ON HIGH – PORTLAND, MAINE

4. Provide suitable watertight vehicles to haul soft or wet materials over streets or pavements to prevent deposits on same.
5. Keep crosswalks, streets, and pavements clean and free of debris.
6. Clean up materials dropped from vehicles as often as directed by Owner.

3.07 REPAIRS TO EXISTING PIPES, CONDUIT AND WATER LINES

- A. Remove damaged or broken portions of pipe or conduit and replace with a pipe or conduit of the same size and material, unless otherwise directed by Owner, designed to serve same function as existing pipe or conduit.
- B. Make connections for repair with flexible couplings to satisfaction of Owner.
- C. Maintain inventory of suitable repair materials on site.
- D. Make repairs immediately following discovery of damage.
- E. Do not backfill until repairs have been completed to satisfaction of Owner.
- F. Repairs to water mains and services will be by the water utility. Coordination and payment for repairs shall be the responsibility of the Contractor.

3.08 BACKFILLING

- A. Place and compact bedding material to grade of underside of pipe in trench bottom as soon as excavation reaches grade.
- B. Compact bedding material to provide firm laying base.
- C. After pipe is laid to grade, place bedding material uniformly on each side of pipe up to spring line while carefully compacting bedding material under haunches of pipe.
- D. Support pipe and conduit during placement and compaction of bedding fill.
- E. Place and compact base material to grade of underside of appurtenant structures in bottom of excavation as soon as excavation reaches grade.
- F. Compact base material for appurtenant structures to provide a firm laying base.
- G. Place and compact backfill materials in continuous layers not exceeding 8" in areas of paving, slabs-on-grade, and similar construction. Lift thickness not to exceed 16" in lawn or field areas.
- H. Backfill to contours and elevations indicated using unfrozen materials.

DANFORTH ON HIGH – PORTLAND, MAINE

- I. Install geotextile fabric in accordance with manufacturer's recommendations and where shown on Drawings.
- J. Employ a placement method that does not disturb or damage other work or existing pipe.
- K. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- L. Maintain optimum moisture content of fill materials to attain required compaction density.
- M. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- N. Correct areas that are over-excavated.
 - 1. Thrust bearing surfaces: Fill with concrete.
 - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- O. Leave stockpile areas completely free of excess fill materials.
- P. Upon completion of backfilling in paved areas, sweep undisturbed pavement.
- Q. Upon request of Owner implement the following dust control measures during the interim period between backfilling and capping of the trench:
 - 1. Apply water and calcium chloride as directed by Owner.
 - 2. Spread calcium chloride uniformly over designated areas.
 - 3. Apply water with equipment having a tank with pressure pump and nozzle equipped spray bar acceptable to Owner.
- R. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density based upon ASTM D-1557.
 - 2. At other locations: 90 percent of maximum dry density.
- S. Reshape and re-compact fills subjected to vehicular traffic.

3.09 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.10 FIELD QUALITY CONTROL

- A. Perform compaction density testing on compacted fill in accordance with ASTM D1556.
- B. Evaluate results in relation to compaction curve determined by testing uncompacted material

DANFORTH ON HIGH – PORTLAND, MAINE

in accordance with ASTM D 1557 ("modified Proctor").

- C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Frequency of Tests: 1 test for each 200'-0" of trench for the first and every other lift of compacted trench backfill.

3.11 CLEAN-UP

- A. Leave unused materials in a neat, compact stockpile.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 02510

WATER DISTRIBUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and fittings for site water lines including domestic water lines and fire water lines.
- B. Valves and Fire hydrants.

1.02 RELATED SECTIONS

- A. Section 02250 - Dewatering: Dewatering and Water Control.
- B. Section 02317 - Trenching: Bedding and Backfill.
- C. Section 03300 - Cast-in-Place: Concrete for thrust restraints.

1.03 REFERENCES

- A. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water; American Water Works Association; 1995 (ANSI/AWWA C104/A21.4).
- B. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2000 (ANSI/AWWA C111/A21.11).
- C. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; 1996 (ANSI/AWWA C151/A21.51).
- D. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; American Water Works Association; 2001 (ANSI/AWWA C509).
- E. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; American Water Works Association; 1999 (ANSI/AWWA C600).
- F. UL 246 - Hydrants for Fire-Protection Service; Underwriters Laboratories Inc.; 1993.

1.04 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with Portland Water District requirements. The Contractor shall comply with the requirements contained within this section and those contained within the Department's requirements. In the event of conflicting requirements, the more stringent standard shall apply.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Unload materials so as to avoid shock or damage. Handle and store all pipe in such a manner as to avoid deterioration or other injury thereto. Place no pipe within pipe of larger size. Store pipe and fittings on sills above storm drainage level and delivery for laying after trenches are excavated. Valves and hydrants shall be drained and stored to protect them from damage.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Ductile Iron Pipe: AWWA C151:
 - 1. Pipe shall meet requirements of AWWA Standard C-151 (latest revision) and be cement line and seal coated to meet AWWA Standard C-104 (latest revision).
 - 2. Joints shall meet requirements of AWWA C-111 (latest revision).
 - 3. Interior seal coated, bituminous paint oil, cut emulsion not acceptable, thickness, minimum of 2 mils dry film thickness.
 - 4. Exterior bituminous coated with minimum of 2 mils dryfilm thickness
 - 5. Class 52 wall thickness, 4 inch diameter through 12 inch diameter inclusive.
 - 6. State nominal laying length and mark shorter lengths near bell.
 - 7. Mechanical joint pipe to be furnished with gland, gaskets, and Cor-ten bolts and nuts.
 - 8. Push on joint pipe to be supplied with gasket and gasket lubricants (approx. 5 lb. containers).
- B. Ductile Iron Fittings:
 - 1. Material shall be ASTM A536 latest, grade 70-50-05, in accordance with AWWA C153 (latest revision) for fittings 3" through 24".
 - 2. Fittings shall be cement lined AWWA C104 (latest revision).
 - 3. Interior seal coated AWWA C104 with minimum of 4 mils dry film thickness.
 - 4. Exterior bituminous coated with minimum of 2 mils dry film thickness.
 - 5. Mechanical joint with accessories furnished: DI glands, gaskets, Cor-Ten T-bolts and nuts.
 - 6. Class 350 pressure rating in accordance with AWWA C110 - 3" - 24" sizes.
 - 7. The "compact design" fittings must provide adequate space for the MJ joint and accessories to be installed without special tools (i.e. Lowell wrench can be used).

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service " in large letters.
- D. Valve Boxes
 1. Bottom section shall be slide-type with bell-type base.
 2. Top section shall be slide-type. It may have a top flange, but shall not have a "bead" or bottom flange.
 3. The cover shall be a 2" drop-type cover to fit the 7 1/4" opening of the top section.
 4. The intermediate (mid) section shall be slide-type with a minimum 3" belled bottom.
 5. Material shall be cast iron or ductile free from defects.
 6. Interior and exterior of all components shall be bituminous coated with a minimum of 4 mils dry film thickness.
- E. Service Rod Box and Rod
 1. Service box shall be 1.0" Schedule 40 steel pipe with top having 1.0" NPT pipe threads for screw on cover or coupling.
 2. Service box shall be Erie style with 5'6" slide type riser.
 3. Service box cover shall be Quincy type (heavy-duty) cover that screws on E.1 above.
 4. Service box cover shall be tapped with a 1" rope thread with a solid brass plug with pentagon operating head.
 5. Service box foot piece shall be heavy-duty (Ford style or equal) cast iron design.
 6. The large heavy-duty foot piece shall have an arch that will fit over 2" inch ball valve curb stops.
 7. Service rod shall be 36" in length and have a self-aligning design.
 8. Service rod shall be of circular dimension and constructed of 5/8" dia. Min cold rolled steel with an epoxy coating (minimum 4 mil D.F.T.) or 1/2" dia. Min. #304 stainless steel.
 9. Service rod shall have a yoke design that is and integral part of the rod.
 10. The curb-stop attachment pin shall be a brass cotter pin.
 11. The rod "wrench flat" shall have a minimum thickness of 1/4" tapered to 1/16" and a width of 5/8" or 1/2".
- F. Gate Valves:
 1. Shall be USP Metroseal, Waterous Series 500 (AFC), Mueller A-2360, American AVK or Clow F6100 Series.

2.02 THRUST BLOCKS

- A. Blocks shall be concrete of a mix not leaner than 1:2 -1/2:5 cement:sand:stone, and shall have a compressive strength of not less than 3,000 psi at 28 days. Concrete for thrust blocks shall be placed against undisturbed earth.
- B. Bedding: As specified in Section 02317.
- C. Cover: As specified in Section 02317.

DANFORTH ON HIGH – PORTLAND, MAINE

2.03 ACCESSORIES

- A. Concrete for Thrust Restraints: Concrete type specified in Section 03300.

PART 3 EXECUTION

3.01 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.02 TRENCHING

- A. See Sections 02315 and 02317 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

- A. Service line from existing main shall be furnished and installed to serve the project. The project contract work shall begin at indicated public water supply line and shall include all water lines, valves, fire hydrant and appurtenances as shown on the drawings, except as indicated otherwise.
- B. Pipe-Laying - General:
 - 1. The interior of all pipe shall be clean and joint surfaces wiped clean and dry before the pipe is lowered into trench. Lower each pipe, fitting and valve into the trench carefully and lay true to line and without objectionable breaks in grade. The depth of cover below finished grade shall be not less than 5'-0" and the standard cover shall be 6'-0".
 - 2. Provide uniform bearing for all pipe in trenches. Do not allow trench water or dirt to enter the pipe after laying. Insert a watertight plug in the open end of the piping while laying of pipe is not in progress.
 - 3. Do not lay pipe closer than 10 feet to a sewer. At cross-overs with sewers, no joint in the water line shall be closer than 6 feet from the cross- over point. A minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer shall be maintained when the water main is either above or below the sewer. Provide valves, plugs or caps, as required, where pipe ends are left for future connections.
- C. All pipe shall be laid with standard provisions for expansion and contraction and in

DANFORTH ON HIGH – PORTLAND, MAINE

accordance with manufacturer's recommendations. All pipe with slip type joints shall be restrained at elbows and tees by thrust blocks or rods and clamps.

- D. Install suitable fittings at all changes in direction, dead ends and branch connections, provided that double strap saddles, in lieu of tees, may be used for service taps.
- E. Before setting each valve, make sure that the interior is clean, and test opening and closing. Set valves and stops with stems plumb and at the exact location shown. Provide brick laid flat, or other similar foot-pieces, under each curb box. Valve and service boxes shall be plumb, with tops at finished grade.
- F. Maintain separation of water main from sewer piping in accordance with applicable code.
- G. Install ductile iron piping and fittings to AWWA C600.
- H. Route pipe in straight line.
- I. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- J. Slope water pipe and position drains at low points.

3.04 INSTALLATION - VALVES AND HYDRANTS

- A. Set valves on solid bearing.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.

3.05 FIELD QUALITY CONTROL

- A. Pressure test water mains in accordance with the requirements of the Portland Water District.
- B. Disinfect water mains in accordance with the requirements of the Portland Water District.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.06 ATTACHMENTS

- A. Portland Water District - Construction Handbook

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 02525

CURBS AND SIDEWALKS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete, Paver, Brick or Bituminous Sidewalks.
- B. Granite Curb.
- C. Bituminous Curb (Not in Contract).
- D. Concrete Curb (Not in Contract).
- E. Exterior Plaza Areas or Special Materials for Walks.
- F. Detectable Warning Pavers set on sand leveling course over bituminous asphalt layer.

1.02 RELATED SECTIONS

- A. Section 02230 - Site Clearing
- B. Section 02315 – Excavation
- C. Section 02741 – Bituminous Concrete Paving
- D. Maine Department of Transportation Standard Specifications, Current Edition
- E. Construction Documents.

1.03 SECTION EXCLUDES STRUCTURAL SLABS AT ENTRANCES – VACANT

1.04 REFERENCES

- A. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
- B. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural construction.
- C. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- D. ASTM C33 - Concrete Aggregates.

DANFORTH ON HIGH – PORTLAND, MAINE

- E. ASTM C94 - Ready Mix Concrete.
- F. ASTM C150 - Portland Cement
- G. ASTM C260 - Air-Entraining Admixtures for Concrete.
- H. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- I. ASTM C494 - Chemical Admixtures for Concrete.
- J. FA TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.
- K. MDOT and New Hampshire specifications for Highway and Bridge construction, current edition.

1.05 PERFORMANCE REQUIREMENTS

- A. Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

1.06 SUBMITTALS

- A. Product Data: For materials other than water and aggregates.
- B. Samples for unit pavers.

1.07 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or build on frozen subgrade or setting beds.
- B. Weather Limitations for Bituminous Setting Bed: Install bituminous setting bed only when ambient temperature is above 40 deg F (4 deg C) and when base is dry.
- C. Weather Limitations for Mortar and Grout:
 - 1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.

DANFORTH ON HIGH – PORTLAND, MAINE

PART 2 PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with non-staining type coating that will not discolor or deface surface of concrete.
- B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM 185. Furnish in flat sheets, not rolls, unless otherwise acceptable to Owner.
- C. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required. Any concrete outside of the building and not a structural slab shall be part of the Sitework for the project.
- D. Joint Fillers: Resilient pre-molded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.
- E. Joint Sealers: Non-priming, pourable, self-leveling polyurethane. Acceptable sealants are Sonneborn "Sonolastic Paving Joint Sealant", Sonneborn "Sonomeric CT 1 Sealant", Sonneborn "Sonomeric CT 2 Sealant", Mameco "Vulken 45", or Woodmont Products "Chem-Caulk".
- F. Granite Curb: All curb shall be of granite mined and cut in the United States of America. Type 1 granite headstones shall be used at all catch basin inlets. Granite at all ADA ramps shall be Type 1.
- G. Bituminous Curb shall be used where required on the Contract Drawings and shall be installed in accordance with Section 609 of the MDOT specifications. Fiberglass resin shall be used in all curb. Coatings pursuant to MDOT specifications (seal coat) shall be provided for all bituminous curb.
- H. Aggregates subbase gravels and base gravels (if appropriate) for sidewalks shall meet the requirements of Section 02741 of these specifications.
- I. Asphaltic concrete pavement for sidewalks shall meet the requirements of Section 02741 of these specifications.
- J. Aggregate Base: Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.
 - 1. Material shall conform to MDOT Specifications Section 703.06, "Aggregate for Base" Type A gravel.

DANFORTH ON HIGH – PORTLAND, MAINE

K. Sand:

1. Sand for setting bed and for between pavers shall be a clean, washed river or bank sand conforming to ASTM C 144.
2. Sand shall be supplied by a single source. Source of supply shall not be changed during course of project without written permission of the Engineer.

L. Bituminous Setting Bed:

1. Asphalt cement to be used in the bituminous setting bed shall conform to ASTM D 3381. Viscosity grade shall be A.C. 10 or A.C. 20.
2. Fine aggregate to be used in the bituminous setting bed shall be clean, hard sand with durable particles and free from adherent coating, lumps of clay, alkali salts, and organic matter. Aggregate shall be uniformly graded from "coarse" to "fine" with 100% by weight passing the No. 4 sieve and shall meet the gradation requirements when tested in accordance with ASTM C 136.
3. Fine aggregate shall be dried and shall be combined with hot asphalt cement, and the mix shall be heated to approximately 300° F. at an asphalt plant. The approximate proportion of materials shall be 7% cement asphalt and 93% fine aggregate. Each tone of material shall be apportioned by weight in the approximate ratio of 145 lb. Asphalt to 1,855 lb. Sand. The Contractor shall determine the exact proportions to produce the best possible mixture for construction of the bituminous setting bed to meet specified requirements.

M. Concrete Pavers: Pavers shall be of a color selected by the Owner and, where necessary, comply with the ADA requirements for tactile warning strips.

1. Pavers shall have an average compressive strength of 5000 psi.
2. Water absorption shall be less than 5%.
3. No weight loss or visual signs of deterioration after 50 cycles of freeze-thaw, or three-day application of rock salt (wet).
4. Allowable tolerance shall be plus or minus 1/16 in. any direction.

N. Joint Mortar: Dry set mortar for header courses shall conform to ASTM C 270, Type M.

O. Edging – Edge Restraints: Use approved edge restrains where pavement or concrete does not abut the pavers.

P. Water: Water shall be potable and shall be free of injurious contaminants.

Q. Catalog cuts and information on the curb supplier shall be submitted to the Engineer for approval prior to ordering the material.

2.02 BRICK MATERIALS

A. Materials:

DANFORTH ON HIGH – PORTLAND, MAINE

1. Materials shall conform to the requirements of the various subsections of the specifications listed below:
 - a. New Brick: Conform to the various subsections of the specifications listed below:

Brick – Brick shall conform to requirements of ASTM Standard Specifications for Building Brick (made of clay or shale) Designation C62-66 for Grade SW with the following modifications:

 1. The absorption limits shall be less than 8 percent for the average of 5 bricks.
 2. The compressive strength shall not be less than 8000 pounds per square inch (psi).
 3. The modulus of rupture shall not be less than 1000 pounds per square inch (psi).
 4. The bricks shall be No. 1, wire cut type for paving.
 - b. Bricks shall be Pinehall/Pathway 4x8 Lachance Item #193623 as distributed by Morin Brick of Auburn, Maine. Prior to ordering the brick, samples shall be submitted in whole strips to show color range.

2.03 CLAY DETECTABLE WARNING PAVERS (Not in Contract)

- A. Material: Clay detectable warning pavers with detectable warning surface with dome configuration that complies with ADA requirements.
- B. Manufacturers: Subject to compliance with requirements, provide products by :
 1. Whitacre – Greer – www.wgpaver.com
 2. Pavestone, or approved equal
- C. Size: 4 inches x 2 ¼ inches
- D. Color: Yellow or Maize

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- B. Cut unit pavers with motor-driven masonry saw equipment to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.
 1. Smallest acceptable cut stone dimension: 8 inches
 2. Smallest claypaver dimension: 2 inches.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Joint Pattern: Running bond.
- D. Tolerances: Do not exceed 1/16-inch (1.6-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches (3 mm in 600 mm) and] 1/4 inch in 10 feet (6 mm in 3 m) from level, or indicated slope, for finished surface of paving.
- E. Expansion and Control Joints: Provide for sealant-filled joints at building foundation and against concrete slabs or foundation. Provide compressible foam filler as backing for sealant-filled joints as necessary. Install joint filler before setting pavers. Sealant materials and installation are specified in Division 07 Section "Joint Sealants." Make top of joint filler flush with top of pavers.
- F. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

3.02 PREPARATION FOR SIDEWALKS

- A. Prepare subgrade to receive sidewalk subbase gravel in accordance with Section 02741.
- B. Place and compact subbase and base gravel in accordance with Section 02315 of these specifications.
- C. Proof-roll prepared base material surface to check for unstable areas. The paving work shall begin after the unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.
- D. Surface Preparation: Remove loose material from compacted base material surface immediately before placing concrete.

3.03 CONCRETE PAVERS (Detectable Warning Pavers)(Not in Contract)

- A. Acceptability of base:
 - 1. Contractor shall examine the aggregate and bituminous base to determine its adequacy to support concrete pavers. Evidence of inadequate base shall be brought to the immediate attention to the Engineer.
 - 2. Start of work of this Section shall constitute acceptance of the aggregate and bituminous base.
- B. Aggregate Base Course: Aggregate material for base beneath concrete pavers shall be to the depth indicated on the Drawings. Base shall be compacted to 95% of the maximum dry density at optimum moisture content, as determined by ASTM D 1557.
- C. Bituminous Setting Bed:
 - 1. Bituminous setting bed shall be installed over the aggregate base. Control bars ¾ inc. deep shall be placed directly over the base. If grades must be adjusted, wood chocks under depth control bars shall be set to proper grade. Set two bars parallel to each other

DANFORTH ON HIGH – PORTLAND, MAINE

to serve as guides for the striking board. The depth control bars must be set carefully to bring the pavers, when laid, to proper grade.

2. While still hot (not less than 250°F) some of the bituminous bed material shall be placed between the parallel depth control bars. This bed shall be pulled with the striking board over the control bars several times. After each passage, low porous spots shall be showered with fresh bituminous material to produce a smooth, firm, and even setting bed. As soon as this initial panel is completed, advance the first bar to the next position in readiness for striking the next panel. After the depth control bars and wood chocks have been removed, carefully fill any depressions that remain.
3. The setting bed shall be rolled with a power roller to a nominal depth of $\frac{3}{4}$ in., while still hot. The thickness shall be adjusted so that when the bricks are placed and rolled, the top surface of the pavers will be at the required finished grade.

D. Sand Setting Bed:

1. Sand shall be spread over bituminous base course as a setting bed for pavers. Sand shall be spread and leveled to require slope and grade. Minimum thickness of sand shall be 1 in. after leveling. Bed shall not be compacted until pavers are installed.
2. Surface tolerance shall be within $\frac{1}{4}$ in. of required grade as measured with a 10 ft. straightedge in both the transverse and longitudinal directions.

E. Setting Concrete Pavers:

1. Setting bed shall be protected from damage prior to setting pavers.
2. Setting shall be done by competent workmen under adequate supervision, and in accordance with manufacturer's recommendations. Pavers shall be placed on the setting bed, to true line and plane and in required position. Surface edge of one paver shall be level with the next adjacent pavers so that no voids, rocking motions, or tripping hazards are encountered. Edge to edge arris shall not exceed 1/16 in.
3. Pavers with chips, cracks, or other structural or aesthetic defects shall not be used.
4. Pavers shall be set true to the required lines and grades in the pattern detailed on the Drawings. Pavers shall be tightly butted. Joints between pavers shall be uniform and shall not exceed 1/8 in.
5. After a sufficient area of pavers has been installed, joints of pavers shall be filled by sweeping stone dust into the joints. When joints are filled, paver surfaces shall be swept clean of stone dust.
6. Where required, pavers shall be accurately cut with a masonry or concrete saw. Cut edges shall be plumb and straight. Scoring and breaking will not be acceptable.
7. Completed surface shall be compacted by running a medium plate vibrator across the top of the pavers. Additional stone dust material shall be swept in the joints during vibration to completely fill joint space.
8. When joints are filled, paver surfaces shall be swept clean of excess stone dust. Swept surfaces shall then be thoroughly dampened with a low-volume fine spray of water.

DANFORTH ON HIGH – PORTLAND, MAINE

F. Joint Treatment:

1. Header Courses: Dry set mortar shall be installed in the joints of header courses.
2. Remainder of Joints: On a dry day, after pavers have been installed, joints of pavers shall be filled by sweeping dry sand into the joints. When joints are filled, paver surfaces shall be swept clean, and hosed down with low-volume fine spray of water.

- ### **G. Cleaning of Paved Surface:** After completion of concrete pavers, paved areas shall be thoroughly swept clean and surface shall be left unsoiled. Where required, surface shall be cleaned with water or an approved cleaner.

3.04 INSTALLATION OF GRANITE CURB

- #### **A.** Granite curbing will be installed and backfilled in accordance with provisions of Paragraph 3.06. If Type 5 sloped curb configuration is used, the curb shall be set on a slope as shown on the plans. All granite curb used to form a radius and any granite curb of any type with stone length of less than 36" shall be backfilled with lean concrete to a level equal to the binder pavement surface in front of the curb and a level equal to 3" below finish grade behind the curb.
- #### **B.** Protect the granite curb from damage throughout construction and until substantial completion.

3.05 BITUMINOUS CURB (Not in Contract)

- #### **A.** Bituminous curb shall be installed on the bituminous pavement base course prior to placement of final bituminous pavement wearing course. The curb shall be backfilled with approved materials. That shall be placed in layers not exceeding 8 inches in depth, loose measure and thoroughly tamped.
- #### **B.** Bituminous curb shall be seal coated after placement in accordance with MDOT Standard Highway specifications.

3.06 HOT BITUMINOUS CONCRETE SIDEWALKS (Not in Contract)

- #### **A.** Bituminous concrete pavement for sidewalks shall be placed in two lifts to provide the total thickness specified on the drawings.
- #### **B.** Compaction shall be by a paver roller having a minimum total weight of 2,000 lb. with a minimum of 65 lbs. per inch of drive roll or by satisfactory vibratory equipment.
- #### **C.** Placement and quality control shall comply with Section 02741 of these specifications.

3.07 BRICK SIDEWALK INSTALLATION

- #### **A.** Description: This work shall consist of the construction of brick sidewalks and driveways on bituminous concrete base in accordance with these specifications and the City of Portland

DANFORTH ON HIGH – PORTLAND, MAINE

Technical Standards and in reasonably close conformity with the lines and grades as shown on the plans.

1. Subgrade: The subgrade for the sidewalks and driveways shall be shaped parallel to the proposed surface of the walks and drives and shall be thoroughly compacted. All depressions occurring shall be filled with a suitable material and again compacted until the surface is smooth and hard.
2. Foundation: After the subgrade has been prepared, a foundation of crushed gravel shall be placed upon it. After being thoroughly compacted, the foundation shall have a thickness as shown on the plans and typical details and shall be parallel to the proposed surface of the work.
3. Bituminous Base: A layer of hot bituminous pavement grading "B" shall be spread upon the properly prepared crushed gravel. After being thoroughly compacted, the bituminous base course shall have a minimum thickness of two inches (2") and shall be parallel to the proposed finish grade.
4. Sand-Cement Base: A layer of sand-cement base course material one inch (1") in thickness shall be spread upon the properly prepared bituminous base course. The course shall be thoroughly compacted and present a hard smooth surface parallel to the proposed finished slope and grade of the walks and drives. The ratio shall be six (6) part of washed mortar sand to one (1) part portland cement.
5. Brick Placement: After the sand base course has been properly prepared, the brick shall be placed in the pattern shown on the plans and typical details. The brick shall be placed as closely together as possible and the sand joints between the brick shall be no wider than that allowed by the natural texture of the brick itself. NO OPEN JOINTS WILL BE ALLOWED. Brick shall be saw cut to fit spaces requiring less than a whole brick. No cut brick shall be less than two inches (2") in length. A journeyman brick mason shall supervise all brick placement.

After the bricks are carefully set upon the properly prepared sand-cement base, a plank or heavy sheet of plywood covering several courses of brick shall be placed upon the bricks and carefully rammed with a heavy hammer until the bricks reach a firm, unyielding bed and present a surface of the proper slope and grade. Any divergence from line and grade shall be corrected by taking up and relaying the bricks. After the ramming of the bricks, a sufficient amount of sand-cement shall be spread over the surface and thoroughly swept or raked so as to fill the joints. All surplus sand-cement remaining on the sidewalk and driveway after the joints have been properly filled, shall be carefully removed by sweeping. Care shall be taken to avoid raking out the joints during removal of excess sand-cement. A final application of sand only shall be spread on the sidewalk. The application of sand shall then be removed by sweeping while the aforementioned precautions are being exercised.

A 12" wide bituminous strip shall be placed at the gutter line and at the back edge of the brick driveway as a transition between the brick and adjoining surfaces.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 02535

SANITARY SEWER PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary sewerage drainage piping, fittings, and accessories.

1.02 RELATED SECTIONS

- A. Section 02315 -Common Excavation Embankment and Compaction.
- B. Section 02317 - Trenching.
- C. Section 02640 - Manholes and Covers.

1.03 REFERENCES

- A. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2000.
- B. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 1996a.
- C. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2000.

1.04 SUBMITTALS

- A. Product Data: Provide data indicating pipe, pipe accessories.

1.05 REGULATORY REQUIREMENTS

- A. Perform work in accordance with the Portland Public Services Department.
- B. Perform work in accordance with the City of Portland Rules and Regulations for Excavation Activity within the Public Right of Way.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

- A. Plastic Pipe - gravity service: ASTM D 3034, Type PSM, Poly(Vinyl Chloride) (PVC) material

DANFORTH ON HIGH – PORTLAND, MAINE

- rated SDR 35; inside nominal diameter of 8 inches, bell and spigot style solvent sealed joint end.
- B. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM classification.
 - C. Pipe joints shall be integrally molded bell ends in accordance with ASTM D-3034 Table 2, with factory supplied elastomeric gaskets and lubricant.
 - D. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

PART 3 EXECUTION

3.01 TRENCHING

- A. See Section 02317 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPE

- A. Make all required connections to existing sewers. Carry out such work in accordance with local standards. Observe care to prevent debris from entering sewers. Check the invert elevations of existing sewers to which connections are to be made, and if appreciable difference from elevations noted on the drawings, or if they involve any difficulty in obtaining necessary drainage, notify the Engineer immediately so that appropriate corrective action may be taken.
- B. Commence at the lowest point in the system and lay the pipe with the bell-end up grade. Test pipe for soundness and clean interior and joint surfaces before lowering the pipe into the trench. Lay pipe in straight lines and on uniform grades between points where changes in alignment or grade are shown. Bed the pipe barrel uniformly.
- C. Comply fully with manufacturer's instructions for sewer pipe jointing, using sealing or lubricating compound as supplied by the manufacturer, and apply proper pressure to seal the spigot in the bell.
- D. As soon as the joint material has set, pack fine earth carefully around the joints, and around and over the pipe. Carry this backfill operation to a depth of at least 12 inches above the top of the pipe. Care shall be used in tamping backfill under lower parts of the pipe to give proper support, especially in shallow trenches.
- E. Flush all sanitary sewers, including building connections, with water in sufficient volume to

DANFORTH ON HIGH – PORTLAND, MAINE

- obtain free flow through each line. Remove any obstructions and correct any defects discovered.
- F. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
 - G. Install pipe, fittings, and accessories in accordance with ASTM D 2321 and manufacturer's instructions. Seal joints watertight.
 - H. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with the requirements of the servicing utility.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.04 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 02635

STORM DRAINAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Storm drainage piping, fittings, and accessories.

1.02 RELATED SECTIONS

- A. Section 02250 - Dewatering.
- B. Section 02315 - Common Excavation, Embankment and Compaction
- C. Section 02317 - Trenching.
- D. Section 02640 - Manholes and Covers.

1.03 REFERENCES

- A. ASTM C 76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2000.
- B. ASTM C 443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets; 1998.
- C. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 1999.
- D. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2000.
- E. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 1996a.
- F. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2000.

1.04 SUBMITTALS

- A. Product Data: Provide data indicating pipe, pipe accessories.
- B. Project Record Documents:

DANFORTH ON HIGH – PORTLAND, MAINE

1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 PROJECT CONDITIONS

- A. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to foundation drainage system.

PART 2 PRODUCTS

2.01 STORM DRAIN PIPE MATERIALS

- A. Reinforced Concrete Pipe: ANSI/ASTM C76, IV, with modified tongue-and-groove compression gasket joints complying with ANSI/ASTM C443.
- B. Reinforced Concrete Pipe Joint Device: ASTM C 443 (ASTM C 443M), rubber compression gasket joint.
- C. Corrugated Polyethylene Pipe (PE): Pipe complying with AASHTO M294 and MP7, and ASTM D3550. Interior of pipes shall be smooth, and shall have an "n" value of not less than 0.010. Pipes shall be joined with gasketed bell and spigot joints complying with ASSHTO M252 and M294. Gaskets shall comply with ASTM F477 and ASTM D1149. Provide minimum coverage per manufacturer's specifications.
 1. Acceptable Manufacturers of Corrugated Polyethylene Pipe: Hancor "Sure Lok", or Equal.
- D. Plastic Pipe: ASTM D 3034, Type PSM, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of specified inches, bell and spigot style solvent sealed joint end.

2.02 PIPE ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

PART 3 EXECUTION

3.01 TRENCHING

- A. See Section 02317 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

DANFORTH ON HIGH – PORTLAND, MAINE

3.02 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
- C. Install pipe, fittings, and accessories in accordance with ASTM D 2321 and manufacturer's instructions. Seal joints watertight.
- D. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance requirements of local authorities having jurisdiction.

3.04 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 02640

MANHOLES AND COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.
- B. Modular precast catch basins with frames and grates.
- C. Modular precast concrete electric handholds and telephone manholes, with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.
- D. Precast concrete grease trap

1.02 RELATED SECTIONS

- A. Section 02250 - Dewatering
- B. Section 02317 - Common Excavation, Embankment, and Compaction.
- C. Section 02535 - Sanitary Sewer Piping.
- D. Section 04810 - Unit Masonry Assemblies: Masonry units.
- E. Section 02635 - Storm Drainage Piping.

1.03 REFERENCES

- A. ASTM C 478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 1997.
- B. ASTM C 478M - Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric); 1997.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.
- B. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

DANFORTH ON HIGH – PORTLAND, MAINE

1.05 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Manhole and Catch Basin Sections: Reinforced precast concrete in accordance with ASTM C 478 (ASTM C 478M), with gaskets in accordance with ASTM C 923 (ASTM C 923M).
 - 1. Use concrete that will attain a 28-day compressive strength of not less than 4,000 psi.
 - 2. Reinforcing: H-20 loading.
 - 3. Horizontal Joints:
 - a. Tongue and Groove formed of concrete to receive a flexible plastic gasket.
 - b. Joints to be watertight.
 - c. Cast to allow installation to be vertical and in true alignment.
 - 4. Provide two tapered lifting holes 180 degrees apart in each section for handling and placing.
 - 5. Base Section: Cast holes for pipes to provide invert elevations as required by Drawings.
 - 6. Pipe to Structure Joints:
 - a. Flexible sleeves, rubber quality, ASTM C-443 and C361 cast into base.
 - b. If pre-manufactured adaptor cannot be installed, use rubber concrete adaptor designed to provide a watertight seal between pipe and structure.
- B. Mortar and Grout: As specified in Section 04810, Type S.
- C. Concrete Masonry Units: ANSI/ASTM C139.
- D. Manhole Brick: ANSI/ASTM C32, Grade MS.
- E. Sewer Brick: ANSI/ASTM C32, Grade SS.
- F. Masonry Mortar: ANSI/ASTM C270, Type M.
- G. Manhole Frames and Covers: Grey cast iron, ANSI/ASTM A 48, Class 30 B.
 - 1. Comply with requirements of FS RR-F-621 for type and style indicated.
 - 2. Furnish covers with cast-in legend on roadway face as indicated.
- H. Manhole Steps: Grey cast iron, ANSI/ASTM A 48, Class 30B, integrally cast into manhole sidewalls, unless otherwise indicated.
- I. Catch Basin Frames and Gratings: Grey cast iron, ANSI/ASTM A 48, Class 30 B.
 - 1. Comply with requirements of FS RR-F-621, for type and style required.
- J. Other Precast Structures:

DANFORTH ON HIGH – PORTLAND, MAINE

1. Use concrete that will attain a 28-day compressive strength of not less than 4,000 psi.
2. Manufactured in accordance with ASTM C-478.
3. Reinforcing: H-20 loading.
4. Horizontal Joints:
 - a. Tongue and groove formed of concrete to receive a flexible plastic gasket.
 - b. Joints to be watertight.
 - c. Cast to allow installation to be vertical and in true alignment
5. Pipe to Structure Joints:
 - a. Flexible sleeves, rubber quality, ASTM C-433 and C-361 cast into base.
 - b. If pre-manufactured adaptor cannot be installed, use rubber-concrete adaptor designed to provide a watertight seal between pipe and structure.

2.02 ELECTRIC HANDHOLDS AND TELEPHONE MANHOLES - DIVISION 16

- A. Electric handholds shall comply with the requirements of Central Maine Power.
- B. Telephone manholes shall comply with the requirements of Fairpoint Communications, Inc.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for manholes is correct.

3.02 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 PRECAST CONCRETE STRUCTURES

- A. Precast Concrete Structures: Place precast concrete sections as shown on drawings. Where structures occur in pavement, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.
 1. Use epoxy bonding compound where manhole steps are mortared into structure walls
 2. Provide rubber joint gasket complying with ASTM C443.
 3. Place base section level on 12 inch layer of crushed stone.
 4. Fix inlet and outlet stubs into sleeves with stainless steel pipe clamp.
 5. Place barrel sections, cones or tops of the appropriate combination of heights to meet grades required by Drawings or existing conditions.
 6. Seal horizontal joints as recommended by manufacturer.
 7. Apply lubricant to inside tongue and rubber gaskets immediately prior to joining

DANFORTH ON HIGH – PORTLAND, MAINE

sections.

8. Fill lifting holes with non-shrink mortar.
9. Place frame and grate on top or otherwise prevent accidental entry by unauthorized persons until ready for adjustment to grade.
10. Repair damaged coating of frames and covers with coat-tar-pitch varnish.

3.04 MASONRY WORK

- A. Laying Brick:
 1. Use clean bricks.
 2. Lay brick by methods consistent with the trade acceptable to Owner
 3. Lay in a full bed of mortar and joint without subsequent grouting, flushing, or filling, and thoroughly bond.
 4. Bring casting rim to grade with brick and coat outside with mortar; minimum thickness 3/8 inch with troweled waterproof surface.

3.05 ELECTRIC HANDHOLDS AND TELEPHONE MANHOLES

- A. Electric handholds shall be installed in accordance with the requirements of Central Maine Power.
- B. Telephone manholes shall be installed in accordance with the requirements of Fairpoint Communications, Inc.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 02741

BITUMINOUS CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hot bituminous concrete paving.
- B. Granite Curb.
- C. Surface sealer.

1.02 RELATED SECTIONS

- A. Section 02315 - Common Excavation, Embankment and Compaction.
- B. Section 02317 - Trenching.

1.03 REFERENCES

- A. State of Maine Department of Transportation Standard Specifications Highways and Bridges, latest revision, hereafter designated as MDOT Specifications.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with MDOT Section 403.
- B. Mixing Plant: Conform to MDOT Section 401.
- C. Obtain materials from same source throughout.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for paving work on public property.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Weather and seasonal limitations as required by MDOT Section 401.07 shall apply to this Section.

1.07 TESTS

- A. Submit proposed mix design of each class of mix for review prior to commencement of work.

DANFORTH ON HIGH – PORTLAND, MAINE

PART 2 PRODUCTS

2.01 MATERIALS

- A. Asphalt Cement: MDOT Section 702.
- B. Hot Bituminous Pavement: MDOT Section 401.02 through 401.06.
- C. Mineral Filler: MDOT Section 703.
- D. Emulsified Bituminous Sealing Compound: MDOT Section 702.12
- E. Granite Curb: MDOT Section 712.04. City of Portland
- F. Joint Mortar: MDOT Section 705.02
- G. Tack Coat: Emulsified asphalt for tack coat shall conform to MDOT Section 702.
- H. Bituminous Curb
- I. Pavement Stripping: MDOT Section 708.03, Type N glass beads conforming to AS HTO M 247 Type I.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Beginning of installation means acceptance of substrate.

3.02 PREPARATION AND PLACEMENT

- A. Place tack coat on swept surfaces as noted on Drawings.
- B. Prepare and place plant mix hot bituminous pavement in accordance with MDOT Sections 301 and 401.

3.03 CURBS

- A. Granite Curb: Conform to the requirements of MDOT Section 609.06 and the City of Portland Technical and Design Standards. In the event of conflicting requirements, the more stringent standard shall apply.

DANFORTH ON HIGH – PORTLAND, MAINE

3.04 SEAL COAT

- A. Apply seal coat to surface course in accordance with MDOT Section 609.06.

3.05 TOLERANCES

- A. Flatness: Conform to requirements of MDOT Section 401.20.
- B. Compacted Thickness: Conform to requirements of MDOT Section 401.17.
- C. Variation from True Elevation: Conform to requirements of MDOT Section 403.

3.06 FIELD QUALITY CONTROL

- A. Provide field inspection and testing. Take samples and perform tests in accordance with MDOT and the City of Portland Specifications.

3.07 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 5 days.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 02950

PLANTING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 WORK INCLUDED

- A. Perform all work required to complete the work of the Section, as indicated. Such work includes, but is not limited to, the following:
 - 1. Installation of construction fencing for the protection of existing trees within property boundaries, as required.
 - 2. Planting of trees, shrubs, vines, groundcover and herbaceous materials.
 - 3. Application of fertilizer and soil amendments to support the health and growth of trees, shrubs, vines, groundcovers, perennials, and ornamental grasses.
 - 4. Installation, adjustment and removal of tree stakes and guying.
 - 5. Maintenance of plantings, including watering.
 - 6. One year Guarantee of plantings.

1.3 RELATED WORK

- A. Section 02970 – Structural Soil Mix

1.4 QUALITY ASSURANCE

- A. All plant materials shall be true to name according to "Standardized Plant Names", published by the American Joint Committee on Horticulture Nomenclature, latest edition. Each plant or bundle shall be tagged with the name and size of plants in accordance with the standards of the American Landscape and Nursery Association (ALNA). In all cases, botanical names shall take precedence over common names.
- B. Quality and size shall conform to the "American Standard for Nursery Stock", latest edition, for number one grade nursery stock as adopted by the ANLA.
- C. All plants and plant materials shall comply with all Federal, State, regional and local laws and regulations requiring inspection for plant disease and insect control.

DANFORTH ON HIGH – PORTLAND, MAINE

1.5 PRODUCT HANDLING

A. Delivery and Storage:

1. Deliver all items to the job site in their original containers with all labels intact and legible at time of Landscape Architect's inspection.
2. Immediately remove from the site all plants which are not true to name or damaged and all materials which do not comply with the specified requirements.
3. Use all means necessary including wood construction fences to protect plant materials before, during, and after installation and to protect the work and materials of all other trades.
4. Replacements: in the event of damage, immediately make all repairs and replacements necessary to the approval of the Landscape Architect and at no additional cost to the Owner.
5. Nursery plant identification tags shall remain on plants until final acceptance of plant material.

1.6 JOB CONDITIONS

- A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as compacted soils, rubble fill, adverse drainage conditions, clay or obstructions, notify the Landscape Architect immediately for direction. Do not proceed with planting until direction has been given by the Landscape Architect.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Topsoil used in the Planting Soil Mix and plant beds shall meet the requirements of topsoil in Lawns and Topsoiling section.
- B. Manure - well rotted, unleached, cattle manure, reasonably free of wood shavings, sawdust or other litter and no chemicals or other ingredients harmful to plants. Dehydrated manure (Bovung or equal) is acceptable.
- C. Fertilizer – Fertilizer shall be a slow-release product. All plants shall be fertilized with a controlled release 16-8-16 analysis fertilizer contained in polyethylene perforated bags with micropore holes. The bag shall contain 4 ounces minimum of water soluble fertilizer to be effective for 8 years. Pills, spikes, tablets and injections are not considered controlled release packets.

DANFORTH ON HIGH – PORTLAND, MAINE

1. Fertilizer shall contain not less than the following percentages by weight of ingredients, unless the soil analysis indicates a different formulation:

<u>Plant Type</u>	<u>Composition</u> <u>(percentage nitrogen-phosphorous-potash)</u>
Deciduous and evergreen trees:	20-5-5
Deciduous shrubs and evergreen groundcovers:	5-10-5
Ericaceous plants, including rhododendrons and azaleas:	9-6-6
Needled evergreen shrubs:	3-4-3
Perennials:	5-10-10
Ornamental grasses:	3-4-3
Bulbs:	0-12-0 (Bone Meal)

2. Deliver fertilizer to the site in the original unopened containers showing weight, analysis and manufacturer. Store fertilizer in a cool, dry, waterproof place. Submit manufacturers' Certificates of Compliance to the Owner.
 3. All fertilizers shall be approved by the EPA and all applicable state, regional and local agencies, and conform to their most recent standards.
- D. Peat - domestic or imported, of partially decomposed vegetable matter of natural occurrence, brown, clean, low in content of mineral and woody material; mildly acid, granulated or shredded, free from weedy grasses, sedges or rushes.
 - E. Planting Soil Mix - 20 parts topsoil, 4 parts peat moss, and one part well rotted manure or other composted organic material of 7.0 to 6.5 Ph.
 - F. Mulch - aged pine bark consisting of the outer bark of pine trees with minimum hardwood bark. Bark shall be thoroughly mixed and aged in stock piles a minimum of 6 months, partially decomposed, dark brown in color, and generally free of chunks of wood thicker than 1/4". Aged pine bark containing an excess of fine particles or stringy material over two inches will not be acceptable.
 - G. Water – Provide hose and connections and/or water truck for watering all plant materials until completion of the project.
 - H. Tree staking - Hardwood stake, 8' long (min.). Install as detailed on the Drawings.

DANFORTH ON HIGH – PORTLAND, MAINE

- I. Tree protection – 4" by 4" wood posts, 2" by 6" wood rails, free of chemicals.
- J. Wire - pliable No. 12 to 14 gauge galvanized soft steel wire with rubber hose.
- K. Wrapping material - first quality, heavy, waterproof crepe paper manufactured for this purpose; not less than 4" wide. Use only when specified on Drawings.

2.2 PLANT MATERIALS

- A. Provide plants as per Drawings in quantities listed on plant materials list. If there is any discrepancy between quantities listed and plant material graphically shown, notify the Landscape Architect immediately for clarification prior to bidding. Be responsible for quantity of plant material graphically shown on Drawings and as per clarification by Landscape Architect.
- B. Plants shall be nursery grown unless otherwise authorized, and grown under climatic conditions similar to those of the project.
- C. Plants - in accordance with American Standard for Nursery Stock, latest edition, hardy under climatic conditions similar to location of Project, typical of species or variety, normal habit of growth, sound, healthy, vigorous, well-branched with well developed root systems, densely foliated when in leaf, and free of disease, insect pests, eggs, or larvae. All plants shall be freshly dug. No heeled-in plants or plants from cold storage shall be used. All parts of the plant and root ball shall be moist and the plant shall show active green cambium when cut, and shall be free of dead wood, bruises or other root or branch injuries. All plants shall conform to the highest grades and standards adopted by the American Nursery and Landscape Association. Perennials shall conform also to the standards as adopted by the Perennial Plant Association in the Perennial Plant Association Standards - latest edition.
- D. Upon signing contract immediately order and arrange to have the required plant material put on reserve for potential inspection by the Owner and use for the project. Provide proof of reservation to Landscape Architect. At this time if plants of specified kind or size are not available within states of NH, PA, MA, VT, NY, CT, RI or Long Island, issue a written statement to the Landscape Architect listing the unavailable plants. Substitutions may only be made if approved by Landscape Architect.
- E. Plant Dimensions - conform to the American Standard for Nursery Stock, latest edition, as specified. Exceptions as follows:
 - 1. Plants larger than specified may be used if approved by the Landscape Architect at no increase in contract price. Increase the root mass or root ball in proportion to increased size of plant.
 - 2. Undersize plants (10% max.) in any one variety or grade may be used if approved by the Landscape Architect. Provide sufficient plants above size to make average equal to or above specified grade. Undersize plants shall be larger than the average size of next smaller size group.

DANFORTH ON HIGH – PORTLAND, MAINE

- F. Balled and burlapped (B & B) plants - dig with firm natural earth roots. Manufactured or man-made root balls are not acceptable.
- G. Container grown container plants - grown in container long enough for root system to have developed sufficiently to hold its soil together firm and whole. Plants loose in container will not be acceptable. Plants in grow bags shall not be accepted.
- H. Trees shall be a single trunk unless otherwise specified in project plant lists, and growing from a single intact and undamaged crown of roots. No part of the trunk shall be conspicuously crooked as compared with other specimen quality trees of the same variety. The trunk shall be free from sunscald, frost cracks, or wounds resulting from abrasions, fire, or other causes. No pruning wounds shall be present having a diameter of more than 2" and such wounds must show vigorous bark on all edges.
- I. Protect B & B and container plants not planted immediately upon delivery with soil. Prevent voids among roots with careful filling. Do not bind plants with wire or rope so as to damage bark or break branches.
- J. The Landscape Architect reserves the right of inspection and rejection upon delivery at the Site or during progress of work. Remove and replace defective and rejected plants immediately from site.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Prior to any planting operations, provide Owner and Landscape Architect with an inventory of topsoil and a sample survey of test sites for infiltration/percolation, conducted by a licensed Geotechnical Engineer.

3.2 PLANTING OPERATIONS

- A. Planting shall be performed by a licensed and bonded Contractor.
- B. Prior to construction, install a two railed wood fence at canopy drip line of existing trees to remain. Use 4"x4" posts and 2"x6" rails. Landscape Architect must be consulted to approve tree protection.
- C. Antidessicant shall be applied to all plants before digging at the nursery and/or as directed by the Owner or Owner's Representative.
- D. Plants shall be installed only at the following times:
 - 1. Deciduous Trees, Shrubs, and Vines:

DANFORTH ON HIGH – PORTLAND, MAINE

March 21 through May 1 and October 1 through December 1

2. Evergreen Trees, Shrubs, and Groundcovers; Perennials and Ornamental Grasses: April 15 through June 1 and August 15 through October 1
 3. Plants poorly adapted for fall planting shall only be planted during the spring planting season. Trees poorly adapted for fall planting include, but are not limited to, species of Quercus, Platanus, Magnolia, Cercidiphyllum japonica, Prunus, Populus, Liquidambar, Carpinus, Tilia, Salix, Zelkova, Pyrus calleryana, Pinus nigra, Nyssa sylvatica, Liriodendron tulipifera, Crataegus viridis 'Winter King, Cercis canadensis, Betula nigra, and Acer Rubrum 'Armstrong'.
 4. If a replacement is required for a tree known to be poorly adapted for fall planting, planting should take place only during the spring planting period. If such a schedule is unacceptable to the Owner, contact Landscape Architect for planting substitutions. Plant substitutions not authorized by Landscape Architect are unacceptable.
 5. Avoid planting in hot, dry weather and during rain events.
- E. Plant material delivery and planting schedules shall be arranged to minimize storage of plant material at the site. Plants shall be transported to the Site in closed or covered trucks. Tarps used to cover plants shall be made specifically to protect plants in transit, shall be new or in undamaged condition, and shall be secured sufficiently to protect plant material from harm.
- F. Keep plants and root balls sufficiently moist at all times. Store plants awaiting installation in a location with filtered sunlight and out of direct sun exposure. Contractor shall bear sole responsibility for health and security of plants stored at the Site.
- G. Landscape Contractor shall stake all proposed plant material locations for Landscape Architect review. Notify Landscape Architect a minimum of 72 hours prior to installation. Landscape Contractor shall be responsible for locations of installed plant materials.
- H. Trees should be planted when dormant, unless otherwise authorized by the Landscape Architect. Careful attention should be given to weather conditions, such as avoiding planting in hot, dry weather. All other planting may be done whenever weather and soil conditions are favorable and according to plant installation times in Specifications, or as otherwise authorized by the Landscape Architect. Contractor shall monitor moisture of root balls and keep plants sufficiently moist at all times. Store plants awaiting installation in a location with filtered sunlight and out of direct sun exposure. Contractor shall bear sole responsibility for health and security of plants stored on site.
- I. Set plants in center of pits, plumb and straight with the root collar level with finished grade or slightly higher (max 1-1/2") than finished grade as shown on the Drawings.
- J. When B & B plants are set, compact Planting Soil Mix around bases of balls to fill all voids. Cut off and remove burlap, ropes or wires from top 2/3 of balls, tuck and flatten the remaining 1/3 down on the sides before backfilling. Cover all roots with Planting Soil Mix

DANFORTH ON HIGH – PORTLAND, MAINE

(care should be taken not to crush the roots on bare root trees). No burlap shall emerge from the soil or be near the soil surface after the hole is backfilled.

- K. When container plants are set, remove plant from container, make sure root system is in good health and not root bound. Loosen the outside layer of the root system by scoring with a knife. Circling roots pose a serious health hazard to the plant and shall be divided by hand.
- L. Thoroughly compact Planting Soil Mix around roots and thoroughly and deeply water the root zone to the drip line immediately after plant pit is backfilled. Form a watering saucer 6" greater than the diameter of the root ball with a 4" ridge of loam to retain water. Maintain watering saucer throughout growing season. Rake saucer smooth to finish grade before first frost of the year. Cultivate soil in shrub beds, rake smooth and neatly edge after planting.
- M. Distribute controlled release fertilizer packets equidistant within the planting pit adjacent to the root ball but not in direct contact with the roots. Placement depth shall be 6 to 8 inches. Packets shall not be cut, ripped or damaged. Fertilization of stressed trees should include very low, if any nitrogen during the first year. Fertilizer should include humic acids and mycorrhizal spores. Soil tests should be conducted to verify acceptable pH levels.

1. Fertilizer application quantities as follows:

<u>Plant</u>	<u>Size</u>	<u>No. of Packets</u>
Deciduous Trees:	1-3" cal.	3
	4-6" cal.	4
Shrubs:	2-3 ft	2
	over 3 ft	3
Evergreen Trees:	5-10 ft	4
	over 10 ft	5
Vines:	1 gal.	1
Groundcover:		1 per four plants

- N. When specified on the Drawings, wrap all deciduous trees under 2" caliper immediately after planting. Wrap spirally from bottom to top and adequately secure. Overlap wrapping approximately 2" and entirely cover trunk from ground to height of second branch.
- O. Stake trees according to Drawings.
- P. Do not prune plants at the time of planting except to remove broken or crossed branches. Broken or crossed branches shall be pruned with a sharp tool in a manner to retain and encourage the plant's natural growth characteristics. The crown of a young tree should not be cut back to compensate for root loss. Wound paint or dressing shall not be used.

DANFORTH ON HIGH – PORTLAND, MAINE

- Q. Cover all tree and shrub pits immediately after planting with 3" layer of specified mulch unless shown otherwise on the Drawings. Limit of mulch for trees shall be 6" beyond watering saucer; for shrubs in beds, entire area of shrub bed unless otherwise specified on Drawings.
- R. Keep mulch 3" away from the trunk.
- S. Furnish plans showing locations of underground utilities encountered, as required.

3.3 MAINTENANCE - PLANTING

A. Planting Maintenance

1. Maintenance shall begin immediately after each plant is installed and shall continue until final acceptance of all planting.
2. Maintenance shall consist of keeping plants in a healthy growing condition and shall include but is not limited to watering, weeding, cultivating, applying mulch as needed, tightening and repairing of guys, removal of dead material, resetting plants to proper grades or upright position, and maintaining the watering saucer. Maintenance shall include the following:
 - a. Plants shall be inspected for watering needs at least twice each week and watered as necessary to promote plant growth and vitality. During dry periods, the Contractor shall water plants deeply at least once weekly. **Irrigation is not provided on this project site.**
 - b. When staking is called for, stakes shall be kept plumb and neat in appearance. Guys, wires and anchoring cables shall be tightened and repaired weekly. The Contractor shall be responsible for removing staking and guying materials one year after planting.
 - c. Any plant of a species not shown in the planting plan and any plant growing outside of the area where it was originally planted shall be considered a weed and removed by the maintenance Contractor. Weeds include specific types of trees, shrubs, vines, perennials, biennials, bulbs, grasses, and annuals. Weeds shall be removed from all mulched areas, planted areas, shrub and tree plantings, lawns, paving, all hardscape areas, and all site improvements. Weed plants including all roots shall be removed using a long-handled fork-like spike. No weed roots shall remain in the soil, and a weed-wacker or string trimmer to control weeds shall not be used. Weeds shall be disposed of off site.
 - d. Mulch shall be replaced as required to maintain the specified layer of mulch. Beds and individual pits shall be neat in appearance and maintained to the designed layout.
 - e. Plants that die during the maintenance period shall be removed and replaced at once, unless designated otherwise by the Landscape Architect.

DANFORTH ON HIGH – PORTLAND, MAINE

- f. Spraying for both insect pests and diseases shall be included during the maintenance period as required and as directed.
- 3. During the maintenance period, any decline in the condition of plants shall require immediate action to identify potential problems and undertake corrective measures. If requested by the Landscape Architect, engage professional arborists and/or horticulturalists to inspect plant materials and to identify problems and recommend corrective procedures.

3.4 ACCEPTANCE STANDARDS FOR PLANTING

- A. Following the completion of planting, request from the Landscape Architect in writing, a formal inspection of the completed work. If plant materials and workmanship for the Site are acceptable, written notice will be given to the Contractor stating that the work has been accepted and that the maintenance period is terminated. The one year guarantee period shall commence from the date of acceptance.
- B. If a number of plants are sickly or dead at the time of inspection, or if, in the Landscape Architect's opinion, workmanship is unacceptable, written notice will be given by the Landscape Architect to the Contractor in the form of a punch list, which itemizes necessary planting replacements and/or other deficiencies to be remedied. Maintenance of plants shall be extended until replacements are made or other deficiencies are corrected and are accepted by Landscape Architect. All dead and unsatisfactory plants shall be removed promptly from the project. Replacements shall conform in all respects to the Specifications for new plants and shall be planted accordingly.
- C. Deciduous plant material installed after September 21 cannot be reviewed for acceptance due to stage of leaf physiology. In this situation, review of plant material by the Landscape Architect will occur the following growing season. The guarantee period begins upon acceptance of plant material.

3.5 GUARANTEE FOR PLANT MATERIALS

- A. Plants shall be guaranteed for a period of one (1) year after written notification of acceptance and shall be alive and in satisfactory growth at the end of the guarantee period.
- B. At the end of the guarantee period, a final inspection will be held to determine whether any additional plant material replacements are required. Each plant shall show at least 80% healthy growth and shall have the natural character of its species as determined by the Landscape Architect. Plants found unacceptable shall be removed promptly from the site. These plants shall be replaced during the plant installation times given in the Specifications.
- C. Replacement plants shall have a one (1) year guarantee from time of plant approval.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 02970

STRUCTURAL SOIL MIX

PART 1 - GENERAL

1.1 REFERENCES

- A. Include GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS as part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.
- C. Coordinate work with trades affecting, or affected by, work of this section. Cooperate with such trades to assure the steady progress of all work under the contract.

1.2 WORK INCLUDED

- A. Refer to the Drawings for the extent and details of this work.
- B. The work of this section consists of all Structural Soil work and related items as indicated on the drawings or as specified herein and includes, but is not limited to, the following:
 - 1. Preparation, placement, and compacting of structural soil mix on prepared subgrade, for the purposes of planting, necessitated by conditions encountered in the course of the work and as specified herein.
 - 2. Provide CU Soil™, a proprietary material patented by Cornell University (US Patent # 5,849,069). Only licensed producers are allowed to supply this material, meeting the specifications described in this text. The national distributor is AMEREQ, INC. at 1-800-832-8788. Maine producer: K. Lane Erosion Control Services; 199 Neck Rd. West Gardiner, ME 04345; ph 207-724-7369 contact Kevin Lane
 - 3. Power and/or hand excavation, stockpiling, re-handling and incidental work.
 - 4. One year Guarantee of Structural Soil as related to sidewalk paver performance.

1.3 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections and Divisions of the Specifications:
 - 1. Section 02950 - Planting

DANFORTH ON HIGH – PORTLAND, MAINE

1.4 DEFINITIONS

- A. The following related items are included herein and shall mean:
 - 1. ASTM: American Society of Testing and Materials
 - 2. USDA: United States Department of Agriculture
 - 3. AASHTO: American Association of State Highway and Transportation Officials
 - 4. AOAC: Association of Official Agricultural Chemists

1.5 STANDARDS

- A. The following standards form a part of these Specifications:
 - 1. ASTM D1556. Test for Density of Soil in Place by tile Sand-Cone Method.
 - 2. ASTM D1557. Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. (4.5 kg) Rammer and 18-in. (457 mm) Drop.
 - 3. AASHTO T-59. The moisture-Density Relations of Soils Using a 5.5 lb. (2.5 kg) Rammer and a 12-in. (305 mm) Drop.

1.6 SUBMITTALS

- A. Submit: Manufacturer's product information, certificates and installation guidelines.
- B. Qualifications of Landscape or Pavement material Contractor: The work of this section shall be performed by a firm which has a minimum of five years experience successfully installing planting mix of a similar quality, schedule requirement and construction detailing to this project.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver or place materials in frozen condition.
- B. Deliver material at or near optimum compaction moisture content as determined by AASHTO T 99 D 698. Do not deliver or place materials in an excessively moist condition (beyond two (2) percent above optimum moisture content as determined by AASHTO T 99 D 698).
- C. Do not store material unprotected from large rainfall events. Protect soils and mixes from erosion and from absorbing excess water at all times. Do not allow excess water to enter the site prior to compaction (washing of tools, trucks, etc.) If water is introduced into the material after grading, allow material to drain to

DANFORTH ON HIGH – PORTLAND, MAINE

near optimum compaction moisture content.

1.8 EXAMINATION OF CONDITIONS

- A. All areas to receive Structural Soil shall be inspected by the Contractor before starting work and all defects such as incorrect grading, compaction and inadequate drainage etc. shall be reported to the Landscape Architect prior to beginning this work.
- B. The Contractor shall be responsible for judging the full extent of work requirements involved, including but not limited to the potential need for temporary storage and staging of soils, including moving soil stock piles at the site to accommodate scheduling of other work and the need to protect installed soils from compaction, erosion and contamination.

1.9 QUALITY ASSURANCE

- A. Qualifications of Landscape or Pavement material Contractor: The work of this section shall be performed by a firm which has a minimum of five years experience successfully installing planting mix of a similar quality, schedule requirement and construction detailing to this project. Proof of this experience shall be submitted as per paragraph, SUBMITTALS, of this Section.

PART 2 – PRODUCTS

2.1 GENERAL

- A. CU Soil™. See 1.02 for product information and producer contact information.

PART 3 - EXECUTION

3.1 UNDERGROUND UTILITIES AND SUBSURFACE CONDITIONS

- A. Notify the Landscape Architect of any subsurface conditions which will effect the Contractor's ability to complete the work.
- B. Locate and confirm the location of all underground utilities prior to the start of any excavation.
- C. Repair any underground utilities or foundations damaged by the Contractor during the progress of this work. The cost of all repair shall be at the Contractor's expense.

3.2 SITE PREPARATION

- A. Do not proceed with the installation of the Structural Soil material until all walls, curb footings and utility work in the area have been installed. For site elements dependent on Structural Soil for foundation support, postpone installation until immediately after the installation of Structural Soil.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Install subsurface drain lines as shown on the Civil Engineer's Drawings prior to installation of Structural Soil material.
- C. Excavate and compact the proposed subgrade to depths, slopes and widths as shown on the Drawings. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted subgrades of adjacent pavement or structures.
- D. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the Civil Engineer Drawings.
- E. Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required subgrade compaction.
- F. Do not proceed with the installation of Structural Soil until all utility work in the area has been installed. All subsurface drainage systems shall be operational prior to installation of Structural Soils.
- G. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use ½" plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
- H. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.
- I. Any damage to the paving or architectural work caused by the soils installation Contractor shall be repaired by the general contractor at the soils installation contractor's expense.
- J. Maintain all silt and sediment control devices required by applicable regulations. Provide adequate methods to assure that trucks and other equipment do no track soil from the site onto adjacent property and the public right of way.

3.3 INSTALLATION OF STRUCTURAL SOIL MATERIAL

- A. Install Structural Soil in 6 inch lifts and compact each lift.
- B. Compact all materials to peak dry density from a standard AASHTO compaction curve (AASHTO T 99). No compaction shall occur when moisture content exceeds maximum as listed herein. Delay compaction 24 hours if moisture content exceeds maximum allowable and protect Structural Soil during delays in compaction with plastic or plywood as directed by the Landscape Architect.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Bring Structural Soils to finished grades as shown on the Drawings. Immediately protect the Structural Soil material from contamination by toxic materials, trash, debris, water containing cement, clay, silt or materials that will alter the particle size distribution of the mix with plastic or plywood as directed by the Landscape Architect.
- D. The Landscape Architect may periodically check the material being delivered and installed at the site for color and texture consistency with the approved sample provided by the Contractor as part of the submittal for Structural Soil. In the event that the installed material varies significantly from the approved sample, the Landscape Architect may request that the Contractor test the installed Structural Soil. Any soil which varies significantly from the approved testing results, as determined by the Landscape Architect, shall be removed and new Structural Soil installed that meets these specifications.

3.4 FINE GRADING

- A. After the initial placement and rough grading of the Structural Soil but prior to the start of fine grading, the Contractor shall request review of the rough grading by the Landscape Architect. The Contractor shall set sufficient grade stakes for checking the finished grades.
- B. Adjust the finish grades to meet field conditions as directed.
 - 1. Provide smooth transitions between slopes of different gradients and direction.
 - 2. Fill all dips with CU-Soil™ and remove any bumps in the overall plane of the slope. The tolerance for dips and bumps in Structural Soil areas shall be a 3" deviation from the plane in 10'.
 - 3. All fine grading shall be inspected and approved by the Landscape Architect prior to the installation of other items to be placed on the Structural Soil.
- C. The Landscape Architect will inspect the fine grading work upon the request of the Contractor. Request for inspection shall be received by the Landscape Architect at least 3 days before the anticipated date of inspection.

3.5 PLACEMENT OF PLANTING MEDIA IN TREE PITS

- A. After subgrade levels have been reached in tree pits, a minimum of four inches of Sand Based Structural Planting Medium to be placed and compacted to 84 to 88 percent Modified Proctor Maximum Dry Density as a base for the root ball.
- B. After setting root balls, back fill tree pits with Loam Based Planting Medium in six inch lifts and tamped to 84 to 88 percent Modified Proctor Maximum Dry Density. The surface area of each lift to be scarified by raking prior to placing the next lift.

3.6 ACCEPTANCE STANDARDS

DANFORTH ON HIGH – PORTLAND, MAINE

- A. The Landscape Architect will inspect the work upon the request of the Contractor. Request for inspection shall be received by the Landscape Architect at least 3 days before the anticipated date of inspection.

3.7 CLEAN-UP

- A. Upon completion of the Structural Soil installation operations, clean areas within the contract limits. Remove all excess fills, soils and mix stockpiles and legally dispose of all waste materials, trash and debris. Remove all tools and equipment and provide a clean, clear site. Sweep, do not wash, all paving and other exposed surfaces of dirt and mud until the paving has been installed over the Structural Soil material. Do not wash until finished materials covering Structural Soil material are in place.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.
 - 2. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.

1.3 DEFINITIONS:

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

1.4 SUBMITTALS:

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Each mix design will also indicate where concrete will be used.
 - 1. Indicate amounts of mix water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Setting Drawings shall be complete in showing and identifying by mark or otherwise all the bars to be incorporated into the work. Reinforcement of concrete walls shall be shown on wall elevations and reinforcement of beams shall be shown on beam elevations with sections as required. Elevations of walls and beams shall be at least 1/4 inch scale.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
- E. Anchor Bolt Survey: Stamped Survey Plan of Anchor Bolt As-Built.

1.5 QUALITY ASSURANCE:

- A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Supplier Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the 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-1 or an equivalent certification program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS:

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of the exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.

2.2 STEEL REINFORCEMENT:

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Wire: ASTM A82
- C. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- D. Epoxy Coated Reinforcing Bars: ASTM A 775.

2.3 REINFORCEMENT ACCESSORIES:

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
 - 2. For chairs supporting reinforcement above soil, provide sand plates to properly support bars.
- B. Slab On Grade Construction Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

DANFORTH ON HIGH – PORTLAND, MAINE

2.4 CONCRETE MATERIALS:

- A. Portland Cement: ASTM 150, Type I/II.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Combined Aggregate Gradation: Well graded from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 (0.3-mm) sieve, and less than 8 percent may be retained on sieves finer than No. 50 (0.3 mm).
- C. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES:

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.6 FIBER REINFORCEMENT:

- A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Fibrillated Fibers:
 - a. Fibrasol F; Axim Concrete Technologies.
 - b. Fibermesh; Fibermesh, Div. of Synthetic Industries.
 - c. Forta; Forta Corporation.
 - d. Grace Fibers; W. R. Grace & Co., Construction Products Div.

2.7 WATERSTOPS:

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

DANFORTH ON HIGH – PORTLAND, MAINE

2.8 VAPOR RETARDERS:

- A. Vapor Retarder: ASTM E 1745, Class C or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick:
 - 1. Nonwoven, polyester-reinforced, polyethylene coated sheet; 10 mils (0.25 mm) thick.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 (4.75-mm) sieve and 10 to 30 percent passing a No. 100 (0.15-mm) sieve; meeting deleterious substance limits of ASTM C 33 for fine aggregates.
- C. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (38-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

2.9 CURING MATERIALS:

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

2.10 RELATED MATERIALS:

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.11 CONCRETE MIXES:

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 - 2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.
- B. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows:
 - 1. Compressive Strength (28 Days): Refer to plans.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches (200 mm) after admixture is added to concrete with 2- to 4-inch (50- to 100-mm) slump.
- C. Proportion design mixes to provide concrete with the following properties:
1. Interior Slab-On-Grade:
 - a. Strength: 4000 psi @ 28 days, $\frac{3}{4}$ " aggr.
 - b. W/C Ratio: 0.48
 - c. Entrained Air: non-air-entrained
 - d. Slump: 3"±1"
 2. Foundation Walls, Frost Walls and all other exposed Site Concrete:
 - a. Strength: 3000 psi @ 28 days, $\frac{3}{4}$ " aggr.
 - b. W/C Ratio: 0.58
 - c. Entrained Air: 6% ±1%.
 - d. Slump: 3"±1"
 3. Exterior flatwork including slabs, ramps, stairs and sidewalks:
 - a. Strength: 4000 psi @ 28 days, $\frac{3}{4}$ " aggr
 - b. W/C Ratio: 0.48
 - c. Entrained Air: 7% ±1%.
 - d. Slump: 3"±1"
 - e. DCI-S Corrosion Inhibitor by Grace Construction Products or Rheocrete CNI Corrosion Inhibitor by Master Builders, 3 ½ gal/cy/ added at Batch Plant.
 4. Add air entraining admixture at manufacturers prescribed rate to result in concrete at point of placement having the above noted air contents.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor, when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.
1. Water may be added at the project only if the specified slump and design mix maximum water/cement ratio is not exceeded.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Combined Fly Ash and Pozzolan: 25 percent.
- F. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete exposed to deicers or subject to freezing and thawing while moist.
- G. Air Content: Where required, add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
1. Air Content: 6 percent for 3/4-inch- (19-mm-) nominal maximum aggregate size.

DANFORTH ON HIGH – PORTLAND, MAINE

- H. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 2 percent.
- I. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd. (0.90 kg/cu. m).
- J. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.12 FABRICATING REINFORCEMENT:

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

2.13 CONCRETE MIXING:

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information. Provide amount of water withheld from Design Mix on batch ticket.
 - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK:

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class B, 1/4 inch (6 mm).
- D. Construct forms tight enough to prevent loss of concrete mortar.

DANFORTH ON HIGH – PORTLAND, MAINE

- E. Chamfer edges of permanently exposed concrete, as indicated on the drawings.
- F. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- G. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- H. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- I. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS:

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts, accurately located, to elevations required. All anchor bolts shall be dryset (set prior to placement – wetsetting is unacceptable).

3.3 REMOVING AND REUSING FORMS:

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS:

- A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
- B. Fine-Graded Granular Material: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Granular Fill: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).
 - 1. Cover vapor barrier with 8" of granular fill.
 - 2. Place and compact a 1/2-inch- (13-mm-) thick layer of fine-graded granular material over granular fill.
 - 3. Do not allow granular fill to wet by rain or construction activities.

3.5 STEEL REINFORCEMENT:

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire. Use sand chair supports at slabs on grade.

3.6 JOINTS:

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect.
 - 1. Provide keyways at least 1-1/2" deep in construction joints in walls, and slabs; accepted bulkheads designed for this purpose may be used for slabs.
 - 2. Roughened surfaces shall be used between walls and footings unless shown otherwise on the drawings. The footing surface shall be roughened to at least an amplitude of 1/4" for the width of the wall before placing the wall concrete.
 - 3. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
 - 4. Joints in slabs on grade shall be located and detailed as indicated on the drawings. If saw-cut joints are required or permitted, cutting shall be timed properly with the set of

DANFORTH ON HIGH – PORTLAND, MAINE

the concrete: Cutting shall be started as soon as the concrete has been hardened sufficiently to prevent aggregate being dislodged by the saw, and shall be completed before shrinkage stresses become sufficient to produce cracking.

- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Slab On Grade Construction Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated. Refer to drawings for details.
 - 1. Construction joints shall be saw cut and filled with joint filler.

3.7 WATERSTOPS:

- A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

3.8 CONCRETE PLACEMENT:

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 - 1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES:

DANFORTH ON HIGH – PORTLAND, MAINE

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified. Use at areas not exposed to view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm) in height.
 - 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
 - 2. Do not apply rubbed finish to smooth-formed finish.
- C. Rubbed Finish: Apply the following to smooth-formed finished concrete, as indicated on plans:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS:

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish.
- C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
 - 2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:

DANFORTH ON HIGH – PORTLAND, MAINE

- a. Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15 for slabs-on-grade in office area.
 - b. Specified overall values of flatness, F(F) 25; for elevated slabs on steel beams and metal deck (equivalent to ¼" gap under 10-foot straightedge). Elevated slab elevations shall be set by lasers taking in consideration that beams and deck shall deflect due to dead load..
- D. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS:

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE PROTECTION AND CURING:

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments or adhesive applied floor finishes.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING:

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 1.5 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS:

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations by removal and replacement.
 - 5. Repair defective areas and low areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 6. Correct low areas scheduled to remain exposed by removal and replacement.

DANFORTH ON HIGH – PORTLAND, MAINE

- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL:

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 3. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 7. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
 - 8. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.
 - a. Test two field-cured specimens at 7 days and two at 28 days.

DANFORTH ON HIGH – PORTLAND, MAINE

- b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- E. Test results shall be reported in writing to Architect, the SER, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION

SECTION 03450

ARCHITECTURAL PRECAST CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes precast concrete units.

1.02 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide precast concrete units and connections capable of withstanding design loads within limits and under all existing code criteria.

1.03 SUBMITALS

- A. Product Date: For each product indicated.
- B. Design Mixes: For each concrete mix.
- C. Shop Drawings: Detail Fabrication and installation of precast concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, limits of each finish and types of reinforcement, including special reinforcement.
 - 1. Comprehensive engineering analysis stamped and signed by the qualified professional engineer responsible for its preparation. Analysis shall indicate design loads, member spans, member reinforcement, and connection design and detail for attachment to supporting structure.
- D. Samples: For each type of finish, in sets of 3, 12 by 12 by 2 inches.
- E. Welding certificates.
- F. Material certificates.

1.04 QUALITY ASSURANCE:

- A. Fabricator Qualifications: A qualified fabricator who assumes responsibility for engineering precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

DANFORTH ON HIGH – PORTLAND, MAINE

1. Participates in PCI's Plant Certification program and is designated a PCI-certified plant for Group A, Category A1 – Architectural Cladding and Load Bearing Units.
- B. Design Standards: Comply with ACI 318 and the design recommendations in PCI MNL 120, "PCI Design Handbook – Precast and Prestressed Concrete."
- C. Quality-Control Standard: Comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- D. Welding: Qualified procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel", and AWS D1.4, "Structural Welding Code-Reinforcing Steel."
- E. Sample Panels: Produce a minimum of 3 sets of full-scale sample panels, approximately 48 inches long by 48 inches high, to demonstrate range of finish, color, and texture variations of approved samples.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.
- B. Lift and support units only at designated lifting and supporting pints shown on Shop Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Steel Reinforcing:
 1. Reinforcing Bars: ASTM A 615/A 615M, Grade 69, deformed.
 2. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
 3. Plain-Steel Wire: ASTM A 496.
 4. Deformed-Steel Wire: ASTM A496.
 5. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
 6. Deformed-Steel Welded Wire Fabric: ASTM A 497 flat sheet.

DANFORTH ON HIGH – PORTLAND, MAINE

7. Supports: Manufacture's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to PCI MNL 117.
 8. Prestressing Strand: ASTM A 416/A 416M, Grade 250 or 270, uncoated, 7-wire, low-relaxation strand.
- B. Concrete:
1. Portland Cement: ASTM C 150, Type I or Type III, of same type, brand, and source. Color samples to be submitted to Design /Builder for approval. Color to be MCTC.
 2. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with course aggregates complying with Class 5S.
 3. Light-Weight Aggregates: ASTM C 330.
 4. Coloring Admixture: ASTM C 979 synthetic mineral-oxide pigments or colored water-reducing as mixtures, temperature stable, nonfading, and alkali resistant.
 5. Air-Entraining Admixture: ASTM C 260.
 6. Fly Ash Admixture: ASTM C 618, Class C or F.
 7. Metakaloin Admixture: ASTM C 618, Class N.
 8. Silica Fume Admixture: ASTM C 1240.
- C. Steel Connections:
1. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
 2. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.
 3. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
 4. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
 5. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.

DANFORTH ON HIGH – PORTLAND, MAINE

6. Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coated by hot-dip process according to ASTM A 123/A 123M, after fabrication and ASTM A 153/A 153M as applicable.
 - a. Galvanizing Repair Paint: DOD-P-21035A or SSPC-Paint 20.
 7. Shop-Primed Finish: Prepare surfaces of non-galvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead and chromate-free, rust-inhibitive primer, complying with performance requirements in FS TT-P-664, SSPC-Paint 25, according to SSPC-PA 1.
- D. Sand-Cement Grout: Portland cement, ASTM C 150, Type 1, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2 ½ parts sand, by volume, with minimum water required for placement and hydration.
- E. Pre-Cast units: To include pre-cast beams at lobby and west stair, pre-cast column covers, and pre-cast sill elements as shown.

2.02 CONCRETE MIXES:

- A. Light-Weight Concrete Face and Backup Mixes: Proportion mixes by either laboratory trial batch or filed test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
1. Compressive Strength (28 Days): 5000 psi.
 2. Maximum Water-Cementitious Materials Ratio: 0.40.
- B. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

2.03 FABRICATION:

- A. Anchorage Hardware: Fabricate with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during pre-casting operations.
- B. Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing pre-cast concrete units to supporting and adjacent construction.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Cast-in reglets, slots, holes, and other accessories in precast concrete units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.
- D. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 117 for fabricating, placing, and supporting reinforcement.
- E. Reinforce precast concrete units to resist handling, transportation, and erection stresses.
- F. Prestress tendons for precast concrete units by either pre-tensioning or post-tensioning methods. Comply with PCI MNL 117.
- G. Mix concrete according to PCI MNL 117 and requirements in the Section. After concrete batching, no additional water may be added.
- H. Place face mix to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover.
- I. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 117 for measuring, mixing, transporting and placing concrete.
 - 1. Place backup concrete to ensure bond with face mix concrete.
- J. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 117.
- K. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- L. Comply with ACI 305 R recommendations for hot-weather concrete placement.
- M. Identify pickup pints of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast architectural concrete unit on a surface that will not show in finished structure.
- N. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.
- O. Discard precast concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Design/Builder.

DANFORTH ON HIGH – PORTLAND, MAINE

- P. Fabricate precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finish panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in-items.

2.04 FINISHES:

- A. Finish exposed-face surfaces of precast concrete units to match approved design reference sample and as follows:
 - 1. Finish to Simulate Granite Per MGA Cast Stone, Inc., New Gloucester, ME (207-926-5993); Color – ‘Cumberland’ (Granitex Finish); Sandblast.
 - 2. PCI and APA’s “Architectural Precast Concrete – Color and Texture Selection Guide”
 - 3. Smooth-Surface Finish: Free of pockets, sand streaks, and honeycombs, with uniform color and texture.
 - 4. Textured-Surface Finish: Impart by form liners or inserts to produce surfaces free of pockets, streaks, and honeycombs, with uniform color and texture.
 - 5. Bushhammer Finish: Use power or hand tools to remove matrix and fracture coarse aggregates.
 - 6. Retarded Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
 - 7. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
 - 8. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
 - 9. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
- B. Finish exposed top, bottom and side surfaces of precast concrete units to match face-surface finish.

2.05 SOURCE QUALITY CONTROL

DANFORTH ON HIGH – PORTLAND, MAINE

- A. Design/Builder will employ an independent testing agency to evaluate precast concrete fabricator's quality-control and testing methods.
- B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install precast concrete. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
 - 1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
- B. Anchor precast concrete units in position by bolting, welding, grouting, or as otherwise indicated.
- C. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.
 - 1. Repair damaged steel surfaces by cleaning and applying a coat of galvanized repair paint to galvanized and re-priming damaged painted surfaces.
- D. Install pre-cast concrete units level, plumb, square, true, and in alignment without exceeding the non-cumulative erection tolerances of PCI MNL 117, Appendix 1.
- E. Repair exposed exterior surfaces of precast concrete units to match color, texture, and uniformity of surrounding precast concrete if permitted by Design/Builder.
 - F. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt and stains.

END OF SECTION

SECTION 04200

UNIT MASONRY

1. GENERAL

1.1 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.
- B. Extent of Unit Masonry is shown on the drawings.
- C. In addition to work shown on the drawings and specified elsewhere in this Section, build in steel lintels, anchors, inserts and sleeves.

1.2 QUALITY ASSURANCE

- A. Standards: Comply with recommendations of Brick Institute of America (BIA), and National Concrete Masonry Assoc. (NCMA).

1.3 SUBMITTALS

- A. Issue submittals in accordance with Section 01300, Submittals.
- B. Submit product data and installation recommendations for masonry units, cementitious products for mortar and grout, coloring pigments, throughwall flashing, and masonry accessories.
- C. Submit samples of exposed masonry units and mortar, illustrating full range of colors and textures.

PRODUCTS

2.1 FACE BRICK

- A. Face brick shall be Old Port Narrow Flashed Range.
- B. Face brick shall comply with ASTM C 216, Grade SW, Type FBS. Units shall be standard size, modular for 3/8 in. mortar joints, nominal dimensions 3-5/8 in. thick, 2-1/4 in. high, 7-5/8 in. long, and 8" x 8" x 3-5/8".

2.2 CONCRETE MASONRY UNITS

- A. Except as shown on Drawings or specified otherwise, all concrete masonry units shall be as follows:

DANFORTH ON HIGH – PORTLAND, MAINE

1. Hollow-type complying with ASTM C 90, Type 1 (moisture-controlled), Grade N.
2. Compressive strength: 2500 psi net, 1250 psi gross (average of three units). Prism strength $f_m=2500$ psi in Pier A, $f_m=2000$ elsewhere.
3. Normal-weight, with sand and gravel aggregate complying with ASTM C 33, approximate oven-dry unit weight of 135 lbs. per cu. ft.
4. Nominal 8" x 16" face dimensions (modular for 3/8 in. mortar joints), thickness per drawings, smooth face, standard gray color, laid up in running bond.

2.3 MORTAR AND GROUT

- A. Mortar shall comply with ASTM C 270, BIA Technical Notes 8 and 8A, and local Building Code.
- B. Materials shall conform to applicable ASTM specifications including the following:
 1. Portland Cement: ASTM 150, Types I, II, or III (do not use Types IA, IIA, or IIIA).
 2. Masonry Cement: ASTM C 91.
 3. Hydrated Lime: ASTM C 207, Type S only (do not use Type N).
 4. Natural or manufactured sand aggregate: ASTM C 144, gradation conforming to Table 1 in BIA Technical Note 8.
 5. Masonry cement shall not contain ground limestone.
 6. Water: clean, potable, and free of deleterious amounts of acids, alkalies or organic materials.
- C. Mortar Type
 1. General:
 - a. Mortar for exterior brick shall be colored, submit samples to Architect for approval. Color to be SGS 22A Tan.
 - b. Use 1800 psi minimum Type S mortar for reinforced masonry and where indicated.
 - c. Use 750 psi minimum Type N mortar for exterior, above-grade loadbearing and non-loadbearing walls, and for other applications where another type is not indicated.

DANFORTH ON HIGH – PORTLAND, MAINE

D. Grout

1. Grout shall conform to ASTM C 476 and to match existing.
2. Fine and coarse aggregate for grout mixes shall be defined in ASTM C 404.
 - a. Fine grout shall consist of one part portland cement, 0 to 1/10 part lime, 2-1/4 to 3 parts fine sand.
 - b. Coarse grout shall consist of the fine grout mix described in "a" above plus 1 to 2 parts coarse aggregate.
 - c. Use coarse grout (pea gravel aggregate) except where minimum horizontal core dimension is under 4 in., in which case use fine grout (sand aggregate). Ordinary concrete (maximum 1 in. aggregate) may be used where minimum core dimension exceeds 6 inches.
- E. During cold-weather construction at exterior walls, use Type III (high-early strength) cement and Type S hydrated lime. A non-calcium-chloride-based accelerator such as Dur-o-Wal, Dur-o-Guard, or Euco Accelguard 80 may be used, in quantities recommended by manufacturer for expected ambient temperature. Calcium chloride may not be used. Refer to EXECUTION portion of this Section for general provisions governing cold weather construction.

2.4 METAL REINFORCING, TIES, ANCHORS

- A. Acceptable manufacturers: Heckmann Building Products, or approved equal.
- B. Brick ties at masonry veneer construction:
 1. 14 Ga # 315-D anchor with 3/16 x 4" #316 triangle ties. Min. 2" into bed joints. Ties to be stainless steel.
 2. At gypsum sheathing secure anchors through sheathing directly to wood studs with s/s wood screws as recommended by anchorage manufacturer.
 3. Maximum spacing: 24 in. o.c. vertically, 16 in. o.c. horizontally or closer spacing as required at expansion joints, corners, floors, etc., or to secure directly to studs.
 4. Material: stainless steel.

2.5 THROUGHWALL FLASHING

- A. Thru wall flashing with H & B #DP stainless steel drip plant as manufactured by Hohmann & Barnard Inc. See section 07650 - Flexible Flashing Active Drainage Plane System.

DANFORTH ON HIGH – PORTLAND, MAINE

2.6 ROOFING FELT

- A. No. 15, asphalt-saturated, unperforated organic roofing felt, complying with ASTM D 226, Type I, 36 inches wide.

2.7 MASONRY ACCESSORIES

- A. Weepholes: medium-density polyethylene, 3/8 in. diameter, full depth of outer wythe.
- B. Chemical cleaning agents for newly-installed masonry: ProSoco Sure-Klean liquid masonry cleaners or equal by Diedrich, as recommended by manufacturer for particular condition. Recommended cleaners include Sure-Klean No. 600 Detergent, No. 101 Lime Solvent, and Vana Trol.

3. EXECUTION

3.1 MASONRY WORK IN GENERAL

- A. Erect all masonry work in compliance with the line and level tolerances specified herein. Correct, or replace, as directed by the Architect, non-conforming masonry work at no additional cost to the Contract.
- B. Lay no face brick or concrete masonry unit having chipped edges or face defects where such unit or piece would be exposed to view. Remove any such unit or piece, if installed, replace with new matching material, and bear all costs therefore.
- C. Examine all Drawings as to requirements for the accommodation of work of other trades. Provide all required recesses, chases, slots, cutouts, and set loose lintels. Place anchors, bolts, sleeves and other items occurring in the masonry work. Take every precaution to minimize future cutting and patching. Closely coordinate the location and placement of such items.
- D. Protect all masonry from rain prior to, and during the installation thereof. If the temperature is in excess of 80 degrees F. at time of installation, lightly moisten contact surfaces or masonry units by brushing with water.
- E. Lay all masonry in full mortar beds, and completely butter all concealed from view vertical edges with mortar. Completely fill cells of masonry units with mortar where vertical reinforcement is to be installed therein and in other locations specified or indicated on the Drawings.
- F. Provide complete protection against breakage and weather damage to all masonry work, including substantial wood boxing around door jambs, over the tops of walls and wherever necessary to protect work at all stages of completion. Protect masonry when not roofed over, at all times when masons are not working on the walls. Apply non-staining tarpaulins or waterproof paper, properly weighted, or nailed, to assure their remaining in place to protect masonry from all possible hazards.

DANFORTH ON HIGH – PORTLAND, MAINE

- G. Fit masonry into bucks and frames so as not to distort alignment of such items, and fill backs of such items with mortar, except where joints are indicated to receive caulking and sealant and have no compressible filler therein, in which case rake joints to a uniform depth of $\frac{3}{4}$ inch for proper installation of caulking and sealant material.
- H. Use only power saw, equipped with carborundum blade, for cutting exposed masonry, as needed to assure straight, evenly-cut edges.
- I. Lay out coursing before setting to minimize cutting closures or jumping bond. Do not spread any more mortar than can be covered before surface of mortar has begun to dry. Do not endanger bond or mortar by moving masonry when once laid. If necessary to re-adjust any items, remove entirely, clean-off mortar, and reset with fresh mortar.
- J. Except for cleaning down and pointing, finish all new masonry as the walls and partitions are carried up.
- K. Point and fill all holes and cracks in mortar joints with additional fresh mortar; do not merely spread adjacent mortar over defect or use dead mortar droppings. Do all pointing while mortar is still soft and plastic. If hardened, chisel defect out and refill solidly with fresh additional mortar, and tool as specified.

3.2 JOB CONDITIONS

- A. Store cement, lime and other cementitious materials under cover in a dry place.
- B. Keep steel reinforcing, ties and anchors free from oil, dirt, rust, and other materials which would destroy bond.
- C. Store masonry above ground on level platforms which allow air circulation under stacked units. Masonry units shall be dry and free from soil and ice before being laid in wall.
- D. Keep installed walls dry and clean at all times. Immediately remove grout or mortar from face of masonry to be left exposed or painted. Protect previously installed elements such as louvers, doors, frames, and windows from mortar droppings and construction damage, using masking elements, dropcloths, etc.
- E. Cover exposed walls at end of working day with well-secured canvas tarpaulins. Protect base of exterior walls from splashing mud and mortar by spreading sand, straw, and sawdust or plastic sheeting 3 to 4 ft. horizontally and up face of wall. Turn scaffold boards near wall on edge at end of day to prevent splashing mortar or dirt.
- F. Securely brace partially completed walls against wind damage. Walls shall have been completed 24 hours minimum before application of distributed loads, 72 hours before concentrated loads.

DANFORTH ON HIGH – PORTLAND, MAINE

- G. Comply with cold-weather construction specifications in NCMA-TEK 16 and BIA Technical Note 1A:
1. Maintain masonry above 32 degrees F. for 24 hours minimum using insulated blankets or heated enclosures. Construct windbreaks at wind velocities over 15 mph. Maintain mortar on board at 40 degrees F. minimum, heating mixing water and sand as required.
 2. Sprinkle units with high rates of absorption with heated water. Refer to mortar paragraph under PRODUCTS in this Section for provisions governing cold-weather additives to mortar. If standard instead of Type III high-early strength cement must be used, maintain installed masonry above freezing for 48 instead of 24 hours.
 3. Do no masonry work at temperatures below 38 degrees F and falling or 35 degrees F and rising, until General Contractor has contacted Architect.

3.3 INSTALLATION

- A. Verify that substrate is dry and free from frost, dirt, laitance, loose sand and other material which would prevent satisfactory bond. Lay first course in full mortar bed including face shells and webs of concrete masonry units. Keep cells to be grouted free from mortar.
- B. Dampen masonry units as required to prevent excess suction of mortar. Lay concrete masonry units to form continuous unobstructed vertical spaces within wall. Provide full mortar coverage on horizontal and vertical face shells. Also bed webs adjacent to reinforced cores to prevent grout leakage, except omit web bedding at fully grouted walls to permit grout to flow laterally. Lay face brick with full vertical and bed joints, except as specified below to provide weepholes. Cut exposed masonry units, where necessary, with a power saw. Avoid the use (by proper layout) of less-than-half-size units.
- C. Install masonry units in the bond pattern indicated, or if none is indicated, in running bond.
- D. Step back unfinished work -- toothing is not permitted. Do not adjust installed units -- where necessary, completely remove and reinstall using fresh mortar.
- E. Maximum variation of installed walls from plumb, level, or plan grid shall not exceed 1/4 in. in 10 ft. Wall thickness shall not vary more than 1/4 in. plus or minus from dimension shown on drawings.
- F. Mortar:
1. Measure materials in calibrated containers, or by similar easily-controlled and maintained method. Do not use shovel measurement.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Mix materials in a mechanical mixer at least three minutes with minimum amount of water necessary to produce a workable consistency. Retemper stiffened mortar as required to restore evaporated water, but do not place mortar any later than 2-1/2 hours after mixing.
 3. Exposed-to-view joints shall be approximately 3/8 in. wide, to meet coursing shown, tooled when thumbprint hard with a round bar to produce a dense, slightly concave surface well-bonded to masonry edges.
 4. After tooling, cut off mortar tailings with a trowel and brush off excess. Concealed joints, including those on cavity side of masonry veneer, and joints in masonry to be plastered or stuccoed shall be struck off flush, with no protrusions.
 5. Mortar not tight at time of tooling shall be raked out, pointed with fresh mortar, and retooled. Where sealant is shown, rake out joint 3/4 in., ready for backer rod and sealant specified in Division 7 sealants Section.
- G. Through-wall flashing:
1. Install flashing to the profiles shown on the drawings.
 2. Masonry and concrete surfaces receiving through wall flashings shall be thoroughly dry, free from loose material, and reasonably smooth. There shall be no slopes that will form pockets or prevent free drainage of water to exterior surfaces of wall.
 3. Set flashing in sealant. Hold sealant back 1/4 inch from face of lintel. Hold flashing 1/2 inch back from face of lintel.
 4. At wall openings, extend flashing 6 in. beyond each side of opening and turn up to form pan. Fold all corners, do not cut.
 5. Lap joints between lengths of flashing 6 in. minimum and seal with mastic. Seal penetrations through flashing with mastic or overlapping piece of flashing.
- H. Provide weepholes at 24 inches on center maximum spacing through outer face of masonry at all through-wall flashing.
- I. At masonry veneer construction over gypsum sheathing, provide rubber washers or bituminous dampproofing compound at all penetrations made in sheathing board or paper as part of work under this Section, including screw heads and veneer-tie anchorage.
- J. Provide openings and chases as required for structural members, ductwork, large pipes, etc. Cut exposed masonry with carborundum saw to ensure straight even edges. Neatly block around and patch penetrations. Provide compressible filler around edges of openings to accommodate vibration and structural deflection. Ensure that joint reinforcement remains uncut or is well-lapped.

DANFORTH ON HIGH – PORTLAND, MAINE

- K. Provide control and expansion joints at locations shown, and keep clean of mortar droppings. Install Joint Sealers in accordance with Section 07900.
- L. Build other work into the masonry work as shown, fitting masonry units around other work, and grouting to secure anchorage.

3.4 ALLOWABLE TOLERANCES FOR MASONRY WORK

- A. Maximum variation from true surface level for exposed to view walls and partitions:
 - 1. Unit-to-unit tolerance: 1/8 inch.
 - 2. Surface, overall tolerance: ¼ inch in 10 feet in any direction when tested with ten foot long straightedge. Where both faces of wall or partition will be exposed to view, request and obtain decision from the Architect as to which face will be required to conform to the specified surface level tolerance.
- B. Maximum variation from true vertical plumb lines:
 - 1. In lines of walls and arises:
 - a. ¼ inch in 10 feet.
 - b. 3/8 inch in any story, or up to 20 feet maximum.
 - c. ½ inch in 40 feet maximum.
 - 2. For external corner lines, control joints, and other conspicuous lines:
 - a. ¼ inch in any story, or up to 20 feet maximum.
- C. Maximum variation from horizontal level or grades for exposed sills, lintel blocks, and other conspicuous lines:
 - 1. ¼ inch in any bay, or up to 20 feet maximum.
 - 2. ½ inch in 40 feet maximum.
- D. Maximum variation of linear building line from an established position in plan and related portions of walls and partitions:
 - 1. ½ inch in any bay or up to 20 feet.
 - 2. ¾ inch in 40 feet maximum.

3.5 WALL AND PARTITION CONSTRUCTION

- A. General:

DANFORTH ON HIGH – PORTLAND, MAINE

1. Build the masonry walls and partitions in the various combinations and thickness as indicated on the Drawings and as herein specified.
2. Build in anchorage items and loose lintels as the work progresses.
3. Lay first course of masonry on a smooth bed or mortar, after supporting concrete has been cleaned. Fill cells of first course concrete masonry units with mortar in all cases. Completely fill cells of concrete masonry units wherever vertical reinforcing rods are installed therein.
4. For exterior masonry cavity walls, install cavity insulation, through wall membrane flashings, weep wicks, and peastone, as specified herein.
5. Fill pressed metal frames occurring in masonry with mortar, as the masonry is erected.

3.6 GROUT

- A. Lay masonry units with core cells vertically aligned and cavities clear of mortar and unobstructed.
- B. Permit mortar to cure three (3) days before placing grout.
- C. ACI Building Code requirements for Masonry Structures and ACI Specifications for Masonry Structures are made part of this specification as are all pertinent sections of the ACI Building Code.

3.6 CLEANING MASONRY

- A. Masonry cleaning procedures shall follow recommendations of NCMA-TEK 45 and BIA Technical Note 20 (revised).
- B. Dry brush masonry work at end of each day's work.
- C. After new mortar has cured 14 days minimum, remove large mortar particles with non-metallic scrapers, chisels, or wooden paddles. Wash off dirt and other foreign materials with clean water and light concentration of soap or detergent.
- D. For mortar smears, construction dirt, stains, efflorescence, etc., not removable by above methods, use proprietary cleaners specified under PRODUCTS. Muriatic acid may not be used. Adhere strictly to manufacturer's recommendations.
- E. Apply and scrub cleaning solutions with non-metallic fibrous brushes. Thoroughly rinse cleaned area before cleaning solution can dry, using water hosed under moderate pressure.

END OF SECTION

SECTION 05120
STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes structural steel and architecturally exposed structural steel.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Quality Control" for independent testing agency procedures and administrative requirements.
 - 2. Division 5 Section "Metal Fabrications" for miscellaneous steel framing.
 - 3. Division 9 Section "Painting" for surface preparation and priming requirements.

1.3 PERFORMANCE REQUIREMENTS:

- A. Engineering Responsibility: Engage a fabricator who utilizes a qualified registered professional structural engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.4 SUBMITTALS:

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing fabrication of structural steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 3. Indicate type, size and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.

DANFORTH ON HIGH – PORTLAND, MAINE

4. Include computations for all connections signed and sealed by the registered structural engineer responsible for their preparation.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Mill test reports signed by manufacturers certifying that their products, including the following, 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. Shear stud connectors.

1.5 QUALITY ASSURANCE:

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:
 - a. Category: Category I, conventional steel structures.
- C. Comply with applicable provisions of the following specifications and documents:
1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 2. AISC's "Load and Resistance Factor Design (LFRD) Specification for Structural Steel Buildings."
 3. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
 4. AISC's "Specification for Load and Resistance Factor Design of Single-Angle Members."
 5. AISC's "Seismic Provisions for Structural Steel Buildings."
 6. ASTM A 6 (ASTM A 6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
 7. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 8. Research Council on Structural Connections' (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.
- E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel."
 - 1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. 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 or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 SEQUENCING:

- A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Structural Steel Shapes, Plates, and Bars: As follows:
 - 1. Rolled W Shapes & Channels: ASTM A572 Grade 50 or A992.
 - 2. Plates, Bars and Angles: ASTM A36
- B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B or C.
- C. Hot-Formed Structural Steel Tubing: ASTM A 501.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Steel Pipe: ASTM A 500, Grade B or C.
- E. Anchor Rods (Bolts), Bolts, Nuts, and Washers: As follows:
 - 1. Anchor Rods (Bolts): ASTM A307, ASTM A 449 refer to plans
 - 2. Washers: ASTM A 36 (ASTM A 36M).
- F. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
- G. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers, uncoated.

2.2 PRIMER:

- A. None.

2.3 GROUT:

- A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.4 FABRICATION:

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.
 - 1. Camber structural steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6 (ASTM A 6M) and maintain markings until steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
 - 4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
 - 5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
 - 6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded.
- C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Steel Wall Framing: Select true and straight members for fabricating steel wall framing to be attached to structural steel framing. Straighten as required to provide uniform, square, and true members in completed wall framing.
- E. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.
 - 1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
 - 2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.5 SHOP CONNECTIONS:

- A. Shop, install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.
- B. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 - 2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch (13 mm) and larger. Grind flush butt welds. Dress exposed welds.

2.6 GALVANIZING:

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

2.7 SOURCE QUALITY CONTROL:

- A. Owner will engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
 - 2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
 - 4. Ultrasonic Inspection: ASTM E 164.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until 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.

3.3 ERECTION:

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- 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.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Tighten anchor bolts 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 prior to packing with grout.
 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 - a. Comply with manufacturer's instructions for proprietary grout materials.
- C. Maintain erection tolerances of 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. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Finish sections thermally cut during erection equal to a sheared appearance.
- H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.
- 3.4 FIELD CONNECTIONS:
- A. Install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.
- B. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.
 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface

DANFORTH ON HIGH – PORTLAND, MAINE

bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch (13 mm) and larger. Grind flush butt welds. Dress exposed welds.

3.5 FIELD QUALITY CONTROL:

- A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
 - 4. Ultrasonic Inspection: ASTM E 164.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 05500

METAL FABRICATIONS

1. GENERAL

1.1 REFERENCES

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specifications, apply to work in this section.
- B. Rough Carpentry: Section 06100
- C. Finish Carpentry: Section 06200
- D. Roofing and Flashing: Section 07300
- E. Painting: Section 09900
- F. American Society of Testing Materials (ASTM)
- G. Steel Structures Painting Council (SSPC)
- H. National Association of Architectural Metal Manufacturers (NAAMM)

1.2 DESCRIPTION OF WORK

- A. Extent of Metal Fabrications is shown on the drawings and includes deck railings and metal grills.
- B. Elevator pit metal ladder.

1.3 QUALITY ASSURANCE

- A. Refer to Section 01631, Products and Substitutions, for general provisions covering product selection, substitutions, material storage, and installation.
- B. Refer to Section 01400, Quality Control Services, for provisions for testing and inspection.

1.4 SUBMITTALS

- A. Issue submittals in accordance with Section 01300, Submittals.
- B. Submittals under this section include:
 - 1. Shop drawings showing details of fabrication, assembly, and installation showing all connections to other work.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Samples of materials and finished products as may be requested by the Architect.

2. PRODUCTS

2.1 MATERIALS

1. Railing assembly shall withstand a minimum concentrated load of 200 lbs. applied in any direction at any point on top rail. Intermediate rails, balusters, and panel fillers shall be designed for uniform load of not less than 25 lbs./sq. ft. over gross area of guard.
Assembly shall comply with all provisions of the applicable Building Codes.
2. Accurately miter and cope intersections, and weld all around. Form rail-to-end post connections and changes in rail direction with mitered corners or radius bends, as detailed. Form elbow bends and wall returns to uniform radius, free from buckles and twists.

3. EXECUTION

3.1 FABRICATION

A. GENERAL

1. Use materials of size and thickness shown, or if not shown, of required size, grade, and thickness to produce strength and durability in finished product.
2. Provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes on exposed surfaces.
3. Form metalwork to required shapes and sizes, with true lines, curves and angles. Provide necessary rebates, lugs and brackets for assembly and installation. Use concealed fasteners wherever possible. Mill joints to tight hairline fit; cope or miter corners.
4. Welding:
 - a. Weld corners and seams continuously; grind exposed welds smooth and flush.
 - b. Welding Electrodes and Filler Metal: Type and alloy to match metal to be welded.
5. Anchors and Inserts: Furnish as required for installation in other work. Use copper, cadmium or galvanized anchors and inserts for exterior work.
6. Fasteners
 - a. Type and alloy to match metal to be fastened; use Phillips flat-head screws for exposed fasteners if not otherwise indicated.
 - b. Provide bolts, nuts, lag bolts, machine screws, wood screws, toggle bolts, masonry anchorage devices, lock washers as required for application indicated and complying with applicable Federal standards. Hot-dip galvanize fasteners for exterior applications to comply with ASTM A 153.

DANFORTH ON HIGH – PORTLAND, MAINE

7. Shop Finishing

- a. Comply with NAAMM "Metal Finishes Manual".
- b. Apply shop primer to surface of metal fabrications except those embedded in concrete or galvanized; comply with SSPC-PA1.
- c. Surface Preparation: Comply with SSPC-SP6 "Commercial Blast Cleaning" for exterior work, and with SSPC-SP3 "Power Tool Cleaning" for interior work.
- d. Shop Primer: Fabricator's standard, fast-curing, lead-free, "universal" primer complying with performance requirements of FS TT-P-645.
- e. Stripe paint edges, corners, crevices, bolts, welds and sharp edges.
- f. Protect finished metal items.

3.2 INSTALLATION

- A. Perform cutting, drilling and fitting required for installation; set work accurately in location, alignment and elevation, measured from established lines and levels.
- B. Provide anchorage devices and fasteners where necessary for installation to other work.
- C. Repair or replace damaged items as directed by the Architect.
- D. Touch-up shop paint after installation. Clean field welds, bolted connections and abraded areas, and apply same type paint as used in shop.
- E. Restore damaged protective coverings after installation. Maintain until other work in same areas is completed. Remove protective coverings and clean exposed surfaces prior to final inspection.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART I - GENERAL

1.01 GENERAL REQUIREMENTS

- A. **RELATED DOCUMENTS:** The drawings and the general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.
- B. Examine all other sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

- A. Work covered by this Section includes the furnishing of all labor, material, equipment and accessories, and the performing of all operations in connection with the wood framing, other carpentry as indicated on the Drawings and/or specified within this Section.
- B. The work covered by this Section includes, but is not necessarily limited to, the following:
 - 1. Furnishing and installing all rough carpentry, including miscellaneous grounds, blocking, sills, plates, shoes, shims, and furring, framing, framing anchors, and fasteners.
 - 2. Furnishing and installing plywood wall back up panels and backer boards for telephone and electrical equipment.
 - 3. Drilling concrete and masonry and drilling and tapping of metal work as required for installation of rough carpentry.
 - 4. Any other items of carpentry necessary to complete work properly.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

- A. Finish Carpentry - Section 06200.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Insulation - Section 07210.
- C. Flashing and Sheet Metal - Section 07600.
- D. Caulking and Sealants - Section 07900.
- E. Finish Hardware - Section 08700.

1.04 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. International Building Code IBC/2009
 - 2. AITC Timber Construction Manual - 2004
 - 3. NFPA National Design Specification For Wood Construction - 1991

PART 2 - PRODUCTS

2.01 LUMBER

- A. Lumber shall conform to American Softwood Lumber Standard Voluntary Product Standard PS20-70. Lumber shall bear the grade and trademark of the Association under whose rules it is produced and a mark of mill identification. Use framing lumber harvested from sustainable managed forest or local/regional materials or durable materials. See Section 8 R-1 of Maine State Housing Authority Green Building Standards, Appendix A.
- B. Protect all lumber and keep dry, both in transit and at the job site.
- C. All lumber shall be well seasoned and contain not more than 15% moisture content (marked "S-Dry"), or durable materials, see Section
- D. All two inch nominal framing lumber shall have the following minimum base values, unless otherwise noted:
 - 1. Extreme Fiber Stress in Bending, $F_b = 875$ psi.
 - 2. Horizontal Shear, $F_v = 135$ psi.
 - 3. Compression Perpendicular to Grain, $F_{cA} = 425$ psi.
 - 4. Compression Parallel to Grain, $F_c = 1100$ psi.

5. Tension Parallel to Grain, $F_t = 450$ psi.
 6. Modulus of Elasticity, $E = 1,400,000$ psi.
- E. Engineered Wood Products: Provide engineered wood products manufactured by TrusJoist/MacMillan or approved alternate.

2.02 PLYWOOD

A. General:

1. Each panel shall be identified with appropriate American Plywood Association grade-trademark, showing panel type, span rating, thickness, veneer grade, species group member, edge detail (where applicable), and exposure grade.
2. Each panel shall meet requirements of U.S. Product Standard PS 1 for Construction and Industrial Plywood, or APA Performance Standards where applicable.
3. Panels shall be square-edged except as noted below for flooring panels.

B. Exposure Classification: All panels shall be APA "Exposure 1" panels, unless noted otherwise on the Drawing Set, or qualified below:

1. In areas of high humidity, or in locations permanently exposed to weather, panels shall be APA "Exterior".
2. "Exposure 2" panels may be used if only moderate construction delays are anticipated.
3. "Interior" grade panels may be used only if the panels will be fully protected from weather, both during and after construction.

C. Finish:

1. Plywood with one face exposed-to-view shall be APA A-D Veneer Grade or better.
2. Plywood that is not exposed to view shall be APA C-D Plugged Grade or better.

Panel Size and Grade

DANFORTH ON HIGH – PORTLAND, MAINE

1. Floor shall be 23/32, 24" o.c. "Advantech Floor Span " T&G by J.M. Huber or equal. Refer to Structural Drawings.
2. Underlayment over deck flooring, except in carpet pad areas, shall be ¼" APA "Underlayment" with sanded face and T&G joints.
3. Wall sheathing shall be 7/16 O.S.B. Refer to Structural Drawings.

2.03 PRESERVATIVE TREATED LUMBER

- A. The following wood members shall be Southern Yellow Pine or Douglass Fir supplied by Osiose Inc. with "Natural Wood Preservative", or equal. Wood shall be air dried or kiln-dried to reduce maximum moisture content to 15 percent. Each piece shall bear the AWPA stamp, indicating the plant number, preservative symbol, symbol of standard, date of treatment and moisture content after treatment:
 1. Wood sills plates, rough bucks and frames in exterior masonry wall openings.
 2. Wall plates and furring in contact with exterior masonry or concrete.
 3. Nailers that are set into, or are in contact with, concrete or masonry.
 4. Blocking and nailers for roof deck, sub-fascia members, roof cants and saddles.
 5. Lumber in contact with the ground, embedded in or in contact with concrete or masonry and all exterior trim.
- B. Cut Surfaces: Cut surfaces of preservative-treated materials shall be brush coated with at least two coats of the same preservative used in the pressure treatment.
- C. Odors and Compatibility: Treated wood exposed in the final structure shall be free from objectionable odors and shall not be harmful or corrosive to adjacent materials or anchorages.
- D. Plywood Backer Panels:
 1. Plywood telephone and electrical backer panels, and any other wood designated as fire-retardant treated on drawings, shall be pressure-treated with fire-retardant 2 chemicals to achieve a UL FR-S rating, designating a surface-burning characteristics rating of 25 or less for flame-spread, fuel contributed, and smoke developed, per ASTM E 84, in compliance with AWPA C 20 (lumber) and AWPA C 27 (plywood). Each piece shall be dried to a 15-to-19 percent moisture content after treatment.

2. Acceptable products include: Koppers Dricon, Osmose Flame-Proof, and Hoover Pro-Tex.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Wood Framing:

1. General Requirements:
 - a. Wood construction practices shall conform to recommendations of the NFPA "National Design Specification" and the AITC "Timber Construction Manual".
 - b. All members are to be installed as shown on the drawings.
 - c. When individual members have built-in camber, the members shall be placed with camber up.
 - d. No cutting of holes or notches in trusses for pipe, conduit or other reasons will be allowed.
 - e. All bearing surfaces shall be horizontal and even over the entire width of support.
 - f. Accurately and properly fit and brace all work. Secure in proper position and orientation. Framing, studding and blocking shall be as indicated on the Design Drawings, or as required by the work. See structural's for drawings for stud spacing.
 - g. Cooperate with all other trades as required.
 - h. Use acoustical sealant along shoe and header of all party walls.
2. Cutting and Patching: Do all cutting, patching, heading and blocking required for work of all trades. Notify Telephone Company to place jacks at rough-in stages.
3. Blocking and Supports:
 - a. Install 2" nominal blocking in stud partitions for anchoring all cabinets, mirrors, towel bars, grab bars, handrail brackets and other items applied to or in the walls.

- b. Set all blocking required to erect all exterior and interior woodwork, cabinets, plumbing, electrical and mechanical equipment, rough bucks and blocking for roofing work.
- c. Backing Boards: Install 3/4" plywood backer boards for electrical and mechanical trades as required.
- d. Provide pressure-treated blocking at exterior window openings in steel stud walls.

B. Plywood Installation:

- 1. Plywood sheathing shall be installed with face-grain perpendicular to supports and be continuous over a minimum of two spans.
- 2. End joints of sheets shall be staggered so that joints are not continuous along a support.
- 3. When framing members (including walls and roofs) are 24" or more on center, support edges of plywood sheathing perpendicular to and at midpoints between framing with metal "H" clips or solid blocking.

C. Fastening:

- 1. Fastening shall be as indicated on the Design Drawings, or in accordance with Table 2304.9.1 of the International Building Code.
- 2. Framing supported by concrete or masonry shall be anchored with built-in threaded bolts or lags, as indicated on the design drawings. Powder actuated fasteners shall not be substituted, except in the attachment of wall furring strips.
- 3. Fasteners shall be non-corrosive on exposed and exterior locations and when in contact with pressure treated lumber.

- D. Firestops: Firestops of 2" nominal stock, shall be provided in all concealed spaces not otherwise cut off from passage of air from one space to another.

3.02 CLEAN-UP

- A. Keep the premises and working surfaces in a neat, safe, and orderly condition at all times during execution of this portion of the work.
 - 1. At the end of each day, or more often if necessary, remove accumulation of sawdust, cut-ends, and other debris to proper storage areas for disposal.

- B. Upon completion of this portion of the work, thoroughly clean up the area.

END OF SECTION

**SECTION 06190
METAL-PLATE-CONNECTED WOOD TRUSSES**

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. RELATED DOCUMENTS: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.
- B. Examine all other sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 DESCRIPTION OF WORK:

- A. Definition: Metal-Plate-Connected Wood Trusses include planar structural units consisting of metal plate connected members which are fabricated from dimension lumber and which have been cut and assembled prior to delivery to the job site.
- B. Types of fabricated wood trusses are indicated on the drawings.

1.3 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 06100 - Rough Carpentry

1.4 QUALITY ASSURANCE:

- A. TPI Standards: Comply with all requirements and recommendations of the following Truss Plate Institute (TPI) publications:
 - 1. ANSI/TPI 1 1995, "National Design Standard for Metal-Plate-Connected Wood Truss Construction" including Commentary and Appendices
 - 2. TPI DSB-1989, "Recommended Design specification for Temporary Bracing of Metal-Plate-Connected Wood Trusses."
 - 3. TOI HIB-1991, "Commentary and Recommendations for Handling, Installing & Bracing Metal-Plate-Connected Wood Trusses."
 - 4. TPI DSB-89, "Temporary Bracing of Metal-Plate-Connected Wood Trusses."

- B. Wood Structural Design Standard: Comply with all requirements and recommendations of the National Forest Products Association's NDS-1991, "National Design Specification for Wood Construction."
- C. Lumber Standard: Comply with PS20-70 and with applicable rules of the respective grading inspecting agencies for species and grade of lumber indicated.
- D. Connector Plate Manufacturer's Qualifications: Provide truss connector plates manufactured by a Truss Plate Institute member firm
- E. Fabricator's Qualifications: Provide trusses by a firm which has a record of successfully fabricating trusses similar to type indicated and participates in the TPI "Quality Control Inspection Program" as a licensee authorized to apply TPI marks to trusses.
- F. Uniformity of Manufacture for Connector Plates: Provide metal connector plates from a single manufacturer.

1.5 SUBMITTALS:

- A. The Engineer shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have received and approved all submittals prior to review by the Engineer. All review by the Architect, Engineer and Contractor of submittals shall be completed prior to fabrication and installation of any material or product.
- B. Product Data: Submit fabricator's technical data covering lumber, metal plates, hardware, fabrication process and treatment (if any).
 - 1. Submit certificate, signed by an officer of fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.
- C. Shop Drawings:
 - 1. General: Submit shop drawings, prepared under the supervision of a professional engineer, showing species, sizes and stress grade of lumber to be used; pitch, span, camber, configuration and spacing for each type of truss required; type, size, material, finish, design value and location of metal connector plates; and bearing and anchorage details.
 - 2. Design: To the extent engineering design considerations are indicated as the Fabricator's responsibility, submit design analysis and test reports indicating loading, section modulus, assembled allowable stress, stress diagrams and calculations and similar information needed for analysis and to ensure that trusses comply with requirements.

DANFORTH ON HIGH – PORTLAND, MAINE

3. Engineer Stamp: Provide shop drawings that have been signed and stamped by a structural engineer licensed to practice in the State of Maine.

4. TPI Approval: All drawing submittals must bear a TPI stamp.

1.6 DELIVERY, STORAGE, HANDLING

A. Handle and store trusses with care, and in accordance with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning or other cause for which truss is not designed to resist or endure.

B. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 LUMBER

A. General: Factory mark each plate of lumber with type, grade, mill and grading agency.

B. Sizes: Nominal sizes are indicated except as shown by detail dimensions. Provide actual sizes as required by PS20-70 for dressed lumber, S4S, unless otherwise indicated.

C. Moisture Content: Provide seasoned lumber with a maximum moisture content of 19% at time of dressing.

D. Lumber Grade: Lumber members will be graded in accordance with the following grading agency requirements:

1. Eastern Woods: NELMA or NHPMA

2. Western Woods: WWPA

3. Southern Pine: SPIB

2.2 METAL CONNECTOR PLATES, FASTENERS AND ANCHORAGES

A. Connector Plate Material: Use metal not less than "0.036" thick, coated thickness, (Contractor's option if more than one metal indicated).

1. Galvanized Sheet Steel: ASTM A 446, Grade A, Coating G60.

2. Electrolytic Zinc Coated Steel Sheet: ASTM A 591, Coating Class C, with minimum structural quality equivalent to ASTM A 446, Grade A.

2.3 FABRICATION:

- A. Cut truss members to accurate lengths, angles and sizes to produce close fitting joints with wood-to-wood bearing in assembled units.
- B. Fabricate metal connector plates to size, configuration, thickness and anchorage details required for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with close fitting joints. Position members to produce design camber indicated.
- D. Connect truss members by means of metal connector accurately located and securely fastened to wood members by means indicated or approved.

PART 3 - EXECUTION

3.1 GENERAL

- A: Erect and brace trusses to comply with the recommendations of the Manufacturer and the TPI publications referenced above.
- B. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacing indicated.
- C. Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, applied at designated lift points as recommended by fabricator, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Provide temporary bracing as required to maintain trusses plumb, parallel and in location indicated, until permanent bracing is installed.
- E. Anchor trusses securely at all bearing points to comply with methods and details indicated.
- F. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.
- G. Do not cut or remove truss members.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 06200

FINISH CARPENTRY

1. GENERAL

1.1 GENERAL PROVISIONS: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK:

A. The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

1. All finished carpentry work and millwork as required by Drawings and as specified under this section.
2. Installation of metal and other items furnished by other trades, if specifically noted in these Specifications.

2. PRODUCTS:

2.1 BOARD LUMBER shall comply with the American Lumber Standards Simplified Practice Recommendation No. 16. Grade of board lumber shall be suitable for its intended use. Finish lumber is to be painted and shall be dressed free of tool marks and other objectionable defects. All exposed lumber to be architectural quality grade: Custom.

2.2 INTERIOR TRIM: See Drawings.

2.3 PUBLIC CORIDORS: 1 X 6 Oak baseboard.

2.4 STAIR RISERS AND TREADS: 3/4" APA Plywood.

2.5 STAIR RAILINGS & CORRIDOR RAILS: Similar to Brosco, #75 (1-1/2" x 1-3/4" round).

2.6 STAIR SKIRTBOARDS: Pine or Poplar

2.7 STAIR & CORRIDOR HANDRAIL BRACKETS: Stanley SP7081, Satin brass finish. Secure with #8 or #10 Brass screws of adequate length for wall condition, minimum 1-1/4" into blocking. At CMV wall condition, anchor with 5/8" or 3/4" diameter HILTI HIT HY20 Adhesive Anchor (or similar).

2.8 NAILS: 6d for 1/2" finish stock and 4d finish for thinner wood. Use 8d generally for nailing 3/4" wood trim to framing.

2.9 SCREWS, BOLTS & OTHER FASTENERS: as shown on Drawings with penetration into framing or blocking adequate to support loads shown. Where not shown, consult Architect.

DANFORTH ON HIGH – PORTLAND, MAINE

2.11 COUNTERTOPS: Rounded-edge preformed plastic laminate countertops, color choice of Architect.
See Section 11450-Residential Equipment & Kitchens.

2.12 PLASTIC LAMINATE: See Section 11450

2.13 CLOSET SHELVING: Pre-manufactured plastic coated wire shelving with integral clothes hanger.
Closet Maid or equal.

3. EXECUTION:

3.1 ALL ITEMS OF MILLWORK shall be carefully erected, leveled and plumbed with tight-fitting joints and square corners, carefully cut and secured. Exposed nails shall be set adequately for putty. Moulds and faces shall be free from hammer or other tool marks, clean-cut and true pattern. All work shall be thoroughly cleaned and sanded to receive the finish. Sharp corners of small members of finished woodwork shall be slightly rounded. All trim baseboards, etc. fastened to walls shall be secured to wall framing members and nails set. Care shall be taken to avoid splitting ends of trim boards.

3.2 INTERIOR TRIM: Install trim with finishing nails and glue where required to assure permanent, tight joints, according to drawing details.

3.3 STAIRS: Skirtboards and handrails installed as shown on Drawings (handrails supported every 4'-0" o.c. minimum) secured into solid blocking (1-1/4" minimum screw depth for handrails). Risers and treads to be glued and screwed together.

END OF SECTION

SECTION 06600

PLASTIC FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cellular pvc trim boards for corner boards, soffits, fascias, battens, door pilasters, frieze boards, rake boards, architectural millwork and door/window trim.

1.02 RELATED SECTIONS

A. Section 06 64 00 - Plastic Paneling.

B. Section 06 65 00 - Plastic Simulated Wood Trim.

C. Section 06 66 00 - Custom Ornamental Simulated Woodwork.

1.03 REFERENCES

A. ASTM D792 - Density and Specific Gravity of Plastics by Displacement.

B. ASTM D570 - Water Absorption of Plastics.

C. ASTM D638 - Tensile Properties of Plastics.

D. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

E. ASTM D1761 - Mechanical Fasteners in Wood.

F. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by means of a Striker Impacted by a Falling Weight.

G. ASTM D256 - Determining the Pendulum Impact Resistance of Plastics.

H. ASTM D696 - Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous silica Dilatometer.

I. ASTM D635 - Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

J. ASTM E84 - Surface Burning Characteristics of Building Materials.

K. ASTM D648 - Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

L. ASTM D3679 - Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding.

DANFORTH ON HIGH – PORTLAND, MAINE

1.04 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Product Data: Submit product data, manufacturer's catalogs, SPEC-DATA® product sheet, for specified products.
- C. Samples: Submit three material samples representative of the texture, thickness and widths shown and specified herein.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Check with Local Building Code for installation requirements.
- B. Allowable Tolerances:
 - 1. Variation in component length: -0.00 / +1.00"
 - 2. Variation in component width: $\pm 1/16$ "
 - 3. Variation in component thickness: $\pm 1/16$ "
 - 4. Variation in component edge cut: $\pm 2^\circ$
 - 5. Variation in Density -0% + 10%
- C. Workmanship, Finish, and Appearance:
 - 1. Free foam cellular pvc that is homogeneous and free of voids, holes, cracks, and foreign inclusions and other defects. Edges must be square, and top and bottom surfaces shall be flat with no convex or concave deviation.
 - 2. Uniform surface free from cupping, warping, and twisting.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Trim materials should be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

1.07 WARRANTY

- A. Provide manufacturer's 25 year warranty against defects in manufacturing that cause the products to rot, corrode, delaminate, or excessively swell from moisture.

PART II PRODUCTS

2.01 MATERIALS

- A. Acceptable products: AZEK® Trimboards manufactured by Vycom Corporation, 801 Corey Street, Moosic, PA 18507.

DANFORTH ON HIGH – PORTLAND, MAINE

B. Material: Free foam cellular pvc material with a small-cell microstructure and density of .55 grams/cm³.

1. Material shall have a minimum physical and performance properties specified in Section C on the following page.

C. Performance and physical characteristic requirements:

<u>PROPERTY</u>	<u>UNITS</u>	<u>VALUE</u>	<u>ASTM METHOD</u>
PHYSICAL			
Density	g/cm ³	0.55	D 792
Water Absorption	%	0.15	D 570
MECHANICAL			
Tensile Strength	psi	2256	D 638
Tensile Modulus	psi	144,000	D 638
Flexural Strength	psi	3329	D 790
Flexural Modulus	psi	144,219	D 790
Nail Hold	Lbf/in of penetration	35	D 1761
Screw Hold	Lbf/in of penetration	680	D 1761
Staple Hold	Lbf/in of penetration	180	D 1761
Gardner Impact	in-lbs	103	D 5420
Charpy Impact (@23°C)	ft-lbs	4.5	D 256
THERMAL			
Coefficient of Linear Expansion	in/in/°F	3.2 x 10 ⁻⁵	D 696
Burning Rate	in/min	No burn when flame removed	D 635
Flame Spread Index	--	25	E 84
Heat Deflection Temp 264 psi	°F	150	D 648
Oil Canning (@140°F)	°F	Passed	D 648

2.02 ACCESSORY PRODUCTS

A. Fasteners:

- Use fasteners designed for wood trim and wood siding (thinner shank, blunt point, full round head) with AZEK®.
- Use a highly durable fastener such as stainless steel or hot-dipped galvanized.
- Staples, small brads and wire nails must not be used as fastening members.
- The fasteners should be long enough to penetrate the solid wood substrate a minimum of 1 1/2".
- Standard nail guns work well with AZEK trim products.
- Use 2 fasteners per every framing member for trimboards applications. Trimboards 12" or wider, as well as sheets, will require additional fasteners.
- Fasteners must be installed no more than 2" from the end of each board.
- AZEK should be fastened into a flat, solid substrate. Fastening AZEK into hollow or uneven areas must be avoided.
- Pre-drilling is typically not required unless a large fastener is used or product is installed in low temperatures.

DANFORTH ON HIGH – PORTLAND, MAINE

- 3/8" and 1/2" sheet product is not intended to be ripped into trim pieces. These profiles must be glued to a substrate and mechanically fastened.

B. Adhesives:

- Glue all AZEK to AZEK joints such as window surrounds, long fascia runs, etc. with AZEK Adhesive, a cellular pvc cement, to prevent joint separation.
- The glue joint should be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.
- AZEK Adhesive has a working time of 10 minutes and will be fully cured in 24 hours.
- If standard pvc cements are used, keep in mind these products typically cure quickly which will result in limited working time and may reduce adhesive strength.
- Surfaces to be glued should be smooth, clean and in complete contact with each other.
- To bond AZEK to other substrates, various adhesives may be used. Consult adhesive manufacturer to determine suitability.

C. Sealants:

- Use urethane, polyurethane or acrylic based sealants without silicone. Page 3 of 4

2.03 FINISHES

A. AZEK products do not require paint for protection, but may be painted to achieve a custom color.

B. Preparation:

- No special surface preparations are required prior to painting - sanding is not necessary for paint adhesion.
- Surface must be clean and dry.
- If desired, nail holes may be filled with polyurethane or acrylic based caulk.
- Use a 100% acrylic latex paint with a Light Reflective Value (LRV) of 55 or higher.
- Follow the paint manufacturer's recommendations to apply.

PART III EXECUTION

3.01 INSTALLATION

A. Manufacturers instructions:

- Comply with manufacturer's product catalog installation instructions and product technical bulletin instructions.

B. Cutting:

- AZEK products can be cut using the same tools used to cut lumber.
- Carbide tipped blades designed to cut wood work well. Avoid fine tooth metal cutting blades.
- Rough edges from cutting may be caused by excessive friction, poor board support, or worn or improper tooling.

DANFORTH ON HIGH – PORTLAND, MAINE

C. Drilling

- AZEK products can be drilled using the same tools used to drill lumber.
- Drilling AZEK products is similar to drilling a hardwood. Care should be taken to avoid frictional heat buildup.
- Use standard woodworking drills. Do not use drills made for normal rigid pvc.
- Periodic removal of AZEK shavings from the drill hole may be necessary.

D. Milling

- AZEK products can be milled using standard milling machines used to mill lumber.
- Relief Angle 20° to 30°
- Cutting speed to be optimized with the number of knives and feed rate.

E. Routing

- AZEK products can be routed using standard router bits and the same tools used to rout lumber.
- Carbide tipped router bits are recommended.

F. Edge Finishing

- Edges can be finished by sanding, grinding or filing with traditional woodworking tools.

G. Nail Location

- Use 2 fasteners per every framing member for trimboard applications.
- Trimboards over 12" or wider, as well as sheets, will require additional fasteners.
- Fasteners must be installed no more than 2" from the end of each board.

H. Thermal Expansion and Contraction

- AZEK products expand and contract with changes in temperature.
- Properly fastening AZEK material along its entire length will minimize expansion and contraction.
- When properly fastened, allow for 1/8" per 18 foot of AZEK product for expansion and contraction.
- Joints between pieces of AZEK should be glued to eliminate joint separation. When gaps are glued on a long run of AZEK, allow expansion and contraction at ends of the run.

END OF SECTION

SECTION 07100
DAMPPROOFING AND WATERPROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Under-Slab-On-Grade Vapor Retarder
 - 2. Below grade foundation waterproofing

- B. Related Sections:
 - 1. Section 03300 - Cast-In-Place Concrete
 - 2. Section 04200 - Unit Masonry
 - 3. Section 07200 – Thermal Protection

1.02 SYSTEM DESCRIPTION

- A. General: Provide waterproofing that prevents the passage of liquid water under hydrostatic pressure and complies with requirements as demonstrated by testing performed by an independent testing agency of manufacturer's current sheet membrane.
- B. Provide waterproofing at slab on grade and at elevator pit.

1.03 SUBMITTALS

- A. Submit "Letter of Conformance" with the following supporting data:
 - 1. Include product data on each type of dampproofing and waterproofing product specified, including data substantiating that materials comply with specified requirements.
 - a. Mark each copy to identify applicable products, characteristics, models, options and other supplemental data to clearly communicate information specific to this project.
- B. Samples, 3 x 6 inches minimum size, of each fluid-applied and sheet membrane waterproofing material specified for Project.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed fluid-applied and sheet membrane waterproofing applications similar in material, design, and extent to that indicated for Project and that has resulted in construction with a record of successful in-service performance.
 - 1. Assign work closely associated with waterproofing, including (but not limited to) waterproofing accessories, and flashings used in conjunction with waterproofing, expansion joints in membrane, insulation, and protection course on membrane, to Installer of fluid-applied waterproofing, for single, undivided responsibility.
- B. Single-Source Responsibility: Obtain primary waterproofing materials of each type required from a single manufacturer.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.

1.06 PROJECT CONDITIONS

- A. Environmental Conditions: Apply waterproofing within range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during penetration and application of waterproofing materials.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

- A. General Compatibility: Provide products that are recommended by manufacturer to be fully compatible with indicated substrates.

2.02 UNDER-SLAB-ON-GRADE VAPOR RETARDER:

- A. Vapor Retarder Under-Slabs-On-Grade:
 - a. Polyethylene vapor barrier material shall be placed under all concrete slabs on grade. Provide in lengths and widths required for least number of seams.
 - b. Vapor barrier minimum thickness of ten (10) mils.
 - c. Lap all joints minimum six (6) inches and seal with mastic or tape. All pipe penetrations sealed with tape.
 - d. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.03 BELOW GRADE FOUNDATION WATERPROOFING:

- A. Waterproofing:
 - 1. Trowel applied waterproofing membrane.
 - 2. Manufacturers:
 - a. "Thorseal Foundation Coating, No. T1180"; Thoro Consumer Products (216-839-7171)
 - b. Or equal.

2.04 MISCELLANEOUS MATERIALS

- A. In addition to primary waterproofing materials, provide the following:

DANFORTH ON HIGH – PORTLAND, MAINE

1. Primer/Filler/Sealer: As recommended by waterproofing manufacturer.
2. Flashings, Cant Strips, and Accessories: As recommended by waterproofing manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions under which waterproofing systems will be applied, with Installer present, for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.
 1. Do not proceed with installation until after minimum concrete curing period recommended by waterproofing manufacturer.
 2. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
- B. Inspect concrete and concrete masonry surfaces for:
 1. Contamination: Algae, chalkiness, dirt, dust, efflorescence, form oil, fungus, grease, mildew or other foreign substances.
 2. Surface absorption and chalkiness.
 3. Cracks: Measure crack width and record location of cracks.
 4. Damage and deterioration.
 5. Moisture content and moisture damage:
 - a. Use a moisture meter to determine if the surface is dry enough to receive the air and moisture barrier and record any areas of moisture damage or excess moisture.
 6. Compliance with specification tolerances:
 - a. Record areas that are out of tolerance (greater than 1/4 inch in 8-0 feet deviation in plane).
- C. Notify Architect in writing of anticipated problems using waterproofing over substrate.

3.02 PREPARATION

- A. Clean substrate of projections and substances detrimental to work; comply with instructions of prime materials manufacturer.
- B. Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown.
- C. Fill voids, seal joints, and apply bond breakers as recommended by prime materials manufacturer.
- D. Prime substrate as recommended by prime materials manufacturer.

3.03 INSTALLATION - GENERAL

- A. Comply with manufacturer's written installation recommendations, including preparation of substrate surfaces, detail coatings of joints and planar changes in substrate, and priming of substrates.
- B. Mix separately packaged components in accordance with manufacturer's written recommendations.

DANFORTH ON HIGH – PORTLAND, MAINE

3.04 INSTALLATION - UNDER-SLAB-ON-GRADE VAPOR RETARDER

- A. General: Extend vapor and moisture barriers to extremities of areas to be protected from vapor transmission. Extend vapor and moisture barriers to cover miscellaneous voids in insulated substrates, including those which have been stuffed with loose fiber-type insulation.
- B. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape of type recommended by vapor retarder manufacturer to create an air-tight seal between penetrating objects and vapor retarder.
- C. Repair any tears or punctures in vapor and moisture barriers immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.05 PROTECTING AND CLEANING

- A. Protect waterproofing from damage and wear during application and remainder of construction period, according to manufacturer's written instructions.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07200
Moisture and Thermal Protection
Spray Foam Insulation

CORBOND® III Performance Insulation System®

All spray applied insulation as shown on drawings or Specified herein shall be the **CORBOND Performance Insulation System®** as manufactured by Corbond Corporation of Bozeman, Montana OR EQUAL.

CORBOND shall be installed by technicians in accordance with manufacturer's instructions.

I. GENERAL

A. Related documents: The general provisions of the contract and all codes and standards referenced.

B. Description of the Work:

1. The extent of **CORBOND** insulation is shown on the drawings.
2. The applications of **CORBOND** include the following:
 - a. Rigid spray-in-place perimeter floor header (box sill, rim joist) insulation. Provide minimum R-Value of 21 at all exterior wall applications. (Thermal barrier requirement exception at floor header for class 1, 1.5 – 2.0 lb. spray foam when applied at 3.25 thickness or less per IBC/IRC).
3. **Related Work:**
 - a. Spray-on Thermal Barrier: Division 7 (071).
 - b. Spray-on Ignition Barrier: Division 7 (071).
 - c. Gypsum Drywall System: Division 9 (092000).
4. **Quality assurance:**
 - a. Thermal Conductivity: $K = .15$ (ASTM-C-518).
 - b. R-Factor = 6.6 per inch.
 - c. Density = 2.0 lbs/cu ft. in-place (ASTM D-1622).
 - d. Permeance = .90 at 2.5 inch thickness (ASTM-E-96).
 - e. Surface Burning Characteristics: Class I (ASTM-E-84-91a) **Flame Spread <25, Smoke Density <450. (1.5 inch, 4inch, 6inch)
 - f. Recognizable lavender trademark color.
5. **Product handling:**
 - a. Do not store containers in direct sunlight. Keep drums covered. Empty container disposal by technicians in accordance with current law and industry standard practice.
 - b. Store raw materials at 60° F to 70° F.
 - c. Fire hazard class of raw material stored on site: Combustible liquid, Class 3B.
 - d. Transportation Class 55, NOIBN, Non-Hazardous

DANFORTH ON HIGH – PORTLAND, MAINE

- e. **WARNING:** Breathing hazard during application of insulation materials. Do not enter without proper respiratory protection. No smoking or open flame.
 - f. Process materials in accordance with **CORBOND** published Technical Data.
6. **Job Conditions:**
- a. Examination of substrate: Technicians will examine the substrate and conditions under which the spray insulation work is to be performed, and notify the contractor in writing of any unsatisfactory conditions, such as: 1. Excessive dirt or oil on substrate. 2. Excessive moisture present as dampness, dew, frost or water. 3. Substrate temperatures outside applicable limits.
 - b. Cover tools and work of other trades as required to prevent damage from overspray.
 - c. Do not weld or torch near **CORBOND**. Cover as soon as possible with subsequent work.

II. PRODUCTS

A. Materials:

- 1. Crawlspace perimeter and floor header (box sill, rim joist) insulation: **CORBOND** Performance Insulation System® installed to thickness required to provide R-Value of 21.

III. EXECUTION

A. Installation:

Installation of the **CORBOND** Performance Insulation System® is performed by technicians familiar with the processing of two component polyurethane foams and in complete accord with application instructions provided by the manufacturer. These technicians employ equipment with preset component ratio and electronically controlled heat input to assure in-place consistency of finished product and performance. Contact **CORBOND** Corporation, Bozeman, Montana, (888) 949-9089 or direct at (406) 586-4585.

END OF SECTION

SECTION 07210

THERMAL INSULATION

1.1 SUMMARY

- A. Applications:
 - 1. Cavity-wall insulation.
 - 2. Concealed building insulation.
 - 3. Exposed building insulation.
 - 4. Loose-fill building insulation.
 - 5. Self-supported, spray-applied cellulosic insulation.
 - 6. Sound attenuation insulation.

1.2 PERFORMANCE REQUIREMENTS

- A. Product meets ASTM E 84 for surface burning characteristics.
- B. Product is tested for ASTM E 90 for STC ratings.
- C. Product is tested to ASTM C 739 standards.
- D. Product is tested to ASTM E 119 standards.

1.3 MATERIALS

- A. Insulation:
 - 1. 1. Cellulose Spray-on Insulation: Installed Density 3.2 lb/cu. ft. (51 kg/cu. m)
 - 2. 2. Cellulose Attic Insulation: Installed Density 1.60 lb/cu. ft. (26 kg/cu.)

Product Specification

1. PRODUCT NAME

NU-WOOL Premium Cellulose and WALLSEAL are registered trademarks for NU-WOOL Co. Inc.

2. MANUFACTURER

NU-WOOL Premium Cellulose is made from recycled paper (85%) and is packaged in 26 pound bags. Installation is done by factory trained installers. NU-WOOL WALLSEAL Cellulose Insulation is a spray-in-place cellulose insulation made from recycled paper, primarily newspaper. It is installed in both attics and walls of residential and commercial buildings because of its superior thermal and air

DANFORTH ON HIGH – PORTLAND, MAINE

infiltration properties. WALLSEAL is an energy-saving material that has an R-Value of 3.8 per inch, and will last for the life of the structure. NU-WOOL uses borate chemicals as a fire retardant, making NU-WOOL WALLSEAL Cellulose Insulation one of the most environmentally friendly materials used in home construction.

3. PRODUCT DESCRIPTION

NU-WOOL Insulation is an energy-saving insulation made from recycled newspapers. NUWOOL Insulation, with its superior thermal and air infiltration properties, is installed in both attics and walls of residential and commercial buildings. This environmentally friendly, “green” insulation provides up to 40% savings on energy bills when compared to conventional insulation materials. NU-WOOL Insulation also contains an E.P.A. registered fungicide making it resistant to the growth of mold.

WALLSEAL is applied by a spray-on method that insures the correct density to prevent settling while making the wall resistant to air movement and achieving maximum thermal performance.

4. TECHNICAL DATA

4.1 All cellulose insulation must conform to the CPSC standard 16 CFR Part 1209 and 1404. NU-WOOL also meets ASTM C-739. Also refer to UL R-8078 and R-13173.

4.2 Density is measured using ASTM C-739 standards and is 1.6 lb/ft³.

4.3 Thermal resistance was measured by test method ASTM C-518 (4 in. thick) and is 3.8 (R-value/in.)

4.4 Surface Burning Characteristics: Surface burning characteristics are determined using two methods. Critical radiant flux using test method ASTM E 970 and ASTM E 84.

ASTM E 970 Greater than 0.12 watts/CM²

ASTM E 84 Less than 25, Class 1

4.5 Moisture Vapor Sorption: NU-WOOL meets the requirements of ASTM C 739 of less than 15% maximum weight gain under test conditions. Variations in relative humidity will not affect the thermal properties of the insulation.

4.6 Corrosiveness: NU-WOOL is tested for contact against copper, steel and aluminum under the test conditions of ASTM C 739 and is not corrosive to these metals.

4.7 Building Codes: NU-WOOL meets all the current building codes.

4.8 Sound Transmission Loss (STC) Ratings: NU-WOOL has been tested for numerous wall assemblies at Riverbank Laboratories using ASTM E 90. Specific wall assemblies are listed in this book.

4.9 Other Test Properties: Under ASTM C 739, there are tests for fungi resistance, odor and smolder resistance.

www.nuwool.com 1-8 00-74 8-01 28

END OF SECTION 072100

SECTION 07460

SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fiber cement siding panels, fascia, moulding and accessories.

1.2 RELATED SECTIONS

- A. Section 05400 – Light Gage Metal Framing: Wall framing and bracing.
- B. Section 06100 – Rough Carpentry: Wood framing and bracing.
- C. Section 06100 – Rough Carpentry: Sheathing.
- D. Section 07210 – Insulation: Exterior wall insulation.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

DANFORTH ON HIGH – PORTLAND, MAINE

3. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

- A. Product Warranty: Limited product warranty against manufacturing defects.
 1. Hardieplank lap and Hardipanel vertical siding for 50 years.
 2. HardieTrim for 10 years.
- B. Finish Warranty: Limited product warranty against manufacturing finish defects.
 1. When used for its intended purpose, properly installed and maintained according to Hardie's published installation instructions, James Hardie's ColorPlus finish with ColorPlus Technology, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip.
- C. Workmanship Warranty: Application limited warranty for 2 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: James Hardie Building Products, Inc; 26300 La Alameda, Suite 250, Mission Viejo, CA 92691. ASD. Toll Free Residential: (888) J-HARDIE. Toll Free Commercial: (866) 274-3464. Tel: (949) 348-1800. Fax: (949) 367-0185. Email: info@JamesHardie.com. Web - Residential: <http://www.jameshardie.com>. Web - Commercial: <http://www.jameshardiecommercial.com>.
- B. Substitutions: Not permitted.
- C. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01600.

DANFORTH ON HIGH – PORTLAND, MAINE

2.2 SIDING

- A. Code Compliance Requirement for Materials:
 - 1. National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI)
 - 2. City of Los Angeles, Research Report No. 24862
 - 3. Metro Dade County, Florida Acceptance No. 07-0148, 04
 - 4. US Department of Housing and Urban Development Materials Release 1263d
 - 5. California DSA PA-019.
 - 6. City of New York M EA 223-93-M.
 - 7. Non-asbestos fiber-cement siding where required to be non-combustible shall be tested in accordance with ASTM E136.
- B. Lap Siding: Hardieplank as manufactured by James Hardie Building Products, Inc.
 - 1. Type: Smooth 6-1/4 inches (159 mm) with 5 inches (127 mm) exposure.
- C. Vertical Siding: Hardiepanel as manufactured by James Hardie Building Products, Inc.
 - 1. Type: Smooth Vertical siding panel 4 feet by 8 feet (1219 mm by 2438 mm).
- D. Trim: Hardietrim Fascia and Moulding as manufactured by James Hardie Building Products, Inc.

2.3 FASTENERS

- A. Wood Framing Fasteners:
 - 1. Wood framing: 6d common corrosion resistant nails.
- B. Metal Framing:
 - 1. Metal framing: 1-5/8 inches (41 mm) No. 8-18 by 0.323 inch (8.2 mm) head self-drilling, corrosion resistant S-12 ribbed buglehead screws.

2.4 FINISHES

- A. Factory Primer: Provide factory applied universal primer.
 - 1. Primer: PrimePlus by James Hardie.
 - 2. Topcoat: Field finish two (2) coats.
- B. Factory Finish: Refer to Exterior Finish Schedule.
 - 1. Product: ColorPlus by James Hardie.
- C. Factory Finish Color for Trim, Soffit and Siding Colors: - By Architect

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Nominal 2 inch by 6 inch (51 mm by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
 - 1. Install water-resistive barriers and claddings to dry surfaces.
 - 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
 - 3. Protect siding from other trades.
- D. Minimum 20 gauge 6 inch (92 mm) C-Stud 16 inches maximum on center metal framing complying with local building codes, including the use of water-resistive barriers and/or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
 - 1. Install water-resistive barriers and claddings to dry surfaces.
 - 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
 - 3. Protect siding from other trades.

3.2 PREPARATION

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

3.3 INSTALLATION - HARDIEPLANK SIDING

- A. Install materials in strict accordance with manufacturer's installation instructions.
- B. Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
- C. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- D. Align vertical joints of the planks over framing members.
- E. Maintain clearance between siding and adjacent finished grade.
- F. Locate splices at least one stud cavity away from window and door openings.
- G. Use off-stud metal joiner in strict accordance with manufacturer's installation instructions.
- H. Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.
- C. Face nail to sheathing.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Locate splices at least 12 inches (305 mm) away from window and door openings.
- E. Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.

3.4 INSTALLATION - HARDIEPANEL SIDING

- A. Install materials in strict accordance with manufacturer's installation instructions. (See instructions at end of section) Use "Extruded Aluminum Details" from James Hardie with Aluminum Piers by Fry Reglet Inc.
- B. Block framing between studs where Hardiepanel siding horizontal joints occur.
- C. Place fasteners no closer than 3/8 inch (9.5 mm) from panel edges and 2 inches (51 mm) from panel corners.
- D. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- E. Maintain clearance between siding and adjacent finished grade.
- F. Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.

3.5 INSTALLATION – HARDIE SHINGLESIDE CLADDING

- A. Install materials in strict accordance with manufacturer's installation instructions.
- B. Substrate: Install a minimum 7/16 inch (11 mm) thick OSB wall sheathing or equivalent braced walls complying with applicable building codes.
- C. Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall.
- D. Maintain clearance between siding and adjacent finished grade.
- E. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- F. Wind Resistance: Where a specified level of wind resistance is required Hardie Shingleside cladding is installed to substrate and secured with a minimum two fasteners described in Table No. 6, 7 and 8 in National Evaluation Service Report No. NER-405.

3.6 FINISHING

- A. Finish unprimed siding with a minimum one coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within

DANFORTH ON HIGH – PORTLAND, MAINE

90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

- B. Finish factory primed siding with a minimum of one coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.7 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 07500 ROOFING AND FLASHING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Fully adhered EPDM sheet roofing, tapered and flat roof insulation, elastomeric flashing, copper siding, copper flashings, copper edge strips, tapered edge strips and roof drains.

1.02 CODES, REGULATIONS AND STANDARDS

A. Contractor Responsibility: The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State and local codes, regulations and standards pertaining to work practices, hauling, disposal, protection of workers and visitors to the site, and persons occupying areas adjacent to the site. This includes modification of procedures to comply with changes to codes, regulations and standards which occur during the work of this contract. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable Federal, State and local regulations. The Contractor shall hold the Owner and Owner's Representatives harmless for failure to comply with any applicable work, hauling, disposal, safety, health or other regulations on the part of himself, his employees or his subcontractors.

1.03 QUALITY ASSURANCE

A. Roofing contractor to be approved in writing by the membrane manufacturer. Contractor shall be able to substantiate that he has been trained by the membrane manufacturer.

B. Roofing and flashing workmanship to comply with industry standards. The National Roofing Contractors Association's (NRCA) **ROOFING AND WATERPROOFING MANUAL** along with **ARCHITECTURAL SHEET METAL MANUAL** as published by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) will be used to establish industry standards.

1.04 SUBMITTALS

A. Sample fifteen (15) year watertight warranty for the EPDM membrane.

B. Sample twenty (20) year material warranty for the EPDM membrane.

C. Current EPDM membrane manufacturer's application specifications.

D. Shop drawings of each flashing condition, such as eave, curb, vent, wall termination, fascia and siding. Show securement of panels and clips, spacing, type and number of fasteners.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in their original, unopened containers, clearly labeled with

DANFORTH ON HIGH – PORTLAND, MAINE

manufacturer's name. All material to be stored in waterproof trailers or sheds, up on raised platforms and under lock and key until use. Do not use materials damaged in handling or storage. Replace damaged material with new material. Store adhesives between 60 and 80 degrees F. Should they be exposed to lower temperatures, restore to room temperature for three to five days prior to use.

1.06 WARRANTY

- A. A ten (10) year watertight warranty and twenty (20) year material warranty shall be issued by the EPDM membrane manufacturer.
- B. The roofing contractor shall furnish the Owner with his personal two (2) year watertight warranty.

PART 2 PRODUCTS

2.01 ROOF INSULATION

- A. Tapered and flat roof insulation to be polyisocyanurate closed-cell foam core with manufacturer's standard facing laminated to both sides, complying with FS HH-I-1972/2, Class 1. The roof is to receive an average thickness of 8 ½", to achieve slopes as necessary to drain water, isocyanurate, refer to the drawings and specifications. Both 1/8" per foot and 1/2" per foot tapered isocyanurate will be required. Roof insulation to be ISO 95+ by Firestone, H-Shield by Hunter Panels or approved equal.
- B. Over all foam insulation, install one layer of 1/2" high density fiberboard roof insulation. The high density fiberboard roof insulation to be Structodek by Wood Fiber Industries, High Density Fiberboard by the Celotex Corp. or approved equal. **EPDM to be "Low Slope Fire Resistant" LSFR meeting U.L. - B. - FA.- 38.**
- C. Tapered edge strips to be 1-1/2" by 18" fiberboard. Use the tapered edge strips at the drains to create an additional sump for the drains.

2.02 MEMBRANE ROOF SYSTEM

- A. Membrane roofing to be fully adhered .060" EPDM sheet roofing furnished in twenty five foot (25') wide (or wider) rolls by Firestone, Carlisle or Versico. Roof membrane to be fully adhered to the 1/2" high density fiberboard roof insulation.
- B. Use the roof membrane for flashing of curbs and walls per the manufacturer's standard details. Use reinforced EPDM anchor strips to avoid splice joints at walls and edges.
- C. Adhesives, sealants, thinner, cleaner and accessories to be furnished by the membrane manufacturer.
- D. **Six inch (6") wide seam tape will be required for all field seams.**

2.03 METAL FLASHING

- A. Edge strip to be formed using 16 ounce copper. Concealed clips to be formed using 20 ounce plain copper.
- B. Cap flashing to be formed using 16 ounce plain copper.

DANFORTH ON HIGH – PORTLAND, MAINE

2.04 FASTENERS

- A. Use fasteners recommended by the membrane manufacturer to secure anchor bars and termination bars.
- B. Fasteners used to secure roof insulation to the wood deck to be #14-10 Heavy Duty Roofing Fasteners with CR-10 coating, a minimum shank diameter of 0.170" and a thread diameter of 0.125". Pressure plates to be 3" diameter Galvalume plates. Screws and plates to be manufactured by Olympic Fasteners or approved equal. Length, size and accessories to be as required by the EPDM membrane manufacturer selected.
- C. Copper flashing to be secured with annular-ring copper nails as shown on attached drawings.

PART 3 EXECUTION

3.01 PREPARATION OF SURFACES

- A. Surfaces on which the roofing system is to be applied shall be clean, smooth, dry, free of fins, rot, sharp edges, loose and foreign materials, oil and grease.

3.02 ROOF INSULATION

- A. Insulation shall be tightly butted with joints not more than 1/8" in width. Stagger joints with those in layer below. Fiberboard to be installed with a 1/16"-1/8" gap at all joints when board size is greater than 2' x 4'.
- B. Fasten insulation to the roof deck with the appropriate screws and plates. Fastener quantity and layout must meet all requirements that may be imposed by the EPDM manufacturer to obtain their warranty.
- C. Stagger joints in one direction for each course. For multiple layers, stagger joints in both directions between courses leaving no gaps, allowing a complete thermal envelope to be formed.
- D. Provide tapered units to suit drainage pattern indicated.
- E. Do not install more insulation in a day than can be covered with membrane before end of day or before start of inclement weather.

3.03 ROOF MEMBRANE

- A. Adhere the .060" EPDM membrane to the 1/2" high density fiberboard in strict accordance with the manufacturer's specifications.
- B. **Six inch (6") wide seam tape will be required for all field seams.**
- C. Install an additional layer of roof membrane material, loosely applied, for additional protection at locations shown to receive concrete paver system.

3.04 FLASHING - - WALLS, PARAPETS, CURBS AND VENTS

- A. Use the longest pieces of material which are practical. All flashing and terminations shall be done in accordance with the applicable manufacturer's details.
- B. Care must be taken to set the elastomeric flashing so it does not bridge where there

DANFORTH ON HIGH – PORTLAND, MAINE

is a change of direction (i.e. where a parapet meets the roof deck). This can be accomplished by creasing the membrane into the angle change prior to adhering up the wall. Excess bridging will be cause for rejection and will be re-done at the contractor's expense.

C. Install termination bars at the top of all base flashing, fastening a minimum of 6" on center.

3.05 METAL FLASHING

A. Bottom edge of copper edge strips to be secured with continuous cleats. Nail top flange with annular-ring nails, three inches (3") on center. Strip top flange with 6" pressure sensitive flashing.

B. Submit details of all proposed flashing conditions.

3.06 TEMPORARY WATER CUT-OFF

A. Temporary water cut-offs are to be constructed at the end of each working day to protect the insulation, roofing, building and building interior from damage due to wind, snow and rain.

B. Temporary water cut-offs are to be detailed by the contractor and approved by the manufacturer and Owner.

3.07 CLEAN UP

A. Site clean-up shall be complete and to the satisfaction of the Owner.

B. All roofs, building, landscape and parking areas shall be cleaned of all trash, debris and dirt caused by or associated with this work.

C. Any areas stained, dirtied, discolored or otherwise damaged due to this work shall be cleaned, restored and replaced as required.

D. All debris shall be removed from the premises promptly and the construction area left clean daily.

3.08 INSPECTION AND TESTING

THE OWNER RESERVES THE RIGHT TO INSPECT AND TEST ALL CONSTRUCTION OPERATIONS AND MATERIALS.

A. Any defect or noncompliance discovered by inspection shall be reported to the contractor who shall promptly remove any defective material from the site.

B. The Owner reserves the right to inspect the work or parts of it as he chooses. His failure to inspect the work in progress shall not relieve the contractor of the responsibility for properly executing the contracted work, nor shall it impair the Owner's right to reject deficiencies he may subsequently discover.

PART 4 JOB CONDITIONS

A. Roofing to be applied in dry weather.

B. Completed roof areas shall not be trafficked. The work shall be coordinated to

DANFORTH ON HIGH – PORTLAND, MAINE

prevent this situation by working toward the roof edges.

C. This project is subject to compliance with all requirements of the Occupational Safety and Health Administration (OSHA). All work on this project must meet the requirements of all applicable state and local codes, laws and ordinances.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 07650 FLEXIBLE FLASHING ACTIVE DRAINAGE PLANE SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes combination flashing, mortar deflection, and weep as complete one step system. Using this system deletes requirement for mortar deflection devices and may lessen requirements for weep spacing.
- B. Related sections:
1. 04 05 23 Masonry Accessories.
 2. 04 21 13 Brick Masonry
 3. 04 22 00 Concrete Unit Masonry
 4. 04 22 23 Architectural Concrete Unit Masonry
 5. 04 42 00 Exterior Stone Cladding.
 6. 04 72 00 Cast Stone Masonry.
 7. 05 40 00 Cold Formed Metal Framing.
 8. 06 10 00 Rough Carpentry.
 9. 07 11 10 Dampproofing or Liquid Applied Air Barrier
 10. 07 60 00 Flashing and Sheet Metal.
 11. 07 65 00 Flexible Flashing.
- C. Alternates: This Section is alternative method replacing mortar deflection device specified in Masonry Accessories Section and flashing specified in Flexible Flashing Section; includes deletion of accessory metal drip edge where specified or required.

1.02 REFERENCES

- A. Standards of the following as referenced:
1. ASTM.
 2. Brick Industry Association (BIA).
 3. Copper Development Association, Inc. (CDA).
- B. Industry standards:
1. BIA *Technical Notes on Brick Construction No. 7, Water Penetration Resistance- Design and Detailing*, August 2005.
 2. BIA *Technical Notes on Brick Construction No. 28B, Brick Veneer/Steel Stud Walls*, August 2005.

1.03 DEFINITIONS

- A. Terms:
1. Cavity wall flashing: Same as flexible flashing.
 2. Foundation sill flashing: Same as flexible flashing.
 3. Flexible flashing: Water-proof material typically used in cavity wall construction to contain and assist in the proper water drainage that may penetrate wall system veneer. Other materials may be required to constitute the system.
 4. Head and sill flashing: Same as flexible flashing.
 5. Through-wall flashing:
 - a. Generally considered the same as flexible flashing.
 - b. Rare definition referred to full width cap flashing under copings or wall caps.

1.04 SUBMITTALS

- A. Product data: Indicate material type, composition, thickness, and installation procedures.
- B. Samples: 3" by 5" flashing material.

DANFORTH ON HIGH – PORTLAND, MAINE

C. Product Quality & Environmental submittals:

1. **Certificates:**
 - a. Indicate materials supplied or installed are asbestos free.
 - b. Indicate recycled content: 90% total recycled material; based on 80% Post Industrial Recycled Content and 10% Post Consumer Recycled Content.
2. **Critical Performance Attributes:**
 - a. Tensile Strength, 31,500 psi minimum average
 - b. Puncture Resistant, >285 pound average
 - c. When tested as manufactured, product resists growth of mold pursuant to test method ASTM D 3273-94.
 - d. Non-woven fabric passes ASTM G21 resistance to growth of fungi
3. **Specifier's Note:** Products/systems that meet/exceed the above listed Certificates and/or performance criteria **come with a Life of the Wall Warranty**

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Provide flashing materials by single manufacturer with not less than ten years of experience in manufacturing flexible flashing products.

1.06 WARRANTY

A. Special warranty:

1. Manufacturer: **Warrant flexible flashing/drainage system material for life of the wall.**
2. Begin warranty at Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

A. 3 ounce copper core flexible flashing with wicking fabric:

1. Product standard of quality:
 - a. York Manufacturing, Inc.; York Flash-Vent 3oz., (www.yorkmfg.com)
2. Characteristics:
 - a. Type: 3 ounce copper core with non-asphalt adhesive fabric laminated to one copper face and non-woven wicking fabric laminated to opposing face with non-asphalt adhesive.
 - b. Copper type, ASTM B248-06: CDA Alloy 110, 060 temper.
 - c. Fabrics:
 - 1) Polypropylene fabric; laminated back face copper core with core weight manufacturer identified on product with color coded laminate.
 - 2) Non-woven wicking fabric: Fabric laminated to front face.
 - d. Size: Manufacturer's standard width rolls.
 - e. Polyether sealant: York Mfg UniverSeal US-100
 - f. Corner and splice material: York Multi-Flash 500, 3 ounce, or pre-manufactured corners.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Install where indicated, specified, or required in accord with flashing manufacturer's written instructions and as follows.
 - a. Splicing material on material width to manufacture wider pieces is prohibited unless flashing detail requires material wider than normally manufactured.
 - b. Prohibited practice: Bonding or splicing copper to non-woven wicking fabric or non-woven wicking fabric to non-woven wicking fabric.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Extend flashing 6" minimum, beyond opening, each side without stretching flashing material. Fold flashing ends at end of openings or horizontal flashing terminations to form end dam or use preformed end dams from manufacturer.
3. Flashing width: Width required starting flush with outside face of exterior wythe, extending through cavity, rising height required to extend above lintel steel at least 2".
4. Splice end joints by butting ends together over 12" wide piece of Multi-Flash copper flashing and sealing lap joint with UniverSeal US-100 polyether sealant.
5. Masonry back up:
 - a. Surface apply after dampproofing installation specified in Dampproofing Section in accord with manufacturer's installation instructions.
 - b. Apply flashing with wicking surface to outside.
 - c. Fasten to masonry back-up surface at top by embedding in layer of UniverSeal US-100 polyether sealant or use a termination bar, like the T96 by York, to fasten to the backer wall and seal the top of the termination bar with UniverSeal US-100.
6. Concrete back up:
 - a. Surface apply after dampproofing installation specified in Dampproofing Section in accord with manufacturer's installation instructions.
 - b. Apply flashing with wicking surface to outside.
 - c. Fasten to concrete back-up surface at top by embedding in layer of UniverSeal US-100 polyether sealant or use a termination bar, like the T96 by York, to fasten to the backer wall and seal the top of the termination bar with UniverSeal US-100.
7. Stud back up with sheathing:
 - a. Surface apply after dampproofing installation specified in Dampproofing Section in accord with manufacturer's installation instructions
 - b. Apply flashing with wicking surface to outside.
 - c. Fasten to stud back-up surface at top by embedding in layer of UniverSeal US-100 polyether sealant or use a termination bar, like the T96 by York, to fasten to the backer wall and seal the top of the termination bar with UniverSeal US-100.
8. Leave ready for building felt or air barrier installation lapping flashing top installed in another Section.
9. Lay flashing in continuous bead of UniverSeal US-100 polyether sealant on masonry supporting steel.
10. Fold ends of flashing at end of opening to form dam; seal with UniverSeal US-100 polyether sealant or purchase preformed end dams from manufacturer.
11. Inside corners: Make in industry accepted manner using corner and splice material or purchase preformed corners from manufacturer.
12. Outside corners: Make in industry accepted manner using corner and splice material or purchase preformed corners from manufacturer.
13. Cover flashing within a few days of installation to protect it from damage from the different trades, the environment and falling debris. If flashing is left unprotected and it is punctured, torn, or has loose scrim you should contact the manufacturer for repair instructions.

3.02 SCHEDULES

- A. Locations:
 1. Exterior door heads.
 2. Window heads and sills.
 3. Storefront heads.
 4. Horizontal control joints.
 5. Changes in veneer materials, vertically.
 6. Other wall openings.
 7. Other locations indicated.

END OF SECTION

FLEXIBLE FLASHING ACTIVE DRAINAGE PLANE SYSTEM

07650 - 3

SECTION 07721

TYPE D-50T ENHANCED PERFORMANCE ROOF HATCH SPECIFICATION

I. PART ONE - GENERAL

1.01 SUMMARY

- A. Work included: Furnishing and installing factory fabricated roof hatches
- B. Related Work: 07500 Roofing & Flashing

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM), 100 Bar Harbor Drive, West Conshocken, PA 19428-2959; (610) 832-9585, fax (610) 832-9555
 - 1. ASTM A 36-93a: Standard Specification for Structural Steel

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's product data for all materials in this specification.
- B. Shop Drawings: Show profiles, accessories, location, and dimensions.
- C. Samples: Manufacturer to provide upon request; sized to represent material adequately.
- D. Contract Closeout: Roof hatch manufacturer shall provide the manufacturer's Warranty prior to the contract closeout.

1.04 PRODUCT HANDLING

- A. All materials shall be delivered in manufacturer's original packaging.
- B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.
- C. Remove protective wrapping immediately after installation.

1.05 SUBSTITUTIONS

- A. Proposals for substitution products shall be accepted only from bidding contractors and not less than (10) working days **before bid due date**. Contractor guarantees that proposed substitution shall meet the performance and quality standards of this specification.

1.06 JOB CONDITIONS

- A. Verify that other trades with related work are complete before installing roof hatch(s).
- B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
- C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.
- D. Coordinate installation with roof membrane and roof insulation manufacturer's instructions before starting.
- E. Observe all appropriate OSHA safety guidelines for this work.

1.07 WARRANTY/GUARANTEE

- A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no

DANFORTH ON HIGH – PORTLAND, MAINE

charge. Electrical motors, special finishes, and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.

II. PART TWO - PRODUCTS

2.01 MANUFACTURER

- A. The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 1-203-934-6363, Fax: 1-203-933-8478, Web: www.bilco.com

2.02 ROOF HATCH

- A. Furnish and install where indicated on plans metal roof hatch Type D-50T, size 4' 0" x length 5' 0". Length denotes hinge side. The roof hatch shall be double leaf. The roof hatch shall be pre-assembled from the manufacturer.
- B. Performance characteristics:
 - 1. Covers shall be reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
 - 2. Operation of the covers shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
 - 3. Operation of the covers shall not be affected by temperature.
 - 4. Entire hatch shall be weathertight with fully welded corner joints on covers and curb
- C. Covers: Shall be 11 gauge aluminum with a 4" beaded flange with formed reinforcing members. Covers shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.
- D. Cover insulation: Shall be 2" thick polyisocyanurate with an R-value of 12, fully covered and protected by an 18 gauge aluminum liner.
- E. Curb: Shall be 12" in height and of 11 gauge aluminum. The curb shall be formed with a 4-1/2" flange with 7/16" holes provided for securing to the roof deck. The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip[®] flashing system, including stamped tabs, 6" on center, to be bent inward to hold single ply roofing membrane securely in place.
- F. Curb insulation: Shall be 2" thick polyisocyanurate with an R-value of 12.
- G. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.
- H. Hardware
 - 1. Heavy pintle hinges shall be provided
 - 2. Covers shall be equipped with an enclosed two point spring latch with interior and exterior turn handles
 - 3. Roof hatch shall be equipped with interior and exterior padlock hasps.
 - 4. The latch strike shall be a stamped component bolted to the curb assembly.
 - 5. Covers shall automatically lock in the open position with a rigid hold open arm equipped with a 1" diameter red vinyl grip handle to permit easy release for closing.
 - 6. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed.
 - 7. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

DANFORTH ON HIGH – PORTLAND, MAINE

- I. Finishes: Factory finish shall be mill finish aluminum.

III. PART THREE - EXECUTION

3.01 INSPECTION

- A. Verify that roof hatch installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

3.02 INSTALLATION

- A. Submit product design drawings for review and approval to the architect or specifier before fabrication.
- B. The installer shall check as-built conditions and verify the manufacturer's roof hatch details for accuracy to fit the application prior to fabrication. The installer shall comply with the roof hatch Manufacturer's installation instructions.
- C. The installer shall furnish mechanical fasteners consistent with the roof requirements.

END OF SECTION 07721

FIRESTOPPING & SMOKE SEALS

SECTION 07860

1 General

1.1 SECTION INCLUDES

- .1 Comply with Division 1, General Requirements and Documents referred to therein.
- .2 It is the intent of this section of the specifications to establish a single, competent source to be responsible for providing all labour, materials, products, equipment and services, to supply and install the firestopping and smoke seal work for the entire project, at the following locations:

Openings in fire rated walls, floors and roofs both empty and those containing penetrations such as cables, conduits, cable pipes, ducts and similar penetrating items.

Gaps between fire-rated walls and exterior walls.

Openings at each floor level in fire rated shafts or stairwells.

Gaps between the tops of fire rated walls and underside of fire rated floor or roof assemblies.

Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- .1 Openings through Floors and Walls:

Fire Rated: Metal sleeves for fire rated openings through floors and walls shall be provided under applicable mechanical and electrical specification sections.

Non-Rated: Non-rated openings through floors and walls shall be sealed under applicable mechanical and electrical specification sections.

- .2 Firestopping and smoke seals within mechanical (i.e. inside ducts, dampers) and electrical assemblies (i.e. inside bus ducts) shall be sealed under applicable mechanical and electrical specifications sections. Firestopping and smoke seals around outside of such mechanical and electrical assemblies, where they penetrate fire rated separations, are the responsibility of this section.

DANFORTH ON HIGH – PORTLAND, MAINE

1.3 RELATED SECTIONS

- .1 Division 15 - Mechanical: Mechanical work requiring firestopping.
- .2 Division 16 - Electrical: Electrical work requiring firestopping.

1.4 REFERENCE STANDARDS

- .1 ANSI/UL 1479 - Fire Tests Of Through-Penetration Firestops

1.5 SYSTEM DESCRIPTION

- .1 Firestopping Materials: Provide firestopping system(s) of sufficient thickness, width and density to provide and maintain a fire resistance rating, as indicated on drawings and in accordance with UL or FM design numbers.
- .2 Provide a seal completely filling all annular spaces to prevent the passage of flame, smoke and gases through the opening in the fire separation in which it is installed.
- .3 Material Compatibility: Provide materials which are compatible with all materials used in the system including materials used in or on penetrants as well as all construction materials used in conjunction or contiguous with the system.
- .4 Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance rated systems. Accessories include but are not limited to the following items:

- Permanent forming/damming/backing materials.
- Temporary forming materials.
- Substrate primers.
- Collars.
- Steel sleeves.

1.6 SUBMITTALS

- .1 Manufacturer's Data: Submit manufacturer's specifications, installation instructions and product data for each material required, in accordance with Section 01300. Include manufacturer's certification, if requested and UL, WH, ULC, cUL or FM test reports to show compliance with the Contract Documents.
- .2 Shop Drawings: Submit shop drawings showing typical installation details including reinforcement, anchorage, fastenings and method of installation for each type of firestopping condition.

DANFORTH ON HIGH – PORTLAND, MAINE

- .3 Samples: If requested, submit samples of each type of firestopping systems, smoke seals and accessories. Indicate location where material/system shall be utilized.

1.7 QUALITY ASSURANCE

- .1 Manufacturer: Company specializing in manufacturing products of this Section with minimum three (3) years documented experience.
- .2 Applicator: Company having a minimum of three (3) years experience in the installation of materials specified herein on projects comparable to this Project. The firm shall have the written approval of the firestopping material manufacturer(s).

1.8 REGULATORY REQUIREMENTS

- .1 Conform to applicable local Building Codes for fire resistance ratings.
- .2 Provide materials, accessories and application procedures which have been listed by UL, FM or tested by a nationally recognized independent testing agency according the ANSI/UL 1479 or ASTM E814 to achieve the required fire protection rating.

1.9 ENVIRONMENTAL REQUIREMENTS

- .1 Do not proceed with the installation of firestopping materials when temperatures or weather conditions exceed the manufacturer's recommended limitations for installation.
- .2 Ventilate solvent based firestopping per firestopping manufacturer's instructions by natural means or, where this is inadequate, forced air circulation.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to Site in manufacturer's sealed and labelled containers intact. Handle and store materials in accordance with manufacturer's instructions.

1.11 PROJECT/SITE CONDITIONS

- .1 Comply with manufacturer's recommended requirements for temperature, relative humidity and substrate moisture content during application and curing of materials.

1.12 SEQUENCING AND SCHEDULING

- .1 Do not install firestopping system(s) until Work within opening has been completed. Coordinate with other applicable Sections. Schedule work of other trades so that firestopping applications can be inspected prior to being covered by subsequent construction.

DANFORTH ON HIGH – PORTLAND, MAINE

2 Products

2.1 ACCEPTABLE MANUFACTURERS

- .1 Provide firestopping silicone sealants, water-based sealants, mortars, or firestop devices from the following manufacturer:

A/D Fire Protection Systems Inc.

2.2 MATERIALS

- .1 Provide a complete system of asbestos-free firestopping and through-penetrations firestopping. Firestop systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ANSI/UL 1479 or ASTM E814 and listed by UL or FM and in addition are approved by jurisdictional authorities and the Consultant.
- .2 A/D FIREBARRIER Silicone Sealants: For use in openings 304.8 mm dia. or greater but not to exceed opening sizes for which they are intended, penetrations subject to movement, in control joints, in curtain wall joints, as a sealant for smoke barrier construction, fire and smoke dampers, head of wall details and fire doors in masonry or gypsum wall partitions.
- .3 A/D FIREBARRIER Mortar: For use in large openings, in static, non-moving, penetrations such as cable trays, electrical and communication bundles, conduit and non-combustible sleeves and rated insulated pipes.
- .4 Firestopping for Combustible Penetrating Items: For use in openings where either plastic pipe, non-rated insulated pipes or insulated cables are installed.
- .5 Firestop system ratings: Comply with Building Code (BOCA) requirements for locations and hourly ratings of F, FT, FH and FTH designations.

2.3 ACCESSORIES

- .1 Damming and backup materials, supports and anchoring devices: Non-combustible, to manufacturer's recommendations and in accordance with the tested system being installed as acceptable to jurisdictional authorities.
- .2 Retainers: Galvanized clips approved by manufacturer to hold A/D FIREBARRIER Mineral Wool insulation in place.
- .3 Primers: As required by firestopping manufacturer and compatible with selected system and contiguous materials.
- .4 Water: Potable.

DANFORTH ON HIGH – PORTLAND, MAINE

- .5 Sealants for vertical joints: Non-sagging.
- .6 Sealants and fluid seals at floor openings: Self-levelling.
- .7 Sealants and putty for vertical and overhead joints: Non-sagging.
- .8 Tape: Pressure sensitive masking tape as recommended by the firestopping manufacturer.

3 Execution

3.1 EXAMINATION

- .1 Examine substrates, openings, voids, adjoining construction and conditions under which the Work is to be installed. Confirm compatibility of surfaces scheduled to receive firestopping.
- .2 Verify that penetrating elements are securely fixed and properly located with the proper space allowance between penetrations and surfaces of openings.
- .3 Do not proceed with Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Surfaces to receive firestopping shall be free of dirt, dust, grease, oil, rust, loose materials, form release agents, frost, moisture or any other matter which would impair the bond of firestopping material to the substrate of penetrating item(s).
- .2 Prime substrates in accordance with manufacturer's written instructions or recommendations. Confine primers to areas of bond; do not allow spillage or migration onto exposed surfaces.
- .3 Do not apply firestopping and smoke seals to surfaces previously painted or treated with sealers, curing compounds, water repellent or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure that anchoring devices, back-up materials, clips, sleeves, supports and other related materials used in the actual fire tests are provided.
- .5 Mask where necessary to prevent firestopping materials from contacting adjoining surfaces that will remain exposed upon completion of Work. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.
- .6 Installation is not to proceed until submittals have been completed.

DANFORTH ON HIGH – PORTLAND, MAINE

3.3 INSTALLATION

- .1 Manufacturer's Instructions: Comply with UL or FM Listings and manufacturer's instructions for the type of material and condition of opening in each case. Consult with the manufacturer's technical representative to determine proper procedure for conditions not fully covered by printed instructions. Record in writing any oral instructions received, with copy to manufacturer.
- .2 Install firestopping with sufficient pressure to properly fill and seal openings to ensure an effective smoke seal. Tool or trowel exposed surfaces. Remove excess firestopping material promptly as the Work progresses and upon completion.
- .3 Damming: Provide leak-proof dams as required to seal openings and contain liquid sealants, putty or mortar until cured. Install damming in accordance with manufacturer's instructions.
- .4 Damming Boards: Install forming/damming materials and other accessories of type required to support fill materials during their application and in the position needed to produce the shapes and depths required to achieve fire ratings of through-penetration firestop systems.

Combustible Type: For temporary dams only. Remove after firestopping material has cured.

Non-Combustible Type: For temporary or permanent dams. Provide non-combustible type wherever damming material cannot be removed after applying firestopping materials.

- .5 Void Filler: Use materials recommended by the firestopping manufacturer to seal gaps created by non-combustible type damming boards and to seal around cables, conduits, pipes and where void filler material becomes part of the fire rated assembly.
- .6 Sealant: Install damming material or mineral wool as required. Apply sealant so air voids are not present and sealant is in full contact with penetrating items. Tool sealant to ensure substrate contact. Remove excess sealant in accordance with manufacturer's recommendations.
- .7 Mortar: Install damming material as required. Mix mortar in strict accordance with manufacturers instructions. Pump, trowel or hand pack mortar through openings to minimum thickness as recommended by manufacturer and as listed by UL or FM, to achieve required fire rating.
- .8 Firestopping Mineral Wool: Install firestopping by compressing material to the minimum required by UL or FM listing. Apply firestopping in sufficient thickness, depth and density so as to achieve the required fire

DANFORTH ON HIGH – PORTLAND, MAINE

resistance rating. Use impaling clips to support and secure firestopping where required by tested system.

3.4 FIELD QUALITY CONTROL

- .1 Notify Consultant when completed installations are ready for inspection prior to concealing or enclosing an area containing firestopping materials.
- .2 Arrange for inspections by the Owners independent inspection and testing company, appointed and paid for by Owner.
- .3 Following field inspections, provide all repair as required to ensure compliance with the Contract Documents.

3.5 CLEANING AND PROTECTION

- .1 Upon completion of this work, remove all materials, equipment and debris from the site.
- .2 Leave work area and adjacent surfaces in a condition acceptable to the Consultant.
- .3 Leave installed work with sufficient protection to enable it to remain untouched until project turnover.

End of Section

SECTION 07920

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior polyurethane sealants.
 - 2. Exterior and interior polyurethane traffic sealants.
 - 3. Interior polyurethane sealants.
 - 4. Interior latex sealants.
 - 5. Interior sanitary silicone sealants.
 - 6. Exterior and interior water immersed polyurethane sealants.
 - 7. Metal lap joint sealants.
 - 8. Threshold and sheet metal bedding sealants.
 - 9. Joint accessories.

- B. Related Sections:
 - 1. Section 08 80 00 – Glazing: Glazing sealants and protective glazing systems.

1.2 REFERENCES

- A. ASTM International Inc.
 - 1. MaineHousing Green Building Standards Sections 3, R1 Energy Efficiency – Building Envelope.
 - 2. MaineHousing Green Building Standards Section 7, R4 Indoor Environmental Quality – Limits on VOC Content.
 - 3. ASTM C 510 - Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
 - 4. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
 - 5. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
 - 6. ASTM C834 - Standard Specification for Latex Sealants.
 - 7. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
 - 8. ASTM C 1193 - Standard Guide for Use of Joint Sealants.
 - 9. ASTM C 1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
 - 10. ASTM C 1311 - Standard Specification for Solvent Release Sealants.
 - 11. ASTM D 2203 - Standard Test Method for Staining from Sealants.

DANFORTH ON HIGH – PORTLAND, MAINE

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit details to show installation and interface between sealants and adjacent work.
- B. Product Data:
 - 1. Materials list of items proposed to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
- C. Samples:
 - 1. Submit color charts for each sealant type for initial selection.
 - 2. Submit standard cured color samples for each sealant type illustrating selected colors.
- D. Manufacturer's Installation Instructions:
 - 1. Submit manufacturer's published installation procedures.
 - 2. Include instructions for completing sealant intersections when different materials are joined.
 - 3. Include instructions for removing existing sealants and preparing joints for new sealant.
- E. Manufacturer's Certificate:
 - 1. Certify products are suitable for intended use and products meet or exceed specified requirements.
 - 2. Certify applicator is approved by manufacturer.
- F. Qualifications Data:
 - 1. Submit applicator's qualifications, including reference projects of similar scope and complexity, with current phone numbers and contact names of architects and owners for verification.
- G. Manufacturer's Field Reports:
 - 1. Indicate time present at project site.
 - 2. Include observations, indicate compliance with manufacturer's installation instructions, and supplemental instructions provided to installers.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:
 - 1. Submit recommended inspection intervals.
 - 2. Submit instructions for repairing and replacing failed sealant joints.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with the following:
 - 1. Building Joints: ASTM C 1193.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Field Pre-Construction Testing:
 - 1. Test each elastomeric sealant and joint substrate in accordance with the following, before beginning work of this section:
 - a. Install sealants in field samples using joint preparation methods determined by laboratory pre-construction testing.
 - b. Remove existing sealant, clean joint, and install new sealant using manufacturer's recommended joint preparation methods.
 - c. Install field-test joints in location as approved by Architect.
 - d. Test Method: Manufacturer's standard field adhesion test to verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.
 - e. When test indicates sealant adhesion failure, modify joint preparation, primer, or both and retest until joint passes sealant adhesion test.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Applicator Qualifications:
 - 1. Company specializing in performing work of this section with minimum three years documented experience, minimum three successfully completed projects of similar scope and complexity, and approved by manufacturer.
 - 2. Designate one individual as project foreman who shall be on site at all times during installation.

1.7 MOCKUP

- A. Install sealants in mockups specified in other sections including sealant and joint accessories to illustrate installation quality and color.
- B. Incorporate accepted mockup as part of Work.
 - 1. Repair seal joint mockups used for field adhesion testing.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in manufacturers unopened original packaging. Inspect for damage.
- B. Store primers and sealants in cool dry location with ambient temperature range of 60 to 80 degrees F.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not install primers or sealants when atmospheric temperatures or joint surface temperatures are less than 40 degrees F.

DANFORTH ON HIGH – PORTLAND, MAINE

1.10 SCHEDULING

- A. Schedule work so waterproofing, water repellents and preservative finishes are installed after sealants, unless sealant manufacturer approves otherwise in writing.
- B. Ensure sealants are cured before covering with other materials.

1.11 WARRANTY

- A. Submit signed copies of the following warranties against adhesive and cohesive failure of sealant and against infiltration of water and air through sealed joint for period of 3 years from date of completion.
 - 1. Manufacturer's standard warranty covering sealant materials.
 - 2. Applicator's standard warranty covering workmanship.

PART 2 PRODUCTS

2.1 Caulking for joints at all junctions as necessary to obtain complete watertight construction. VOC content shall comply with MaineHousing's Green Standards

2.2 MANUFACTURERS

- A. Tremco Sealant/Weatherproofing Division of RPM International, Inc.
- B. Or equal

2.3 URETHANE SEALANTS

- A. Multi-Component Urethane: two component, chemical curing, nonstaining, nonbleeding, color as selected.
 - 1. Dymeric 240
 - 2. Dymeric 240FC
 - 3. Or equal
- B. Single Component Urethane: single component, moisture curing, nonstaining, non-bleeding, color as selected.
 - 1. Dymonic FC
 - 2. Or equal

2.4 SILICONE SEALANTS

- A. Multi-Component Silicone: ASTM C920, Type M, Grade NS, Class 50; Uses NT, M, G, A and O: multi-component, neutral curing, nonstaining, nonbleeding, color as selected
 - 1. Spectrem 4-TS.
 - 2. Or equal

DANFORTH ON HIGH – PORTLAND, MAINE

2. Ensure concrete surfaces are fully cured.
- B. Report unsatisfactory conditions in writing to the Architect;
- C. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Prepare joints in accordance with ASTM C 1193 and manufacturer's instructions.
- B. Clean joint surfaces to remove dirt, dust, oils, wax, paints, and other contamination capable of affecting primer and sealant bond.
 1. Clean concrete joint surfaces to remove curing agents and form release agents.
- C. Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

3.3 EXISTING WORK

- A. Mechanically remove existing sealant.
- B. Clean joint surfaces of residual sealant and other contaminants capable of affecting sealant bond to joint surface.
- C. Allow joint surfaces to dry before installing new sealants.

3.4 SEALANT INSTALLATION

- A. INTERIOR CAULKING shall be applied to seal all penetrations through top plates of interior walls, (due to electrical or plumbing), and at tubs, showers, counter tops, bottom of party walls GWB, and other as shown on Drawings.
- B. ALL POTENTIAL INFILTRATION cracks & joints to be caulked. Caulking shall be done only by workmen who are thoroughly experienced in this work. Exterior caulking shall be applied around windows, doors, vents, utilities, and any other infiltration "crack".
- C. IN GENERAL see Drawings for any additional applications. Joints and spaces to be caulked shall be dry and free from dust. Finished caulking "bead" shall be neat and smooth, free of gaps and sags and run continuously. Complete all caulking work and allow to stand for the manufacturer's recommended time period before painting. Prime if required before finish coat of paint is applied.
- D. Install primer and sealants in accordance with ASTM C 1193 and manufacturer's instructions.
- E. Caulking shall apply to sealing of joints less than 3/4 inches in width. Any joint in excess of this width shall be filled with a low-expansion closed cell foam insulation or as directed by Architect.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Single Component Silicone: ASTM C920, Type S, Grade NS, ; Uses NT, M, G, A and O: single component, nonstaining, nonbleeding, color as selected.
 - 1. Spectrem 1.
 - 2. Spectrem 2.
 - 3. Spectrem 3.
 - 4. Or equal

- C. Single Component Silicone: ASTM C920, Type S, Grade NS, Class 25; Uses NT, G, A and O: single component, nonstaining, nonbleeding, color as selected.
 - 1. Proglaze.
 - 2. Tremsil 200.

2.5 OTHER SEALANTS

- A. Latex Sealant: ASTM C 834; single component, solvent curing, nonstaining, nonbleeding, nonsagging; color as selected.
 - 1. Tremflex 834.

- B. Synthetic Rubber Sealant:
 - 1. Acoustical Sealant.

- C. Butyl Sealant: ASTM C 1311, butyl or polyisobutylene, single component, nondrying, non-skinning, non-curing.
 - 1. Butyl Sealant.

2.6 ACCESSORIES

- A. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

- B. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

- C. Joint Backing: Round foam rod compatible with sealant; oversized 25 to 50 percent larger than joint width; recommended by sealant manufacturer to suit application

- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

- E. Masking tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify substrate surfaces and joint openings are ready to receive work.
 - 1. Verify joint surfaces are clean and dry.

DANFORTH ON HIGH – PORTLAND, MAINE

- F. Install joint backing to maintain the following joint ratios:
 - 1. Joints up to 1/2 inch Wide: 1:1 width to depth ratio.
 - 2. Joints Greater than 1/2 inch Wide: 2:1 width to depth ratio; maximum 1/2 inch joint depth.
- G. Install bond breaker where joint backing is not used.
- H. Apply primer where required for sealant adhesion.
- I. Install sealants immediately after joint preparation.
- J. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- K. Tool exposed joint surface concave.
- L. Building Envelope:
 - 1. Gaskets or sill seals under mud sills along foundation walls.
 - 2. Seal first floor band joists to the adjoining mud sills and plywood decking using adhesive or caulk. Use construction adhesive or caulking between multiple sill plates.
 - 3. Seal any band joists between upper floors to the adjoining top plate and plywood decking.
 - 4. Use construction adhesive or caulking between multiple tops plates.
 - 5. Seal bottom plates of exterior walls to the sub-floor with construction adhesive or caulking.
 - 6. Window frames and doorjamb must be sealed to their rough openings using low expansion foam, backer rod or caulk but NOT fiberglass.
 - 7. All penetrations through building must be carefully sealed. Typical Penetrations include chimney, duct and plumbing chases and penetrations of pipes and wires through the top plates of top story walls. It is particularly important to seal all possible air paths to the attic.
 - 8. Electrical boxes on exterior walls and ceilings should either be airtight or placed in airtight.

3.5 MANUFACTURER'S FIELD SERVICES

- A. Require sealant manufacturer to be present at project site to:
 - 1. Observe sealant mockup installation and to issue reports of observations.
 - 2. Conduct field pre-construction testing.

3.6 CLEANING

- A. Remove masking tape.
- B. Clean adjacent surfaces soiled by sealant installation.

DANFORTH ON HIGH – PORTLAND, MAINE

3.7 SCHEDULE – SEALANT JOINTS

A. Exterior Sealant Joint [Type A]:

1. Applications:
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Joints between architectural precast concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Control and expansion joints in stone masonry.
 - e. Butt joints between metal panels.
 - f. Joints between different materials listed above.
 - g. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
 - h. Control and expansion joints in soffits and overhead surfaces.
 - i. Other exterior joints in vertical surfaces and non-traffic horizontal surfaces for which no other sealant is specified.
 - j. Or equal
2. Multi-Component Urethane Sealants:
 - a. Dymeric 240/240FC.
 - b. Vulkem 227.
 - c. Or equal
3. Single Component Urethane Sealants:
 - a. Dymonic FC.
 - b. Dymonic.
 - c. Vulkem 116.
 - d. Or equal
4. Multi-Component Silicone Sealants:
 - a. Spectrem 4-TS. D.O.E
5. Single Component Silicone Sealants:
 - a. Spectrem 1.
 - b. Spectrem 2.
 - c. Spectrem 3.
 - d. Or equal

B. Interior Sealant Joint [Type C]:

1. Applications:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints on exposed interior surfaces of exterior openings.
 - c. Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, elevator entrances and similar openings.
 - d. Other interior joints in vertical surfaces and non-traffic horizontal surfaces subject to movement for which no other sealant is specified.
2. Multi Component Urethane Sealants:
 - a. Dymeric 240/240FC.
 - b. Vulkem 227.
 - c. Or equal
3. Single Component Urethane Sealants:

DANFORTH ON HIGH – PORTLAND, MAINE

- a. Dymonic FC.
 - b. Dymonic.
 - c. Vulkem 116.
 - d. Or equal
4. Single Component Silicone Sealants:
- a. Spectrem 1.
 - b. Spectrem 2.
 - c. Spectrem 3.
 - d. Or equal
5. Other Sealants:
- a. Tremflex 834.
 - b. Or equal
- C. Interior Sanitary Sealant Joint [Type G]:
1. Applications:
 - a. Joints in toilet room and bathroom counter tops.
 - b. Joints between plumbing fixtures and adjacent materials.
 - c. Joints between locker room lockers and adjacent materials.
 - d. Joints between food service equipment and surrounding construction.
 - e. Other interior joints in wet areas where needed to limit mold and mildew growth.
 2. Single Component Silicone Sealants:
 - a. Tremsil 200.
 - b. Or equal
- D. Concealed Metal Lap Sealant Joint [Type J]:
1. Applications:
 - a. Concealed lap and hook joints in sheet metal flashing and trim.
 2. Single Component Non-Curing Sealants:
 - a. Tremco Butyl Sealant.
 - b. Or equal
- E. Concealed Bedding Sealant Joint [Type K]:
1. Applications:
 - a. Bedding joints under metal thresholds and saddles.
 - b. Bedding joints between sheet metal flashing and other materials.
 2. Single Component Urethane Sealants:
 - a. Dymonic FC.
 - b. Dymonic.
 - c. Vulkem 116.
 - d. Or equal
 3. Single Component Silicone Sealants:
 - a. Proglaze.
 - b. Spectrem 2.
 - c. Spectrem 3.
 - d. Or equal
 4. Single Component Non-Curing Sealants:
 - a. Tremco Butyl Sealant.

DANFORTH ON HIGH – PORTLAND, MAINE

- b. Tremco Acoustical Sealant.
- c. Or equal

END OF SECTION

STEEL DOORS AND FRAMES

SECTION 08100

PART 1 – GENERAL

1.01 GENERAL PROVISIONS:

- A. The CONDITIONS OF THE CONTRACT and all Sections of Division 1 are hereby made a part of this section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this section. Extent of steel doors and frames required is indicated on drawings and in schedules.

- 1. Furnish and Install:

- a. Steel frames for hollow metal doors
 - b. Steel frames for wood doors
 - c. Steel sidelite, borrowed lite, and transom frames
 - d. Hollow metal doors

- 2. Install Only: Finish hardware for hollow metal doors as specified in Section 08710 Finish Hardware.

- B. Related work specified elsewhere:

- 1. SECTION 08210: WOOD DOORS
 - 2. SECTION 08710: FINISH HARDWARE
 - 3. SECTION 09900: PAINTING

1.03 QUALITY ASSURANCE; SUBMITTALS:

- A. General: Comply with requirements of SECTION 01300 - SUBMITTALS, MEETINGS & RECORD DOCUMENTS and SECTION 01400 - QUALITY CONTROL SERVICES.

- B. Manufacturer: Provide steel doors and frames complying with these specifications from one of the following:

- 1. CECO
 - 2. Curries
 - 3. Steelcraft

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Supplier: A recognized hollow metal supplier, with in-house fabrication facilities, who has been furnishing doors and frames in the project's vicinity for a period of not less than five years.
- D. Product Data: Submit four copies of manufacturers technical product data for each item. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and maintenance.
- E. Door Schedule: Submit final door schedule in manufacturer's standard format and as outlined below. Coordinate doors, frames and related work to ensure proper size, thickness, hand, function, and fasteners.

1. **NOTE: Contractor shall make all submittals for finish hardware, doors, frames and related items simultaneously, only after proper review and coordination by own staff beforehand.**

2. Final Door Schedule Content: Based on doors and frames in drawings, organize door schedule to indicate complete designations of every item required for each door or opening. Include the following information:

- a. Type, style, hand, size and construction of each item.
- b. Anchors and fastenings to related work.
- c. Corner construction of welded and/or knocked down frames.
- d. Location of door and frame cross-referenced to indications on drawings both on floor plans and in hardware schedule.
- e. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
- f. Mounting locations for hardware.
- g. Door construction and materials.
- h. Gage and finish of all materials.

3. Shop Drawings: Submit separate detail drawings, referenced to door schedule, showing size, hand, construction, fasteners, anchors and all other details pertinent to the fabrication of doors and frames for this project.

1.04 APPROVAL OF SUBSTITUTIONS:

- A. Manufacturers and model numbers specified herein are to establish a standard of quality. If products other than those specifically identified herein are to be considered for this Project, they must be submitted for approval of the Architect not less than ten (10) calendar days prior to receipt of General Bids.
- B. Requests for approval of substitutions shall be in writing, accompanied by catalog cuts, technical information and physical samples.
- C. Approval of substitutions shall only be valid when issued by Architect to all bidders in the form of Addendum.

DANFORTH ON HIGH – PORTLAND, MAINE

1.05 REFERENCES:

- A. ANSI A115 Series: Standards for Steel Doors And Frames.
- B. NFPA 80, NFPA 101.
- C. Other applicable building and life safety codes.
- D. Door and Hardware Institute: "Recommended Locations for Builder's Hardware.
- E. ANSI A117.1: American National Standard Providing Accessibility and Usability for Physically Handicapped People.
- F. Other applicable industry standards.

1.06 PRODUCT PACKAGING AND HANDLING:

- A. Tag each item or package separately, with identification related to final door schedule.
- B. All doors shall be packaged in full cartons and securely banded.
- C. Doors and frames shall be received by the contractor at the jobsite and handled in a manner so as not to be damaged. They shall be stored upright in a protected area on wood runners or skids and shall be covered with vented tarpaulins or plastic.

1.07 WARRANTY: Doors and frames specified for this Project shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of Substantial Completion of Project.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Doors shall be manufactured from commercial quality cold-rolled steel sheets. Exterior doors shall be A60 hot-dipped galvanized.
- B. Frames shall be manufactured from commercial quality cold-rolled steel sheets. Exterior frames shall be A60 hot-dipped galvanized.
- C. Steel shall conform to ASTM standards A366 or A620 and A568 (uncoated), ASTM A526 or A642 and A525 (galvanized).
- D. All doors and frames shall be chemically treated for paint adhesion and prime painted to meet performance requirements of ANSI A224.1.

2.02 DOOR FABRICATION:

- A. Interior doors shall be 1-3/4" thick, manufactured from two 18 gage steel sheets. A one piece resin-impregnated honeycomb core with sanded edges shall be securely bonded to both face sheets. Doors shall have mechanically interlocked vertical edges, flush face sheets, and hairline seam edges. The top and bottom of the door shall be closed flush by 16 gage steel channels (where concealed door bottoms are specified, bottom channel shall be

DANFORTH ON HIGH – PORTLAND, MAINE

reversed to allow insertion of door bottom into door web). At contractor option, in lieu of honeycomb cores, doors may be provided with a rigid polystyrene foam core, continuously bonded to the face sheets, and completely filling the door.

- B. Exterior doors shall be 1-3/4" thick, manufactured from two 16 gage galvanized steel sheets. The interior of the doors shall be completely filled with a foamed-inplace polyurethane core, chemically bonded to all interior surfaces. Doors shall have mechanically interlocked vertical edges, flush face sheets, and hairline seam edges. The top and bottom of the door shall be closed flush by 16 gage steel channels (where concealed door bottoms are specified, bottom channel shall be reversed to allow insertion of door bottom into door web).
- C. All doors shall be handed type with factory preparation for all concealed or mortised Finish Hardware scheduled. Door closer reinforcements shall be provided for all doors whether scheduled to received closer or not. Reinforce doors for all surface applied hardware.
- D. Non-handed doors, and/or filler plates for cutouts not required for scheduled hardware preparation shall NOT be acceptable.

2.03 FRAME FABRICATION:

- A. General: Frames shall be knocked down and field assembled or welded type at contractor option.
- B. Standard knockdown or welded frames shall be manufactured form 16 gage steel sheets with 2" face and 5/8" integral stop. Jamb depth to be determined by wall thickness in accordance with the drawings. Supply appropriate anchors for wall construction.
- C. Drywall frames shall be manufactured form 16 gage steel sheets with 2" face and 5/8" integral stop and double back bend to grip the partition firmly without marring the wall surface. Jamb depth to be determined by wall thickness in accordance with the drawings. Provide adjustable plumb anchors to insure square and plumb installation. Supply standard floor anchors for bottom of each jamb.
- D. Prepare frames for all concealed or mortised hardware and reinforce for all surface applied hardware.
- E. Provide plaster guards for all hardware cutouts.
- F. Prepare frames to receive pneumatic type silencers: two for each pair frame, three for each single frame.
- G. Exterior frames shall be 16 ga welded, galvanized with thermally broken jambs.

2.04 FIRE RATED ASSEMBLIES

- A. All labeled fire doors and frames shall be of a type tested in accordance with ANSI/UL-10b, ASTM E-152, NFPA-252, or UL-305, and shall provide the degree of fire protection, heat transmission, panic-loading capabilities, and/or smoke control as indicated on the label and required by the drawings.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Labeled doors and frames shall bear the label of Underwriters Laboratories, Warnock Hersey, or Factory Mutual and shall meet all requirements of the labeling agencies current procedures and policies.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Doors and frames shall be assembled, installed, and erected plumb and in true alignment and in conformance with manufacturer's recommendations and final approved shop drawings. Preparation for surface applied hardware shall be performed on the jobsite. Frames shall be rigid and securely anchored in place. Doors shall be installed in a manner to achieve functional operation and appearance.
- B. Install hardware in compliance with 08710 FINISH HARDWARE.

END OF SECTION

SECTION 08200

INTERIOR APARTMENT DOORS

A. GENERAL:

SCOPE: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

1. Furnishing and installing all door frames as called for on drawings or noted in Specifications.
2. Furnishing and installing all interior wood and exterior metal doors as specified.
3. Furnishing and installing hardware in accordance with Door Schedule, including locksets, closers, holders, knockers etc.

NOTE: The Contractor shall submit drawings on every item specified in this section. There shall be no substitutions without a specific written explanation from the subcontractor that the specific item is equal with the item specified by the Architect. All substitutions shall be approved by the Architect and the Owner.

B. PRODUCTS:

All doors and frames shall be of the material, type and finish as called for on Drawings or in these Specifications. All dimensions shall be as shown by Door Schedule on Drawings. Door identified by manufacturer's name and type of brand name may be substituted for others of equal quality only with the approval of the Architect. Doors delivered for installation shall be carefully stored to prevent damage or warping.

All Interior unit swing doors and sliding shall be 1-3/8" Atherton #550 moulded smooth panel doors by Door Craft Inc. and distributed by Brosco or equal. Units shall be prehung and primed. Verify finish and coordinate with painting specification.

Apartment Entry Door: To be 1 ¾ solid oak veneer with metal frame.

Hardware: See Hardware Schedule

C. EXECUTION:

Install doors after completion of all other work which would raise the moisture content of wood doors or damage door surfaces. Fit, hang and trim as required by the opening so the doors will close and not bind. Solid blocking at hinges and latch required. Provide even clearance of 1/8" at sides and top, 1/4" over thresholds, and 3/4" over floors. See also Section 06100 & 06200 Rough and Finish Carpentry.

Install doorstops for all swing doors.

At completion of work, door glass shall be cleaned, leaving no masking tape or any other visible marks on the surface; doors shall be free of any nicks, scratches or marks; all doors shall open and close freely; and all locksets shall operate with key, (if required) and hardware function properly.

END OF SECTION

INTERIOR APARTMENT DOORS

SECTION 08210

WOOD DOORS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

- A. The CONDITIONS OF THE CONTRACT and all Sections of Division 1 are hereby made a part of this section.

1.02 DESCRIPTION OF WORK:

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this section. Extent of wood doors required is indicated on drawings and in schedules.

- 1. Furnish and Install:

- a. Flush wood doors for steel frames
- b. Related work specified elsewhere:

- 1. SECTION 08100: STEEL DOORS AND FRAMES
- 2. SECTION 08700: FINISH HARDWARE
- 3. SECTION 09900: PAINTING

1.03 QUALITY ASSURANCE; SUBMITTALS:

- A. General: Comply with requirements of SECTION 01300 - SUBMITTALS, MEETINGS & RECORD DOCUMENTS; SECTION 01400 - QUALITY CONTROL SERVICES.
- B. Manufacturer: Provide wood doors complying with these specifications from one of the following:
 - 1. Weyerhaeuser
 - 2. Brosco
 - 3. Mohawk
- C. Supplier: A recognized wood door supplier, with in-house fabrication and warehousing facilities, who has been furnishing doors and frames in the project's vicinity for a period of not less than five years.
- D. Product Data: Submit four copies of manufacturers technical product data for each item. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and maintenance.
- E. Door Schedule: Submit final door schedule in manufacturer's standard format. Coordinate doors, frames and related work to ensure proper size, thickness, hand, function, and fasteners.

DANFORTH ON HIGH – PORTLAND, MAINE

1. **NOTE: Contractor shall make all submittals for finish hardware, doors, frames and related items simultaneously, only after proper review and coordination by own staff beforehand.**
2. Shop Drawings: Submit separate detail drawings, referenced to door schedule, showing size, hand, construction, fasteners, elevation and all other details pertinent to the fabrication of doors and frames for this project.

1.04 APPROVAL OF SUBSTITUTIONS:

- A. Manufacturers and model numbers specified herein are to establish a standard of quality. If products other than those specifically identified herein are to be considered for this Project, they must be submitted for approval of the Architect not less than ten (10) calendar days prior to receipt of General Bids.
- B. Requests for approval of substitutions shall be in writing, accompanied by catalog cuts, technical information and physical samples.
- C. Approval of substitutions shall only be valid when issued by Architect to all bidders in the form of Addendum.

1.05 REFERENCES:

- A. Applicable AWI standards.
- B. NFPA 80, NFPA 101.
- C. Other applicable building and life safety codes.
- D. Door and Hardware Institute: "Recommended Locations for Builder's Hardware.
- E. ANSI A117.1: American National Standard Providing Accessibility and Usability for Physically Handicapped People.
- F. Other applicable industry standards.
- G. To achieve "S" rating, a fire-rated smoke gasket (See Spec Section 08710) must be applied around the perimeter of the frame. Comply with the requirements of the International Building Code with testing in accordance with UL10C for positive pressure door test. (a) Test Pressure: After 5 minutes in to the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill. (b) Doors shall be labeled to certify compliance. (c) Provide installation instructions attached to each door in a manner that assures availability to the installer and building official.

1.06 PRODUCT PACKAGING AND HANDLING:

- A. Tag each item or package separately, with identification related to final door schedule.
- B. All doors shall be packaged in full cartons and securely banded.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Doors and frames shall be received by the contractor at the jobsite and handled in a manner so as not to be damaged. They shall be stored upright in a protected area on wood runners or skids and shall be covered with vented tarpaulins or plastic.
- 1.07 WARRANTY: Doors and frames specified for this Project shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of Substantial Completion of Project.

PART 2 - PRODUCTS

2.01 FLUSH WOOD DOORS:

- A. Doors shall be 1-3/4" thick with particle board cores bonded to stiles and rails.
- B. Provide standard 3-ply face veneer of plain slice oak.
- C. Where glass lites are required, provide manufacturer's standard wood molding to match face veneer on non-fire rated doors, and standard steel molding on fire rated doors.
- D. Factory prepare doors to receive concealed or mortise hardware as specified in 08700 FINISH HARDWARE.
- E. Door assemblies in corridors and smoke barriers shall meet UL1784.
- F. Rated side-hinged doors shall meet UL10C.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Doors and frames shall be assembled, installed, and erected plumb and in true alignment and in conformance with manufacturer's recommendations and final approved shop drawings. Preparation for surface applied hardware shall be performed on the jobsite. Frames shall be rigid and securely anchored in place. Doors shall be installed in a manner to achieve functional operation and appearance.
- B. Install hardware in compliance with 08700 FINISH HARDWARE.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 08305

LADDER SAFETY POST SPECIFICATION

I. PART ONE - GENERAL

1.01 SUMMARY

- A. Work included: Furnishing and installing factory fabricated ladder safety posts
- B. Related Work: [Insert applicable specifications sections]

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM), 100 Bar Harbor Drive, West Conshocken, PA 19428-2959; (610) 832-9585, fax (610) 832-9555
 - 1. ASTM A 36-93a: Standard Specification for Structural Steel

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's product data for all materials in this specification.
- B. Shop Drawings: Show profiles, accessories, location, and dimensions.
- C. Samples: Manufacturer to provide upon request; sized to represent material adequately.
- D. Contract Closeout: Ladder Safety Post manufacturer shall provide the manufacturer's Warranty prior to the contract closeout, if applicable.

1.04 PRODUCT HANDLING

- A. All materials shall be delivered in manufacturer's original packaging.
- B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.
- C. Remove protective wrapping immediately after installation, if applicable.

1.05 SUBSTITUTIONS

- A. Proposals for substitution products shall be accepted only from bidding contractors and not less than (10) working days before bid due date. Contractor guarantees that proposed substitution shall meet the performance and quality standards of this specification.

1.06 JOB CONDITIONS

- A. Verify that other trades with related work are complete before installing ladder safety post(s).
- B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
- C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.
- D. Observe all appropriate OSHA safety guidelines for this work.

1.07 WARRANTY/GUARANTEE

- A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to

DANFORTH ON HIGH – PORTLAND, MAINE

function in normal use within this period, manufacturer shall furnish a new part at no charge.

II. PART TWO - PRODUCTS

2.01 MANUFACTURER

- A. The BILCO Company, P.O. Box 1203, New Haven, CT 06505; 1-203-934-6363, Fax: 1-203-933-8478
Internet address: <http://www.bilco.com>
For local representative, contact: Sweet's Buyline 1-800-892-1165 (#0032, #0034)

2.02 LADDER SAFETY POST

- A. Furnish and install ladder safety post Model LU-1. The ladder safety post shall be pre-assembled from the manufacturer.
- B. Performance characteristics:
 - 1. Tubular post shall lock automatically when fully extended.
 - 2. Safety post shall have controlled upward and downward movement.
 - 3. Release lever shall disengage the post to allow it to be returned to its lowered position.
 - 4. Post shall have adjustable mounting brackets to fit ladder rung spacing up to 14" on center and clamp brackets to accommodate ladder rungs up to 1-3/4" in diameter.
- C. Post: Shall be manufactured of high strength square tubing. A pull up loop shall be provided at the upper end of the post to facilitate raising the post.
- D. Material of construction: Shall be steel Model LU-1.
- E. Balancing spring: A stainless steel spring balancing mechanism shall be provided to provide smooth, easy, controlled operation when raising and lowering the safety post. [For installation in corrosive atmospheres, Models LU-2, LU-3, and LU-4 incorporate a special alloy spring mechanism].
- F. Hardware: All mounting hardware shall be Type 316 stainless steel.
- G. Finishes: Factory finish shall be black enamel steel Model LU-1.

III. PART THREE - EXECUTION

3.01 INSPECTION

- A. Verify that ladder safety post installation will not disrupt other trades. Verify that the ladder rungs are dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

3.02 INSTALLATION

- A. Submit product design drawings for review and approval to the architect or specifier before fabrication.
- B. The installer shall check as-built conditions and verify the manufacturer's ladder safety post details for accuracy to fit the application prior to fabrication. The installer shall comply with the ladder safety post manufacturer's installation instructions.
- C. The manufacturer shall furnish fasteners necessary for installing ladder safety post on ladder.

END OF SECTION 08305

SECTION 08360
SECTIONAL OVERHEAD DOORS
521 SERIES ALUMINUM SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Glazed Aluminum Sectional Overhead Doors
- B. Electric Operators and Controls.
- C. Operating Hardware, tracks, and support.

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete: Prepared opening in concrete. Execution requirements for placement of anchors in concrete wall construction.
- B. Section 04810 - Unit Masonry Assemblies: Prepared opening in masonry. Execution requirements for placement of anchors in masonry wall construction.
- C. Section 05500 - Metal Fabrications: Steel frame and supports.
- D. Section 06114 - Wood Blocking and Curbing: Rough wood framing and blocking for door opening.
- E. Section 07900 - Joint Sealers: Perimeter sealant and backup materials.
- F. Section 08710 - Door Hardware: Cylinder locks.
- G. Section 09900 - Paints and Coatings: Field painting.
- H. Section 11150 – Parking Control Equipment: Remote door control.
- I. Section 16130 - Raceway and Boxes: Empty conduit from control station to door operator.
- J. Section 16150 - Wiring Connections: Electrical service to door operator.

1.3 REFERENCES

- A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
 - 1. Design pressure of _____ lb/sq ft (_____ kPa).
- B. Wiring Connections: Requirements for electrical characteristics.
 - 1. 115 volts, single phase, 60 Hz.
 - 2. 230 volts, single phase, 60 Hz.
 - 3. 230 volts, three phase, 60 Hz.

4. 460 volts, three phase, 60 Hz.
- C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened labeled packaging until ready for installation.
- B. Protect materials from exposure to moisture until ready for installation.
- C. Store materials in a dry, ventilated weathertight location.

1.8 PROJECT CONDITIONS

- A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com.

- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS

- A. Glazed Sectional Overhead Doors: 521 Series Aluminum Doors by Overhead Door Corporation.
 - 1. Door Assembly: Stile and rail assembly secured with 1/4 inch (6 mm) diameter through rods.
 - a. Panel Thickness: 1-3/4 inches (44 mm).
 - b. Center Stile Width: 2-11/16 inches (68 mm)
 - c. End Stile Width: 3-5/16 inches (84 mm)
 - d. Intermediate Rail Pair Width: 3-11/16 inches (94 mm).
 - e. Top Rail Width:
 - 1) 2-3/8 inches (60 mm).
 - 2) 3-3/4 inches (95 mm).
 - f. Bottom Rail Width:
 - 1) 3-3/4 inches (95 mm).
 - 2) 4-1/2 inches (114 mm).
 - g. Aluminum Panels: 0.050 inch (1.3 mm) thick, aluminum.
 - h. Stiles and Rails: 6063 - T6 aluminum.
 - i. Springs:
 - 1) 10,000 cycles.
 - 2) 25,000 cycles.
 - 3) 50,000 cycles.
 - 4) 75,000 cycles.
 - 5) 100,000 cycles.
 - j. Glazing:
 - 1) 1/8 inch (3 mm) Acrylic glazing.
 - 2) 1/4 inch (6 mm) Acrylic glazing.
 - 3) 1/8 inch (3 mm) Polycarbonate glazing.
 - 4) 1/4 inch (6 mm) Polycarbonate glazing.
 - 5) 1/8 inch (3 mm) Tempered Glass.
 - 6) 1/4 inch (6 mm) Tempered Glass.
 - 7) 1/4 inch (6 mm) Wire Glass.
 - 8) 1/2 inch (12.5 mm) Insulating Glass.
 - 9) 1/8 inch (3 mm) Double strength glass.
 - 2. Finish and Color:
 - a. Anodized Finish: Clear anodized.
 - b. Anodized Finish: Bronze anodized.
 - c. Powder coat finish bronze light.
 - d. Powder coat finish bronze medium.
 - e. Powder coat finish bronze dark.
 - f. Powder Coating Finish: Color as selected by Architect from manufacturer's standard colors.
 - 3. Windload Design: Provide to meet the Design/Performance requirements specified.
 - 4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
 - 5. Lock: Interior galvanized single unit.
 - 6. Weatherstripping:
 - a. Flexible bulb-type strip at bottom section.
 - b. Flexible Jamb seals.
 - c. Flexible Header seal.

7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
8. Manual Operation: Pull rope.
9. Manual Operation: Chain hoist.
10. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
 - a. Entrapment Protection: Required for momentary contact, includes radio control operation.
 - 1) Pneumatic sensing edge up to 18 feet (5.5 m) wide. Constant contact only complying with UL 325/2010.
 - 2) Electric sensing edge monitored to meet UL 325/2010.
 - 3) Photoelectric sensors monitored to meet UL 325/2010.
 - b. Operator Controls:
 - 1) Push-button operated control stations with open, close, and stop buttons.
 - 2) Key operated control stations with open, close, and stop buttons.
 - 3) Push-button and key operated control stations with open, close, and stop buttons.
 - 4) Flush mounting.
 - 5) Surface mounting.
 - 6) Interior location.
 - 7) Exterior location.
 - 8) Both interior and exterior location.
 - c. Special Operation:
 - 1) Pull switch.
 - 2) Vehicle detector operation.
 - 3) Radio control operation.
 - 4) Card reader control.
 - 5) Photocell operation.
 - 6) Door timer operation.
 - 7) Commercial light package.
 - 8) Explosion and dust ignition proof control wiring.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until openings have been properly prepared.
- B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- C. Verify electric power is available and of correct characteristics.
- D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

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

3.3 INSTALLATION

- A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.
- B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- C. Anchor assembly to wall construction and building framing without distortion or stress.
- D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- E. Fit and align door assembly including hardware.
- F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.4 CLEANING AND ADJUSTING

- A. Adjust door assembly to smooth operation and in full contact with weatherstripping.
- B. Clean doors, frames and glass.
- C. Remove temporary labels and visible markings.

3.5 PROTECTION

- A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.
- B. Protect installed products until completion of project.
- C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION

SECTION 08550

WOOD WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes fixed and operable wood-framed windows of the following type:
 - 1. Single Hung
 - 2. Fixed Casement
 - 3. Operable Awning

1.3 DEFINITIONS

- A. Performance class designations according to AAMA/WDMA 101/I.S.2/A440-08:
 - 1. AW
 - 2. CW
 - 3. LC
 - 4. R.
- B. Performance grade number according to AAMA/WDMA 101/I.S.2/A440-08:
 - 1. Design pressure number in pounds force per square foot used to determine the structural test pressure and water test pressure.
- C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.
- D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

DANFORTH ON HIGH – PORTLAND, MAINE

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of wood window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
 - 1. Flashing and drainage details.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
 - 1. Include similar Samples of hardware and accessories involving color selection.
- D. Samples for Verification: For wood windows and components required, prepared on Samples of size indicated below.
 - 1. Window Corner Fabrication: 12--by-12-inch- long, full-size window corner including full-size sections of window frame with factory-applied color finish, weather stripping,
- E. Product Schedule: For wood windows. Use same designations indicated on Drawings.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type of wood window. The size shall be at least as large as the largest unit of each type in the project.
- G. Maintenance Data: For operable window sash operating hardware weather stripping and finishes to include in maintenance manuals.
- H. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating wood windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- B. Source Limitations: Obtain wood windows through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of wood windows and are based on products supplied by Pella Corporation. Refer to Division 1 Section "Product Requirements." Do not modify size and dimensional requirements.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/A440-08, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Provide AAMA/WDMA Hallmark-certified wood windows with an attached label.
- E. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to wood windows including, but not limited to, the following:
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review, discuss, and coordinate the interrelationship of wood windows with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
 - 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.6 PROJECT CONDITIONS

- 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating wood windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, air infiltration
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of wood, metals, vinyl, other materials, and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:

DANFORTH ON HIGH – PORTLAND, MAINE

- a. Window: Ten years from date of Substantial Completion.
- b. Insulating glass Twenty years from date of Substantial Completion.
- c. Laminated Glass: 5 years from date of Substantial Completion.
- d. Metal Finish (Baked Enamel): Ten years from date of Substantial Completion.
- e. Labor: Two Years from Substantial Completion

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Aluminum-Clad Wood Windows:
 - a. Pella Windows & Doors Inc.
 - b. Commercial contact: T.J. Tigerman 207-232-8446

2.2 MATERIALS

- A. Wood: Clear ponderosa pine or another suitable fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated.
- B. Aluminum Extrusions and Rolled Aluminum for Cladding: Manufacturer's standard formed sheet or extruded-aluminum cladding, mechanically bonded to exterior exposed wood members. Provide aluminum alloy and temper recommended by wood window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, and not less than 16,000-psi minimum yield strength.
 1. Baked-Enamel Finish for Extrusions and Sheet: Manufacturer's standard baked enamel complying with AAMA 2604 and paint manufacturer's written specifications for cleaning, conversion coating, and painting.
 - a. Color: as selected by Architect
 - 1) Color and Gloss: As selected by architect from manufacturer's full offering.
 2. Baked-Enamel Finish for Coil: Manufacturer's standard baked enamel complying with AAMA 2604 and paint manufacturer's written specifications for cleaning, conversion coating, and painting.
 - a. Color: as selected by Architect
- C. Wood Trim Material and finish to match frame members.
- D. Clad Trim Hollow extrusions Roll-formed sheet material and finish to match clad frame members.

DANFORTH ON HIGH – PORTLAND, MAINE

- E. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with wood window members, cladding, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- F. Anchors, Nail Fins, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- G. Reinforcing Members: Aluminum, or nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- H. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when wood window is closed.
 - 1. Weather-Stripping Material: Dual weather stripping, consisting of continuous, flexible polyvinyl chloride material in dual durometer design. Vent units have welded corners, compressed between frame and sash for positive seal on all four sides. Secondary polyvinyl chloride leaf-type weather strip between edge of sash and frame.
- I. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
- J. Replaceable Weather Seals: Comply with AAMA 701/702.
- K. Nail Fins: Folding aluminum

2.3 WINDOW

- A. Window Type: Architect Series, single hung, fixed casement and operable awnings.
- B. AAMA/WDMA Performance Requirements: Provide wood windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/A440-08
 - 1. Performance Class and Grade: Single Hung = LC 50, Fixed Casement = R 50, Awning = R 50.
 - 2. U-Factor: 0.30 Btu/sq.ft.
 - 3. Windows must comply with guidelines set forth in Maine Housing's Green Building Standards.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Solar Heat-Gain Coefficient (SHGC): Provide wood windows with a whole-window SHGC maximum of 0.21 (11-16" Sun Defense Low-E IG with argon with 2.5 mm glass).

2.4 GLAZING

- A. Glass and Glazing Materials: Refer to Division 8 Section "Glazing" for glass units and glazing requirements applicable to glazed wood window units.
- B. Glass Insulating-glass units, with low-E coating argon gas filled, with sputtered on second surface, manufactured by Cardinal complying with Division 8 Section "Glazing."
- C. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- D. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with wood and aluminum cladding; designed to smoothly operate, tightly close, and securely lock wood windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed to the exterior, provide stainless steel.
- E. Counterbalancing Mechanism: Comply with AAMA 902.
 - 1. Sash-Balance Type: Concealed, spring-loaded, block-and-tackle type, of size and capacity to hold sash stationary at any open position.
- F. Gear-Type Rotary Operators: Comply with AAMA 901 when tested according to ASTM E 405, Method A.
- G. Limit Devices: Provide limited open devices designed to restrict sash or ventilator opening.
 - 1. Safety Devices: Limit clear opening to 4 inches for ventilation..

2.5 INSECT SCREENS

- A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on inside or outside of window and provide for each operable exterior sash or ventilator.
- B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
 - 1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
 - 2. Finish: Baked-on organic coating in manufacturer's standard color.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Glass-Fiber Mesh Fabric: 18 by 18 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration; in the following color. Comply with ASTM D 3656..

- 1. Mesh Color: Black.

- D. High Transparency Mesh Fabric: 21-by-17 PVDF mesh with minimum 78 percent visible light transmission screen cloth complying with FS L-S-125B and SMA 1004 or SMA 1201 that is resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration; black.

2.6 ACCESSORIES

2.7 FABRICATION

- A. Fabricate wood windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

- B. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator, unless otherwise indicated.

- 1. Single-Hung Windows: Provide weather stripping only at horizontal rails of operable sash.

- C. Factory machine windows for openings and for hardware that is not surface applied.

- D. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

- E. Factory-Glazed Fabrication: Glaze wood windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/WDMA 101/I.S.2/A440-08.

2.8 INTERIOR WOOD FINISHES

- A. Factory-Primed Windows: Provide manufacturer's standard factory-prime coat interior wood surfaces.

- B. Factory-Finished Windows: Provide manufacturer's standard factory finish. Apply finish to exposed interior wood surfaces.

- 1. Color:

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
 - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 - 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
 - 3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Install windows to be weather-tight and freely operating.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- E. For fin method of attachment, integrate window system installation with exterior weather-resistant barrier using flashing/sealant tape. Apply and integrate flashing/sealant tape with weather-resistant barrier using watershed principles in accordance with window manufacturer's instructions.
- F. Place interior seal around window perimeter using insulating foam sealant to maintain continuity of building thermal and air barrier.
- G. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly.
- H. Leave window units closed and locked.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 08710 FINISH HARDWARE

PART 1 –GENERAL

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 DESCRIPTION OF WORK

- A. The work of this section includes, but is not limited to, the following:
 - 1. Providing hardware for all doors, except doors provided with their own hardware.
 - 2. Providing the services of a qualified hardware consultant to prepare detailed schedules of hardware required for the project.

1.03 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this section. Other specifications sections which directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 08100 – Hollow Metal Doors and Frames; work requiring template coordination, metal astragals for fire-rated doors.
 - 2. Section 08210 – Wood Doors; work requiring template coordination, metal astragals for fire-rated doors.

1.04 INTENT

- A. A major intent of the work of this section is to provide hardware for every door in the project, except as indicated, so that each door functions correctly for its intended use. Provide only hardware that complies with applicable codes and requirements of authorities having jurisdiction including requirements for barrier-free accessibility.

1.05 QUALITY ASSURANCE

- A. Hardware supplier shall have in his employ one or more members of the Door and Hardware Institute to include at least one Certified Architectural Hardware Consultant in good standing, who shall be responsible for preparation of the Finish Hardware Schedule. This Consultant shall be acceptable to the Architect and is to ensure that the intent requirement of this specification is fulfilled, and certify that the work of this section meets or exceeds the requirements specified in this section and the requirements of authorities having jurisdiction.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Hardware supplier shall warrant and guarantee, in writing, that hardware supplied is free of defective material and workmanship. Supplier shall further warrant and guarantee for a period of one year from Owner's Use and Occupancy that the hardware shall function in a satisfactory manner without binding, collapse, or dislodging of its parts, provide the installation is made to the manufacturer's recommendations.
- C. The hardware supplier shall repair or remedy, without charge, any defect of workmanship or material for which he is responsible hereunder.

1.06 SUBMITTALS

- A. Submit the following in accordance with SECTION 01300-SUBMITTALS:
 - 1. Schedule: Submit to the Architect six (6) copies of the complete hardware schedule within the fourteen (14) days after receipt of contract award. Submit therewith complete catalog cuts and descriptive data of all products specifically scheduled therein. No materials shall be ordered or templates issued until the hardware schedule has been approved by the Architect. Form and detail of hardware schedule shall be in vertical format in conformance to the door and hardware industry standards. All hardware sets shall be clearly cross-referenced to the hardware set numbers listed in the specifications.
 - 2. Samples: If requested, submit to the Architect for approval, a complete line of samples as directed. Samples shall be plainly marked giving hardware number used in this specification, the manufacturer's numbers, types and sizes. The Architect will deliver approved samples to the project site to be stored. Samples will remain with the Architect until delivery of all hardware to the project is complete, after which time they will be turned over to the General Contractor for incorporation into the work.
 - 3. Keying System Submission: Before cylinders are ordered, submit a complete proposed keying system for approval. This should be done after a keying meeting has been held with the owner's representative.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of hardware shall be made to the project by the Hardware Supplier in accordance with the instructions of the General Contractor.
- B. The finish hardware shall be delivered to the jobsite and received there by the General Contractor. The General Contractor shall prepare a locked storage room with adequate shelving, for all hardware. The storage room shall be in a dry, secure area, and shall not include storage of other products by other trades.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. The General Contractor shall furnish the Hardware Supplier with receipts for all hardware and accessory items received, and shall send copies of these receipts to the Architect, if requested.

1.08 REGULATORY REQUIREMENTS

- A. Conform to all applicable codes. Provide all throws, projections, coatings, knurling, opening and closing forces, and other special functions required by State and Local Building Codes, and all applicable Handicap Code requirements.
- B. For fire rated openings, provide hardware complying with NFPA 80 and NFPA 101 without exception. Provide only hardware tested by UL for the type and size of door installed and fire resistance rating required.

1.09 SPECIAL REQUIREMENTS

- A. Hardware Supplier shall determine conditions and materials of all doors and frames for proper application of hardware.
- B. The Hardware Schedule shall list the actual product series numbers. Bidders are required to follow the manufacturers' catalog requirement for the actual size of door closers, brackets and holders. All door opening sizes are as noted on the Door Schedule and all hardware shall be in strict accordance with requirements of height, width, and thickness.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

Hinges	McKinney Stanley	Scranton, PA New Britain, CT
Locksets	Schlage Sargent	Colorado Springs, CO New Haven, CT
Exit Devices	Sargent Von Duprin	New Haven, CT Indianapolis, IN
Door Closers	Sargent LCN	New Haven, CT Princeton, IL
Door Stop	Glynn Johnson Ives Rockwood	Indianapolis, IN New Haven, CT Rockwood, PA

DANFORTH ON HIGH – PORTLAND, MAINE

Push/Pulls	Rockwood Burns Ives	Rockwood, PA Erie, PA New Haven, CT
Protective Plates	Rockwood Burns Ives	Rockwood, PA Erie, PA New Haven, CT
Thresholds/ Weatherstripping/ Rain Drips	NGP Pemko Reese	Memphis, TN Memphis, TN Rosemount, MN
Silencers	Ives Glynn Johnson Rockwood	New Haven, CT Indianapolis, IN Rockwood, PA

2.02 MATERIALS AND QUALITY

- A. All hardware shall be of the best grade of solid metal entirely free from imperfections manufacturer and finish.
- B. Qualities, weights, and sizes given herein are the minimum that will be accepted. It is the responsibility of the Hardware Supplier to supply the specified size and weight of hardware and the proper function of hardware in each case and to provide UL approved hardware at all fire rated doors.
- C. Provide, as far as possible, locks of one lock manufacturer and hinges of one hinge manufacturer. Modifications to hardware that are necessary to conform to construction shown or specified shall be provided as required for the specified operation and functional features.

2.03 HARDWARE DESIGNATIONS

- A. All items of hardware are referenced by manufacturer's names and numbers. The manufacturer's names and numbers are used to define the function, design, and the quality of the material to be supplied.

Substitution of products other than those listed shall be submitted to the Architect at least ten (10) days PRIOR to the bid date. The Architect shall be the sole judge of any proposed substitution.

2.04 TEMPLATES

- A. Hardware supplier shall immediately, but not later than three (3) days after approval of his Schedule by the Architect, furnish the General Contractor with complete template information necessary for the fabrication of doors, frames, etc. No templates shall be furnished prior to the approval of the hardware schedule.

DANFORTH ON HIGH – PORTLAND, MAINE

2.05 HARDWARE FOR LABELED FIRE DOORS, EXIT DEVICES AND SMOKE DOORS

- A. Hardware shall conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Labeling and listing by UL Building Materials Directory, for class of door being used will be accepted as evidence of conformance to these requirements. Install minimum latch throw as specified on label of individual doors. Provide hardware listed by UL except where heavier materials, larger sizes, or better grades are specified herein under paragraph entitled "Hardware Sets". In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements. Specific hardware requirements of door or frame manufacturers which exceed sized or weights of hardware herein listed shall be provided with no additional charge.

2.06 KEYS AND KEYING

- A. The hardware supplier shall review the specific hardware functions with the Architect and owner at the time of the keying review, to assure the appropriateness of each of the hardware functions. Failure to make this review does not relieve the hardware supplier from providing the proper functions.
- B. Key System: All cylinders shall be masterkeyed to a new masterkey system.
 - 1. Master keys, Grandmaster Keys: Furnish six (6) keys for each set, if required.
 - 2. Furnish three (3) change keys for each cylinder keyed differently; six (6) change keys for each set keyed alike, and in sets where only (2) cylinders are keyed alike, four (4) change keys will be required.
 - 3. All keying is to be done at the factory to avoid duplication of the new cylinders.
 - 4. Master Keys shall be sent to the Owner by registered mail, return receipt required.
 - 5. Supply a bitting list for all change keys and master keys to the Owner.

2.07 FASTENERS

- A. Manufacture hardware to conform to published templates, generally prepared for machine screw installation.
- B. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Furnish exposed screws to match

DANFORTH ON HIGH – PORTLAND, MAINE

the hardware finish, or, if exposed in surfaces of other work, to match the finish of such other work as closely as possible, except as otherwise indicated.

- C. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard manufactured units of the type specified are available with concealed fasteners. Do not use thru-bolts unless specifically approved by the Architect.
- D. All hardware shall be installed only with fasteners supplied by manufacturers of specific products.

2.08 PACKING AND MARKING

- A. All hardware shall have the required screws, bolts and fastenings necessary for proper installation and shall be wrapped in the same package as the hardware item for which it is intended and shall match finish of hardware with which to be used.
- B. Each package shall be clearly labeled indicating the portion of the work for which it is intended.

2.09 ENVIROMENTAL CONCERN FOR PACKING

- A. The hardware shipped to the jobsite is to be packaged in biodegradable packs such as paper or cardboard boxes and wrapping. If non-biodegradable packing such as plastic, plastic bags or large amounts of Styrofoam is utilized, then the Contractor will be responsible for the disposal of the non-biodegradable packing to a licensed or authorized collector for recycling of the non-degradable packing.

2.10 FINISH HARDWARE DESCRIPTION

- A. Hardware items shall conform to respective specifications and standards and to requirements specified herein.
- B. MATERIALS AND FINISH MATERIALS AND FINISHES SHALL BE:
 - 1. Interior Butts: 26D
 - 2. Door Closers: Sprayed to match hardware finish.
 - 3. Exit Devices: 32D
 - 4. Kick, Push Plates: 32D
 - 5. All other hardware shall be: 26D, or as scheduled.
- C. HINGES
 - 1. Number of hinges per door, two hinges for doors up to and including five feet in height and an additional hinge for each two and one half feet or fraction thereof.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Hinges shall be as follows:

Exterior	McKinney	TA2314 4 ½ x 4 ½ NRP
	Stanley	FBB191 4 ½ x 4 ½ NRP
Interior	McKinney	TA2714 4 ½ x 4 ½
	Stanley	FBB179 4 ½ x 4 ½
Elec	McKinney	TA2714-CC4
	Stanley	CEFBB179

D. DOOR CLOSERS:

1. Door closers shall have fully hydraulic, full rack and pinion action. Cylinder body shall be 1-1/2" in diameter, and double heat treated pinion shall be 11/16" in diameter.
2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and hydraulic back-check.
4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).
5. Closer arms (and metal covers when specified) shall have a powder coating finish.
6. Provide drop, mounting plates, where required.
7. Do not locate closers on the side of doors facing corridors, passageways or similar type areas. Where it is necessary, due to certain conditions and approval of the Architect, to have closers in corridors, provide such closers with parallel or track type arms.
8. All door closers shall be adjusted by the installer in accordance with the manufacturer's templates and written instructions. Closers with parallel arms shall have back-check features adjusted prior to installation.
9. Closers shall conform to all applicable code requirements relative to setting closing speeds for closers and maximum pressure for operating interior and exterior doors.

DANFORTH ON HIGH – PORTLAND, MAINE

10. Door closers meeting this specification are as follows:

	LCN	Sargent
Exterior	1461-CUSH	1431 – CPS
	1461-H-CUSH	1431 – CPSH
Interior	1461	1431 – 0
	1461	1431 – P10

E. EXIT DEVICES:

1. Shall be Von Duprin or Sargent as follows:

Function	Von Duprin	Sargent
A	CD99NL-OP	16-8804
B	CD99EO	16-8810
C	99L	8813ET
D	99L-BE	8815ET
E	99EO-F	12-8810
F	99L-F	12-8813ET
G	99L-F-BE	12-8815ET
H	CD9927EO	16-8710
I	9927L	8713ET
J	9927L-BE	8715ET
K	CD9927EO x LBR	16-PP/PR8710
L	9927L x LBR	PP/PR8713ET
M	9927L-BE x LBR	PP/PR8715ET
N	9927EO-F	12-8710
O	9927L-F	12-8713ET
P	9927L-F-BE	12-8715ET
Q	9927EO-F x LBR	12-PP/PR8710
R	9927L-F x LBR	12-PP/PR8713ET
S	9927L-F-BE x LBR	12PP/PR8715ET
T	CD9927TP	16-8710 x 306
U	EL99L-F	56-12 8813 ETL
V	EL9927EO-F	56-12 8710
W		56-12-8713 ETL

NOTE: Lever design shall match lock trim

F. HEAVY DUTY LEVER HANDLE CYLINDRICAL LOCKS:

1. Locksets for this project shall be heavy duty cylindrical key-in-lever handle type locksets.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Locksets shall be 2 ¾" backset with ½" throw latchbolt, with deadlocking latch, and a cylindrical housing of steel with a zinc dichromate finish.
3. Locksets shall be fastened by thru-bolts, thru the 3 ½" diameter inside rose back plate into the threaded studs in the outside rose back plate. Thru-bolts shall be placed in separate bolt holes, thru the door and outside the cylindrical case at 180 deg. from each other.
4. The inside and outside rose scalps shall be 3 ½" diameter wrought brass or bronze. When assembled, all thru-bolts in the face of the door shall be concealed from view. The lever handles shall be solid cast in the same finish as the rose.
5. The ½" throw latchbolt shall be listed and approved for use by Underwriters Laboratories.
6. Strikes shall be curved lip ANSI A115.2 4 7/8" x 1 ¼" wrought brass or bronze.
7. The following locksets shall be considered acceptable for this project:

Schlage	"ND" Series	RHO Design
Sargent	10 Line	LL Design

8. Lock functions as indicated in the hardware schedule shall be as follows:

Function	Schlage	Sargent
A(Storeroom)	80	04
B(Storeroom)	80 (Knurled)	04
C(Office)	50	05
D(Passage)	10	15
E(Vestibule)	60	16
F(Classroom)	70	37
G(Spec Classroom)	71	38
H(Privacy)	40	65
I(Dummy)	170	93
J	73	54

G. STANDARD DUTY LEVER HANDLE CYLINDRICAL LOCKS:

1. Locksets for this project shall be standard duty cylindrical key in lever handle type locksets.
2. Locksets shall be 2 ¾" backset with ½" throw latchbolt, with deadlocking latch, and a cylindrical housing of steel with a zinc dichromate finish.
3. Locksets shall be fastened by thru bolts, thru the 3 3/8" diameter inside rose back plate into the threaded studs in the outside rose back plate. Thru bolts shall be

DANFORTH ON HIGH – PORTLAND, MAINE

placed in separate bolt holes, thru the door and outside the cylindrical case at 180° from each other.

4. The inside and outside rose scalps shall be 3 3/8" diameter wrought brass or bronze. When assembled, all thru bolts in the face of the door shall be concealed from view. The lever handles shall be solid cast in the same finish as the rose.
5. Cylinders for lever handle cylindrical locks shall be 6 pin tumbler, solid brass, with nickel silver keys. Two keys shall be supplied with each lock or cylinder. See "Keying Section 2.06B" for masterkey information.
6. The 1/2" throw latchbolt shall be listed and approved for use by Underwriters Laboratories.
7. Strikes shall be curved lip ANSI A - 115.2 4 7/8" x 1 1/4" wrought brass or bronze.
8. The following locksets shall be considered acceptable for this project:

Schlage	AL Series	SAT Design
Sargent	6500 Series	KL Design
9. All locksets and cylinders for this project, shall be by the same manufacturer and shall be manufactured in the United States of America by a reputable builders hardware manufacturer.
10. The following is a list of lock functions as indicated under "hardware set:

FUNCTION	SARGENT	SCHLAGE
(1S)	04	80
(2S)	05	53
(3S)	15	10
(4S)	37	70
(5S)	65	40

H. INTERCONNECTED ENTRANCE LOCK:

1. Under the base bid provide interconnected locksets with deadbolt conforming to ANSI/BHMA A156.12 Series 5000, meeting grade 2 strength and operational requirements.

Locks shall be certified for a UL 3 hour fire rating.
 Lever style shall be Saturn.
 Deadbolt shall be removable core.
 Lockset function shall be S210RD.
 Manufacturer shall be Schlage (no substitutions).

I. ELECTRONIC INTERCONNECTED LOCKSETS: (ALT. #01)

1. Provide interconnected locksets with electronic deadbolt conforming to ANSI/BHMA A156.12, Grade 2 requirements, with simultaneous retraction of

DANFORTH ON HIGH – PORTLAND, MAINE

deadbolt and latch for single-operation egress. Locks shall be certified by UL for 3-hour fire resistance rating.

2. Locks shall be adjustable for 2 3/8-inch or 2 3/4-inch backset, with a 1/2-inch throw latchbolt and 1-inch throw deadbolt. Locks shall accommodate door thickness of 1 3/8 inches to 1 3/4 inches.
3. Strikes shall be standard 1 1/8-inch x 2 1/4-inch square corner strikes, unless extended-lip strikes are required for protection of trim.
4. Locks shall be non-handed, and shall accommodate 4-inch or 5 1/2-inch spacing between lockset and deadbolt preparation on door.
5. Lever style shall be Elan.
6. Electronic deadbolt shall be battery-operated, and shall accept iButton credentials, as well as mechanical key override.
7. Software shall generate 1,000-event audit reports which include credential used and date/time of access, and shall allow time-zone control of access credentials. Software shall accommodate 500 user credentials.
8. The following components are also required as part of this system:
 - a. Schlage Security Management System Express (SMS Express) software (Comm: SXPR-SFT-1, Res: 56-063).
 - b. Handheld Programming Device Kit (HHD kit) includes HHD Programming Device and HH-USB Cable.
 - c. Female/Female Serial Cable (Comm: P394548, Res: 56-036).
 - d. Programming iButton (48-515).
 - e. User iButton on black fob (100-pack – 48-530).
9. Acceptable Manufacturers and Products: Schlage FE210 series

J. OFFLINE ELECTRONIC LOCKSETS: (ALT. #01)

1. Bored type locksets to be non-handed, heavy-duty cylindrical type, with 2 3/4" backset, as specified, with 1/2 inch throw latchbolt with 3/4 inch throw available. Chassis to accommodate standard 161 cylindrical lock prep for 1 3/4" doors standard; with 1 3/8" to 2 3/4" thick doors in 1/8" increments. Backset to be 2 3/4" standard, with 2 3/8", 3 3/4" and 5" backset optional.
2. Lockset to meet or exceed ANSI Standard A156.25 and A156.2 Series 4000, Grade 1 strength and operational requirements. Lockset listed to UL294. Lockset certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203. Lockset shall be compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada RSS-210.
3. Exterior lever to be designed with ability to rotate freely while door remains securely locked, preventing damage to internal lock components from vandalism by excessive force. Lever trim to be non-handed, and to operate independently of non-locking levers for extended life cycles.

DANFORTH ON HIGH – PORTLAND, MAINE

4. Lockset powered by four AA batteries.
 5. Furnish locks with following functions that are field configurable:
 - a. Classroom / Storeroom 70.
 - b. Office 50.
 - c. Privacy 40.
 6. Lever style:
 - a. Athens
 - b. Knurling option available for tactile feedback.
 7. Lockset to have visual tri-colored LED indicators that indicate activation, operational systems status, system error conditions and low power conditions. Lockset to have audible feedback that can be enabled or disabled. Lockset to have a on board processor with memory capacity of 2,000 users, 2,000 event audit history, up to 16 time zones and up to 32 calendar events. Lockset to have a standard Mechanical Key Override Switch. Lockset to have an optional Door Position Switch. Lockset to have ability to communicate Battery Status.
 8. Credential reader capabilities for SMS Express Software will include and may not be limited to:
 - a. 125 kHz Proximity card credentials: Schlage.
 - b. Dual credential reading capabilities credential card/fob + pin.
 - c. 12 button keypad.
 9. The lockset will have the ability to utilize emergency mechanical key with Full Size Interchangeable Cores from Schlage.
 10. Acceptable Manufacturers and Products: Schlage CO-200-CY-PRK Series
- K. OFFLINE ELECTRONIC ACCESS CONTROLLED EXIT DEVICE TRIM: (ALT. #01)
1. Exit device lever trim to be non-handed, and field reversible.
 2. Exit device trim to be provided with a universal mounting plate enabling it to operate specified exit devices.
 3. Exit device trim to meet or exceed A156.25 Grade 1 Operational and Security. Exit device trim shall be listed to UL294. Exit device trim certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAs 202 and TAS 203. Exit device trim shall be compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada RSS-210.
 4. Exterior lever to be designed with ability to rotate freely while door remains securely locked, preventing damage to internal lock components from vandalism by excessive force.
 5. Exit device trim powered by four AA batteries.
 6. Exit device lever trim to release the latch bolt for the following exit device applications: rim, surface vertical rod, concealed vertical rod and mortise.

DANFORTH ON HIGH – PORTLAND, MAINE

7. Furnish trim with following functions:
 - a. Classroom / Storeroom.
 8. Lever style:
 - a. Rhodes
 - b. Knurling option available for tactile feedback.
 9. Trim to have a on board processor with memory capacity of 2,000 users, 2,000 event audit history, 16 time zones and 32 calendar events. Exit device trim to have the following switch provided standard: Mechanical Key Override. Lockset to have the following optional switch: Door Position Switch. Exit device trim to have the ability to communicate Battery Status
 10. Credential reader capabilities for SMS Express Software will include and may not be limited to: [Line item 22 or 23 must be referenced]
 - a. 125 kHz Proximity card credentials: Schlage
 - b. Dual credential reading capabilities credential card/fob + pin.
 - c. 12 button keypad with non-backlit buttons.
 11. The exit device trim will have the ability to utilize emergency mechanical key with Full Size Interchangeable Cores from Schlage.
 12. Acceptable Manufacturers and Products: Schlage CO-200-993-PRK Series
- L. ACCESS CONTROL SYSTEM: (ALT. #01)
1. The Access Control shall be a modular system that is capable of expansion to large projects with multiple remote sites, alarm monitoring, badging, digital video servers and CCTV system control. The system shall also reflect the open-architecture design that is flexible and easily expandable.
 2. The software program shall be a 32-bit, client/server, ODBC compliant application based on Microsoft tools and standards. The software program shall operate in one of the following environments; Windows XP or greater using Intel Pentium III Processor or greater. The software shall manage both online and offline locksets; Schlage FE-series, CO-series, and CT5000 controllers.
 3. The manufacturer shall offer both single workstation and multi workstation systems from the product family. The software program shall consist of multiple servers including, but not limited to, database server, communication server and client and workstation server. The servers shall be capable of being installed on one or more PCs across a network providing a distribution of systems and processes.
 4. A PC/workstation computer, furnished by others, shall be used to program all access control functions, generate reports, display in real-time all or selected alarms, operator instructions for alarm response, alarm resets, all or selected valid and invalid entry activity, and all internal system status alarms such as communication loss/restore, power loss etc.

DANFORTH ON HIGH – PORTLAND, MAINE

5. The system programming should be user friendly and capable of being accomplished by personnel with no prior computer experience. The software shall be of a consistent user interface that is compatible with current software techniques employed by Microsoft and other software developers, namely drop down menus, drag and drop programming, dialogue boxes, check boxes, etc. The basic user interface shall be consistent with techniques used in the Windows 2000 operating system, or its predecessor, Windows NT and shall also have a manual mode of operation allowing authorized operators to respond to alarm or trouble conditions, unlock doors or override control points.
6. The System shall provide a means for scheduled automatic backups of any or all database system files.
7. The system (single user system or multi user system) shall have the capability to communicate with the controllers via LAN/WAN connections utilizing industry standard TCP/IP communication protocol. The system shall also support dial-up communication via an on-board modem at 2400-baud rate and direct communication via RS232 protocol.
8. Access Control Server Software to be installed in Owner supplied computer system.
9. Acceptable Manufacturers and Products: Schlage SMS Express.

M. ELECTRIC STRIKES

1. Provide non-handed surface mounted electric strikes that require no alteration or field cutting to existing frame designed for use with the rim type exit device where scheduled.
2. Provide electric strikes meeting UL1034 burglary resistant and UL Listed up to 3-hours. Provide fail-secure type electric strikes, unless specified otherwise.
3. Provide transformers and rectifiers for each strike as required. Strikes shall be field selectable voltage 12-24 VDC.
4. Acceptable Manufacturers and Products: Von Duprin 6300 series.

N. HAND HELD PROGRAMMING DEVICE: (ALT. 01)

1. Capable of initializing lock and accessories using preloaded Schlage Utility Software
2. Used to field configure devices:
 - a. Credential Reader Formats
 - b. Lock Function
 - c. Unlock Period
 - d. Power Failure Mode
 - e. Audible Alarm ON/OFF
 - f. Battery Status
 - g. Validate hardware and software revision

DANFORTH ON HIGH – PORTLAND, MAINE

- h. Troubleshooting Status Signals
 - i. Special Access Delay (ADA)
 - j. Delayed Egress (Release Delay)
 - k. Door Propped open Delay
 - l. Lockdown Cancel Delay Time Out between credential and PIM
 - m. Number of Key presses without valid PIN before lockout
 - n. Current Date/Time
 - o. Enable/Disable Manual Programming
- 3. Utilized to download firmware updates and door files to device
 - 4. Utilized to download audit files from device
 - 5. Hand Held Device to have:
 - a. 3.5 inch LCD display minimum
 - b. Touch Screen/Keypad Backlit
 - c. 32-bit processor minimum
 - d. Memory: 128MB RAM/256 MB ROM
 - e. Battery: Rechargeable Li-ion
 - 6. Acceptable Manufactures: Schlage HHD Kit
- O. PROXIMITY CARD READER: (ALT. #01)
- 1. Provide mounting suited for door mullions or narrow stile mounting.
 - 2. The reader shall contain a sensor for tamper detection.
 - 3. The reader shall be UL 294 listed, and shall be FCC and CE certified.
 - 4. Transmit frequency: 125kHz
 - 5. The reader shall have a read range of up to 4.5".
 - 6. The reader shall be capable of reading access control data from Schlage Proximity, XceedID™ Proximity, HID® Proximity, and GE/CASI ProxLite® Proximity credentials.
 - 7. The reader shall be capable of transmitting card data in standard Wiegand format.
 - 8. The reader shall have a Wiegand output.
 - 9. The reader shall have separate terminal control points for LEDs and for the audible indicator.
 - 10. The reader shall have multiple LEDs for increased visibility.
 - 11. The reader's color shall be (select) Black or Gray.

DANFORTH ON HIGH – PORTLAND, MAINE

- 12. The reader shall produce an audio signal providing unique tone sequences for various status conditions.
- 13. The reader shall have a limited lifetime warranty against defects in materials and workmanship.
- 14. Acceptable Manufacturers and Products: Schlage SXF1050

P. PUSH PLATES, DOOR PULLS, PUSH/PULL BARS:

- 1. Shall be as manufactured by Rockwood, Burns or Ives.
 - a. Push plates shall be 4" x 16" x .050 thickness unless otherwise listed in hardware sets.

Rockwood	70 Series
Burns	50 Series
Quality	40 Series

- b. Door pulls shall be 1" x 10"

Type A

Rockwood	BF111
Burns	BF26C
Quality	BF163-10"

- c. Push/Pull bars

Type A (Wide Stile Doors)

Rockwood	BF11147 x T1006 Mounting
Burns	BF26C x 442 x Sim. Mounting as Above
Quality	BF 482 x Sim. Mounting as Above

Q. KICK PLATES, ARMOR PLATES, MOP PLATES:

- 1. Kick plates shall be 8 in. high. Armor plates shall be 34 in. high. Mop plates shall be 4 in. high. All plates shall be 2 in. less the width of door. Plates shall be .050 thickness, bevel 4 edges, screws shall be oval head counter-sunk.

R. STOPS

- 1. Shall be furnished at all doors. Wherever and opened door or any item of hardware thereon strikes a wall, at 90 degrees. Provide wall bumpers, unless otherwise indicated in hardware sets.
- 2. Where wall bumpers cannot be effectively used, a floor stop shall be furnished and installed.

DANFORTH ON HIGH – PORTLAND, MAINE

3. Provide roller bumpers for each door where two doors interfere with each other in swinging.

Manufacturer	Wall Bumpers	Floor Stops	Roller Bumpers
Rockwood	409	440, 442	456
Ives	407 ½	436B, 438B	470 Series
Glynn Johnson	WB 50XT	FB13, FB14	RB-3

4. Where overhead stops are listed they shall be the surface mounted type as follows:

Manufacturer	Series
Glynn Johnson	GJ450
Sargent	1540
ABH	4400

S. THRESHOLDS, WEATHERSTRIP, SEAL:

1. Thresholds shall be as detailed and furnished on all doors where shown on drawings. Thresholds shall be aluminum unless otherwise indicated. Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants".
2. Weatherstripping shall be furnished on all exterior doors unless otherwise indicated.

Product	Pemko	Reese	NGP
Threshold	as detailed		
Brush Seal	45062AP	970	A626A
Auto. Door Bottom	430CR	330	420
Door Sweep	345AV	353	101AV
Set Astragals	351C x 351CP	95 x 95P	140 x 140P
Astragal	357SP	183S	139SP
Rain Drip	346C	R210A	16A

T. ROLLER BUMPERS:

1. Where required roller bumpers shall be installed where two doors open against each other and shall be equal to Rockwood 456.

DANFORTH ON HIGH – PORTLAND, MAINE

U. COAT HOOKS:

1. Where called for in the hardware sets provide coat hook 572 by H.B. Ives of Indianapolis, IN.

V. FLUSH BOLTS:

1. Shall be self-latching or automatic type at label doors, manual flush bolts at non-label doors.

			Glynn Johnson	Door Controls	Rockwood
Manual	HM	FB6		780	555
	WD	FB6W		790	557
Self Latching	HM	FB51P		845	1845
	WD	FB61P		945	1945
Automatic	HM	FB31P		842	1842
	WD	FB41P		942	1942

W. POCKET DOOR HARDWARE:

1. Pocket door hardware shall be Stanley PDFC250N or Hager 9850.

X. VIEWERS/KNOCKER:

1. Combination viewer/knocker to be equal to Ives Model #U763 x U700

Y. MAGNETIC DOOR HOLDER:

1. Electro-magnetic door holder to be equal to Rixson wall mounted unit Model #998

Z. EXIT ALARM:

1. Exit alarm code-complaint, battery alarmed panic hardware with deadbolt equal to Detex Model #ECL-230D

PART 3—EXECUTION

3.01. INSPECTION

1. It shall be the general contractors responsibility to inspect all doors openings and doors to determine that each door and door frame has been properly prepared for the required hardware. If errors in dimensions or preparation are encountered, they are to be corrected by the responsible parties prior to the installation of hardware.

DANFORTH ON HIGH – PORTLAND, MAINE

3.02 PREPARATION

1. All doors and frames, requiring field preparation for finish hardware, shall be carefully mortised, drilled for pilot holes, or tapped for machine screws for all items of finish hardware in accordance with the manufacturers templates and instructions.

3.03 INSTALLATION/ADJUSTMENT/LOCATION

1. All materials shall be installed in a workmanlike manner following the manufacture's recommended instructions.
2. Exit Devices shall be carefully installed so as to permit friction free operation of crossbar, touch bar, lever. Latching mechanism shall also operate freely without friction or binding.
3. Door Closers shall be installed in accordance with the manufacturer's instructions. Each door closer shall be carefully installed, on each door, at the degree of opening indicated on the hardware schedule. Arm position shall be shown on the instruction sheets and required by the finish hardware schedule.
4. The adjustments for all door closers shall be the installer's responsibility and these adjustments shall be made at the time of installation of the door closer. The closing speed and the latching speed valves, shall be adjusted individually to provide a smooth, continuous closing action without slamming. The delayed action feature or back check valve shall also be adjusted so as to permit the correct delayed action cycle or hydraulic back check valve shall also be adjusted so as the opening cycle. All valves must be properly adjusted at the time of installation. Each door closer has adjustable spring power capable of being adjusted, in the field from size 2 thru 6. It shall be the installers' responsibility to adjust the spring power for each door closer in exact accordance with the spring power adjustment chart illustrated in the door closer installation sheet packed with each door closed.
5. Installation of all other hardware, including locksets, push-pull latches, overhead holders, door stops, plates and other items, shall be carefully coordinated with the hardware schedule and the manufacturer's instruction sheets.
6. Locations for finish hardware shall be in accordance with dimensions listed in the pamphlet "Recommended locations for Builders' Hardware" published by the Door and Hardware Institute.

3.04 FIELD QUALITY CONTROL

1. Upon completion of the installation of the finish hardware, it shall be the responsibility of the finish hardware supplier to visit the project and to examine the hardware for each door on which he has provided hardware and to verify that all hardware is in proper working order. Should he find items of hardware

DANFORTH ON HIGH – PORTLAND, MAINE

not operating problem he should make a report, in writing, to the general contractor, advising him of the problem and the measures required to correct the problem.

3.05 PROTECTION

1. All exposed portions of finish hardware shall be carefully protected, by use of cloth, adhesive backed paper or other materials, immediately after installation of the hardware item on the door. The finish shall remain protected until completion of the project. Prior to acceptance of the project by the Architect and owner, the general contractor shall remove the protective material exposing the finish hardware.

3.06 CLEANING

1. It shall be the responsibility of the general contractor to clean all items of finish hardware and to remove any remaining pieces of protective materials and labels.

3.07 INSTRUCTIONS AND TOOLS

1. It shall be the responsibility of the finish hardware supplier to provide installation and repair manuals and adjusting tools, wrenches, etc... for the following operating products.
 - a. Locksets (all types)
 - b. Exit Devices (all types)
 - c. Door Closers

3.08 HARDWARE SETS

1. Each Hardware Set listed below represents the complete hardware requirements for one opening. (Single Door or Pair of Doors). Furnish the quantities required for each set for the work.

HW1

Doors #B04, B06, B08, B09

Each Leaf Shall Have: Hinges, Lockset (Function A), Door Closer, Threshold, Door Stop, Smoke Seals

HW2

Doors #B05, 302

Each Leaf Shall Have: Hinges, Lockset (Function D), Door Closer, Kick Plate, Door Stop, Smoke Seals

HW3

DANFORTH ON HIGH – PORTLAND, MAINE

Door #303

Each Leaf Shall Have:: Hinges, Lockset (Function A), Door Stop

HW4

Door #104

Each Leaf Shall Have: Hinges, Exit Device (Function B), Door Closer (Cush N Stop Arm), Kick Plate, Threshold, Weatherstrip, Door Sweep

HW5

Doors #101, 103, B02, 201, 204, 301, 304, 401, 402

Each Leaf Shall Have: Hinges, Lockset (Function D), Door Closer, Kick Plate, Door Stop, Smoke Seals

HW6

Door #203

Each Leaf Shall Have: Hinges, Lockset (Function H), Door Closer, Kick Plate, Door Stop, Smoke Seals

HW7

Door #102

Each Leaf Shall Have: Hinges, Lockset (Function C), Door Closer, Kick Plate, Door Stop, Smoke Seals

HW8

Door #B07

Each Leaf Shall Have: Hinges, Lockset (Function A), Door Closer, Kick Plate, Door Stop, Smoke Seals

HW9

Door #202

Each Leaf Shall Have: Hinges, Lockset (Function F), Door Closers, Auto Flush Bolts, Coordinator, Mag Holders, Door Stops, Smoke Seals

HW10

Door #B01

Each Leaf Shall Have: Hinges, Lockset (Function A), Auto Door Operator, Electric Strike, Kick Plate, Threshold, Weatherstrip, Door Sweep

HW11

Door #B03

DANFORTH ON HIGH – PORTLAND, MAINE

Each Leaf Shall Have: Hinges, Lockset (Function A), Auto Door Operator, Electric Strike, Kick Plate, Threshold, Smoke Seals, Door Sweep, Door Stop

HW12

Door Type 01

Each Leaf Shall Have: Hinges, Lockset (Function J), Door Closer, Viewer (Provide 2 at HC Apartments), Door Stop, Smoke Seals

HW13

Door Type 02

Each Leaf Shall Have: Hinges, Lockset (Function 5S), Door Stop, (Provide Function 3S at Closet Doors)

HW14

Door Types 03, 05

Each Leaf Shall Have: Pocket Door Hardware, Back to Back Pulls 6" x 5/8 Diameter

HW15

Door Types 09, 10

Each Leaf Shall Have: Bi-Passing Door Hardware, Flush Pulls

HW16

Door Types 04, 06, 07, 08, 11

Each Leaf Shall Have: All Hardware by Door Supplier

ADD ALTERNATE #01

HWA

Doors #B01, B03, Overhead Door

Proximity Card Reader (SXF1050), Power Supply

HWB

Doors Type 01

Electronic Interconnected Locksets (FE210)

HWC

Doors #B05, B07

Off Line Electric Locksets (CO-200-C4-PRK)

DANFORTH ON HIGH – PORTLAND, MAINE

HWD

Provide (1) Hand Held Programming Device (HHD Kit)

Provide (1) Schlage Security Management Express Software

Provide (1) Programming i Button

Provide (200) User i Buttons on Black FOB

Provide (1) Female Serial Cable

END OF SECTION

SECTION 08734
COMMERCIAL DOOR OPERATORS
RSX[®] OVERHEAD SECTIONAL DOOR OPERATOR

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. OVERHEAD SECTIONAL DOOR OPENERS.

1.2 RELATED SECTIONS

- A. SECTION 05500 - METAL FABRICATIONS: SUPPORT FRAMING AND FRAMED OPENING.
- B. SECTION 06200 - FINISH CARPENTRY: WOOD JAMB AND HEAD TRIM.
- C. SECTION 08360 - SECTIONAL OVERHEAD DOORS.
- D. SECTION 08710 - DOOR HARDWARE: PRODUCT REQUIREMENTS FOR CYLINDER CORE AND KEYS.
- E. SECTION 09900 - PAINTING: FIELD APPLIED FINISH.
- F. SECTION 16130 - RACEWAY AND BOXES: CONDUIT FROM ELECTRIC CIRCUIT TO DOOR OPERATOR AND FROM DOOR OPERATOR TO CONTROL STATION.
- G. SECTION 16150 - WIRING CONNECTIONS: POWER TO DISCONNECT.

1.3 REFERENCES

- A. NEMA 250 - ENCLOSURES FOR ELECTRICAL EQUIPMENT (1000 VOLTS MAXIMUM).
- B. NEMA ICS 2 - INDUSTRIAL CONTROL AND SYSTEMS: CONTROLLERS, CONTACTORS, AND OVERLOAD RELAYS, RATED NOT MORE THAN 2000 VOLTS AC OR 750 VOLTS DC.
- C. NEMA ICS 6 - ENCLOSURES FOR INDUSTRIAL CONTROLS AND SYSTEMS.
- D. NEMA MG 1 - MOTORS AND GENERATORS.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. PRODUCTS REQUIRING ELECTRICAL CONNECTION: LISTED AND CLASSIFIED BY UNDERWRITERS LABORATORIES, INC. ACCEPTABLE TO AUTHORITY HAVING JURISDICTION AS SUITABLE FOR PURPOSE SPECIFIED.
- B. WIRING CONNECTIONS: REQUIREMENTS FOR ELECTRICAL CHARACTERISTICS.
 - 1. 115 VOLTS, 60 HZ SINGLE PHASE.
 - 2. 208 VOLTS, 60 HZ SINGLE PHASE OR THREE PHASE.
 - 3. 230 VOLTS, 60 HZ SINGLE PHASE OR THREE PHASE.
 - 4. 460 VOLTS, 60 HZ THREE PHASE.
 - 5. 575 VOLTS, 60 HZ THREE PHASE.

1.5 SUBMITTALS

- A. SUBMIT UNDER PROVISIONS OF SECTION 01300.**
- B. PRODUCT DATA: MANUFACTURER'S DATA SHEETS ON EACH PRODUCT TO BE USED, INCLUDING:**
 - 1. PREPARATION INSTRUCTIONS AND RECOMMENDATIONS.**
 - 2. STORAGE AND HANDLING REQUIREMENTS AND RECOMMENDATIONS.**
 - 3. DETAILS OF CONSTRUCTION AND FABRICATION.**
 - 4. INSTALLATION METHODS.**
- C. SHOP DRAWINGS: INCLUDE DETAILED PLANS, ELEVATIONS, DETAILS OF FRAMING MEMBERS, REQUIRED CLEARANCES, ANCHORS, AND ACCESSORIES. INCLUDE RELATIONSHIP WITH ADJACENT CONSTRUCTION.**
- D. MANUFACTURER'S CERTIFICATES: CERTIFY PRODUCTS MEET OR EXCEED SPECIFIED REQUIREMENTS.**
- E. OPERATION AND MAINTENANCE DATA: SUBMIT LUBRICATION REQUIREMENTS AND FREQUENCY, AND PERIODIC ADJUSTMENTS REQUIRED.**

1.6 QUALITY ASSURANCE

- A. MANUFACTURER QUALIFICATIONS: COMPANY SPECIALIZING IN PERFORMING WORK OF THIS SECTION WITH A MINIMUM OF FIVE YEARS EXPERIENCE IN THE FABRICATION AND INSTALLATION OF SECURITY CLOSURES.**
- B. INSTALLER QUALIFICATIONS: COMPANY SPECIALIZING IN PERFORMING WORK OF THIS SECTION WITH MINIMUM THREE YEARS AND APPROVED BY MANUFACTURER.**
- C. MOCK-UP: PROVIDE A MOCK-UP FOR EVALUATION OF SURFACE PREPARATION TECHNIQUES AND APPLICATION WORKMANSHIP.**
 - 1. INSTALL IN AREAS DESIGNATED BY ARCHITECT.**
 - 2. DO NOT PROCEED WITH REMAINING WORK UNTIL WORKMANSHIP AND INSTALLATION IS APPROVED BY ARCHITECT.**
 - 3. REFINISH MOCK-UP AREA AS REQUIRED TO PRODUCE ACCEPTABLE WORK.**

1.7 DELIVERY, STORAGE, AND HANDLING

- A. STORE PRODUCTS IN MANUFACTURER'S UNOPENED PACKAGING UNTIL READY FOR INSTALLATION.**
- B. PROTECT MATERIALS FROM EXPOSURE TO MOISTURE. DO NOT DELIVER UNTIL AFTER WET WORK IS COMPLETE AND DRY.**
- C. STORE MATERIALS IN A DRY, WARM, VENTILATED WEATHERTIGHT LOCATION.**

1.8 PROJECT CONDITIONS

- A. MAINTAIN ENVIRONMENTAL CONDITIONS (TEMPERATURE, HUMIDITY, AND VENTILATION) WITHIN LIMITS RECOMMENDED BY MANUFACTURER FOR OPTIMUM RESULTS. DO NOT INSTALL PRODUCTS UNDER ENVIRONMENTAL CONDITIONS OUTSIDE MANUFACTURER'S ABSOLUTE LIMITS.**

1.9 WARRANTY

- A. PROVIDE OPERATORS WITH A 3 YEAR OR 20,000 CYCLE LIMITED WARRANTY ON MOTOR AND PARTS.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. ACCEPTABLE MANUFACTURER: OVERHEAD DOOR CORP., 2501 S. STATE HWY. 121, SUITE 200, LEWISVILLE, TX 75067. ASD. TEL. TOLL FREE: (800) 275-3290. PHONE: (469) 549-7100. FAX: (972) 906-1499. WEB SITE: WWW.OVERHEADDOOR.COM. E-MAIL: SALES@OVERHEADDOOR.COM.
- B. SUBSTITUTIONS: NOT PERMITTED.
- C. REQUESTS FOR SUBSTITUTIONS WILL BE CONSIDERED IN ACCORDANCE WITH PROVISIONS OF SECTION 01600.

2.2 OVERHEAD SECTIONAL DOOR OPERATORS

- A. COMMERCIAL SECTIONAL DOOR OPERATOR: MODEL RSX COMMERCIAL DOOR OPERATOR:
 - 1. APPLICATION:
 - A. STANDARD LIFT SECTIONAL DOOR.
 - B. LIFT CLEARANCE SECTIONAL DOOR.
 - C. FULL VERTICAL SECTIONAL DOOR.
 - 2. ELECTRIC MOTOR: UL LISTED.
 - A. RATING:
 - 1) 1/2 HORSEPOWER SINGLE PHASE OR THREE.
 - 2) 3/4 SINGLE PHASE OR THREE PHASE.
 - 3) 1 HORSEPOWER SINGLE PHASE OR THREE PHASE.
 - B. MOTOR FRAME COMPLY WITH:
 - 1) NEMA 48 FOR 1/2 HP SINGLE PHASE.
 - 2) NEMA 56 FOR 1/2 HP THREE PHASE.
 - 3) NEMA 56 3/4 AND 1 HP ALL PHASES.
 - C. CONSTRUCTION:
 - 1) OPEN DRIP-PROOF CONSTRUCTION.
 - 2) TOTALLY ENCLOSED NON VENTILATED – TENV CONSTRUCTION.
 - 3) TOTALLY ENCLOSED FAN COOLED – TEFC CONSTRUCTION.
 - D. REDUCTION: PRIMARY REDUCTION IS SUPERBELT, AN AUTO TENSION POLY-V FLEX BELT THAT DOES NOT REQUIRE ADJUSTMENT. SECONDARY REDUCTION IS BY CHAIN AND SPROCKET.
 - E. DUTY CYCLE: ACCOMMODATE HEAVY USAGE, UP TO 60 CYCLES PER HOUR DURING PEAK USAGE PERIODS.
 - 1) BRAKE: DC DISC TYPE WITH SELECTABLE PROGRESSIVE BRAKING FOR SMOOTH STOPPING.
 - 2) CLUTCH: ADJUSTABLE FRICTION DISC TYPE.
 - 3) LIMIT SYSTEM: LIMITLOCK LIMIT SYSTEM, MAGNETIC TYPE PROVIDING ABSOLUTE POSITIONING WITH PUSH TO SET AND REMOTE SETTING CAPABILITIES. LIMIT SYSTEM SHALL REMAIN

SYNCHRONIZED WITH THE DOOR DURING MANUAL OPERATION AND SUPPLY POWER INTERRUPTIONS.

3. CONTROL SYSTEM: MICROPROCESSOR BASED WITH RELAY MOTOR CONTROLS ON A SINGLE BOARD. SYSTEM INCORPORATES A 16 CHARACTER LIQUID CRYSTAL DISPLAY (LCD) TO DISPLAY THE SYSTEM STATUS. SYSTEM SHALL INCLUDE THE FOLLOWING:
 - A. CAPABLE OF MONITORING AND REPORTING ON A VARIETY OF OPERATING CONDITIONS, INCLUDING: CURRENT OPERATING STATUS, CURRENT COMMAND STATUS, MOTOR MOVEMENT STATUS, CURRENT ERROR STATUS (IF APPLICABLE), HOIST INTERLOCK STATUS (IF APPLICABLE), EXTERNAL INTERLOCK STATUS, AND 24VDC STATUS.
 - B. A DELAY-ON-REVERSE OPERATING PROTOCOL.
 - C. MAXIMUM RUN TIMERS IN BOTH DIRECTIONS OF TRAVEL THAT LIMIT MOTOR RUN TIME IN THE EVENT A CLUTCH SLIPS OR SOME OTHER PROBLEM OCCURS.
 - D. PROVISIONS FOR THE CONNECTION OF A 2-WIRE MONITORED PHOTOCCELL SYSTEM OR A 2-WIRE MONITORED EDGE SENSOR, AS WELL AS STANDARD 2-WIRE SENSING EDGES, PHOTOCCELLS OR OTHER ENTRAPMENT PROTECTION DEVICES.
 - E. CONTROL ACTION WILL BE CONSTANT CONTACT CLOSE UNTIL A MONITORED ENTRAPMENT DEVICE IS INSTALLED, ALLOWING FOR SELECTION OF MOMENTARY CONTACT.
 - F. PROVISIONS FOR CONNECTION OF SINGLE AND/OR 3-BUTTON CONTROL STATIONS.
 - G. PROVISIONS FOR CONNECTION OF AN EXTERNAL 3-WIRE RADIO CONTROLS AND RELATED CONTROL DEVICES.
 - H. ON BOARD OPEN, CLOSE AND STOP CONTROL KEYS FOR LOCAL OPERATION.
 - I. TROLLEY OPERATORS WITH AN INHERENT SECONDARY REVERSAL SYSTEM.
 - J. CODEDODGER RADIO RECEIVER THAT IS DUAL FREQUENCY CYCLING AT 315 MHZ AND 390 MHZ CAPABLE OF STORING 250 SINGLE BUTTON AND/OR 250 OPEN-CLOSE-STOP TRANSMITTERS WITH THE ABILITY TO ADD AND/OR DELETE TRANSMITTERS INDIVIDUALLY, IDENTIFY AND STORE ACTIVATING TRANSMITTER IDS.
4. MOUNTING:
 - A. SECTIONAL DOORS SHALL BE BY JACKSHAFT THAT IS SIDE-MOUNTED WITH:
 - 1) CHAIN/SPROCKET COUPLING TO DOOR TROLLEY.
 - 2) CHAIN/SPROCKET COUPLING TO DOOR SIDE-MOUNT TROLLEY.
 - 3) CHAIN/SPROCKET COUPLING TO DOOR DUAL TROLLEY.
 - 4) DIRECT SHAFT-TO-SHAFT COUPLING TO DOOR TROLLEY.
 - 5) DIRECT SHAFT-TO-SHAFT COUPLING TO DOOR SIDE-MOUNT TROLLEY.
 - 6) DIRECT SHAFT-TO-SHAFT COUPLING TO DOOR DUAL TROLLEY.
5. RELEASE:
 - A. RELEASE SHALL BE A PULL AND HOLD TYPE MECHANISM WITH SINGLE CABLE OPERATION AND AN INTEGRATED INTERLOCK SWITCH ON HOIST UNITS.
 - B. RELEASE SHALL CONSIST OF A MANUAL DISCONNECT DOOR ARM ON TROLLEY UNITS.
6. HOIST: CHAIN HOIST CONSISTS OF CHAIN POCKET WHEEL, CHAIN GUARD AND SMOOTH HAND CHAIN ON HOIST UNITS.
7. ENTRAPMENT PROTECTION:
 - A. JACKSHAFT VERSION DESIGNED TO ACCEPT EXTERNAL ENTRAPMENT DEVICE.

- B. CONTROL SYSTEM SHALL HAVE PROVISIONS TO CONNECT ENTRAPMENT PROTECTION DEVICES SUCH AS ELECTRIC SENSING EDGE, PNEUMATIC SENSING EDGE OR PHOTOELECTRIC SENSOR AND TO PROVIDE CONSTANT CONTACT CONTROL OPERATION IN LIEU OF SUCH DEVICES.
8. SECONDARY REVERSAL:
- A. TROLLEY VERSION ONLY INCLUDES AN INTEGRAL ELECTRONIC REVERSING SYSTEM THAT WILL STOP AND REVERSE A CLOSING DOOR UPON DETECTION OF AN OBSTRUCTION AND DESIGNED TO ACCEPT AN OPTIONAL EXTERNAL REVERSING DEVICE.
 - B. HOIST VERSIONS DESIGNED TO ACCEPT AN OPTIONAL EXTERNAL REVERSING DEVICE.
9. CONTROL ACCESSORIES:
- A. OPERATOR CONTROLS:
 - 1) PUSH-BUTTON OPERATED CONTROL STATIONS WITH OPEN, CLOSE, AND STOP BUTTONS.
 - 2) KEY OPERATION WITH OPEN, CLOSE, AND STOP CONTROLS.
 - 3) PUSH-BUTTON AND KEY OPERATED CONTROL STATIONS WITH OPEN, CLOSE, AND STOP BUTTONS.
 - 4) CONTROLS FOR INTERIOR LOCATION.
 - 5) CONTROLS FOR EXTERIOR LOCATION.
 - 6) CONTROLS FOR BOTH INTERIOR AND EXTERIOR LOCATION.
 - 7) CONTROLS SURFACE MOUNTED.
 - 8) CONTROLS FLUSH MOUNTED.
 - B. SPECIAL OPERATION:
 - 1) VEHICLE DETECTOR OPERATION.
 - 2) RADIO CONTROL OPERATION.
 - 3) CARD READER CONTROL.
 - 4) OHD MONITORED PHOTO ELECTRIC EYES.
 - 5) COMMERCIAL PHOTO ELECTRIC EYES.
 - 6) DOOR TIMER OPERATION.
 - 7) COMMERCIAL LIGHT PACKAGE.
 - 8) EXPLOSION AND DUST IGNITION PROOF CONTROL WIRING.
 - 9) AUXILIARY OUTPUT MODULE WITH SEVERAL AUXILIARY SETS OF DRY CONTACTS THAT ARE MICROPROCESSOR CONTROLLED. OUTPUTS CAN BE CONFIGURED USING THE ON BOARD KEYPAD.

PART 3 EXECUTION

3.1 EXAMINATION

- A. VERIFY DOOR SIZES, CONFIGURATION, TOLERANCES AND CONDITIONS ARE ACCEPTABLE.
- B. EXAMINE CONDITIONS OF SUBSTRATES, SUPPORTS, AND OTHER CONDITIONS UNDER WHICH THIS WORK IS TO BE PERFORMED.
- C. IF SUBSTRATE PREPARATION IS THE RESPONSIBILITY OF ANOTHER INSTALLER, NOTIFY ARCHITECT OF UNSATISFACTORY PREPARATION BEFORE PROCEEDING.

3.2 PREPARATION

- A. CLEAN SURFACES THOROUGHLY PRIOR TO INSTALLATION.

- B. PREPARE SURFACES USING THE METHODS RECOMMENDED BY THE MANUFACTURER FOR ACHIEVING THE BEST RESULT FOR THE SUBSTRATE UNDER THE PROJECT CONDITIONS.

3.3 INSTALLATION

- A. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- B. USE ANCHORAGE DEVICES TO SECURELY FASTEN ASSEMBLY WITHOUT DISTORTION OR STRESS.
- C. FIT AND ALIGN ASSEMBLY INCLUDING HARDWARE; LEVEL AND PLUMB, TO PROVIDE SMOOTH OPERATION.
- D. COORDINATE INSTALLATION OF ELECTRICAL SERVICE WITH SECTION 16150. COMPLETE WIRING FROM DISCONNECT TO UNIT COMPONENTS.

3.4 ADJUSTING

- A. TEST FOR PROPER OPERATION AND ADJUST AS NECESSARY TO PROVIDE PROPER OPERATION WITHOUT BINDING OR DISTORTION.
- B. ADJUST HARDWARE AND OPERATING ASSEMBLIES FOR SMOOTH AND NOISELESS OPERATION.

3.5 CLEANING

- A. CLEAN COMPONENTS USING NON-ABRASIVE MATERIALS AND METHODS RECOMMENDED BY MANUFACTURER.
- B. TOUCH-UP, REPAIR OR REPLACE DAMAGED PRODUCTS BEFORE SUBSTANTIAL COMPLETION.

3.6 PROTECTION

- A. PROTECT INSTALLED PRODUCTS UNTIL COMPLETION OF PROJECT.
- B. TOUCH-UP, REPAIR OR REPLACE DAMAGED PRODUCTS BEFORE SUBSTANTIAL COMPLETION.

END OF SECTION

GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Clear tempered glass.

1.2 REFERENCES

- A. American National Standards Institute (ANSI):
1. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.
- B. American Society for Testing and Materials (ASTM):
1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
 2. ASTM C1036 - Standard Specification for Flat Glass.
 2. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
 3. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.
- C. Consumer Product Safety Standards for Architectural Glazing. CPSC 16 CFR, Part 1201.
- D. Flat Glass Marketing Association (FGMA):
1. FGMA - Glazing Manual and Glazing Sealing Systems Manual.

1.3 SUBMITTALS

- A. Procedures for submittals.
1. Product Data:
 - a. Glass: Structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 - b. Glazing compound: Provide chemical, functional, and environmental characteristics, limitations, special application requirements.
 2. Samples:
 - a. Glazing: Submit one sample 12 x 12 inches (300 x 300 mm) in size of each type of glazing, illustrating tinting, and finish of glazing materials. Label each sample indicating kind, quality and manufacturer.
 3. Assurance/Control Submittals:
 - a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
 - b. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

DANFORTH ON HIGH – PORTLAND, MAINE

1.4 QUALITY ASSURANCE

- A. Identification: Each unit of tempered glass shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed.
- B. Perform Work in accordance with FGMA Glazing Manual.
- C. Installer Qualifications: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store, and protect Products.

1.6 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not install glazing when ambient temperature is less than 40 degrees F.
 - 2. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.7 WARRANTY

- A. Procedures for closeout submittals.
- B. Special Warranty:
 - 1. Include coverage for cracking, breakage, and replacement of same.
 - a. Warranty Period: 1 year.
 - 2. Include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.
 - a. Warranty Period: 10 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
 - 1. Falconer Glass Industries.
 - 2. Libbey-Owens-Ford Company, Toledo, OH (800) 526-6557.
 - 3. PPG Industries, Pittsburgh, PA (412) 434-2858.
 - 4. Viracon, Owatonna, MN (800) 533-2080.
- C. Product options and substitutions. Substitutions: Permitted.

DANFORTH ON HIGH – PORTLAND, MAINE

2.2 GLASS MATERIALS

- A. Glass Type 1 - Clear Tempered Insulated Glass Units, Low E: Double pane units of clear tempered glass.
 - 1. Glass Thickness, Inner: 5/16 inch.
 - 2. Glass Thickness, Outer: 5/16 inch.
 - 3. Unit Thickness: 1 inch (25 mm) thick units.
- B. Glass Type 2 - Clear Tempered Glass Units. Single pane units with clear tempered glass.
 - 1. Glass Thickness, Inner: 1/4 inch (6 mm).

2.3 GLAZING COMPOUNDS

- A. Polysulphide Sealant: Two component, chemical curing, non-sagging type; cured Shore A hardness of 15-25.
- B. Silicone Sealant: Single component, chemical curing; capable of water immersion without loss of properties; non-bleeding, non-staining; cured Shore A hardness of 15-25.
 - 1. Color: Clear.
- C. Acrylic terpolymer compounded especially for glazing; non-hardening, non-staining, and non-bleeding.

2.4 GLAZING ACCESSORIES

- A. Setting Blocks: Resilient blocks of 70 to 90 Shore A durometer hardness; compatible with glazing sealant.
- B. Spacers: Resilient blocks of 40 to 50 Shore A durometer hardness; self adhesive on one side; compatible with glazing sealant.
- C. Filler Rods: Closed cell or jacketed foam rods of polyethylene, butyl, neoprene, polyurethane, or vinyl; compatible with glazing sealant.
- D. Joint Cleaners, Primers, and Sealers: As recommended by glazing sealant manufacturer.
- E. Gaskets: ASTM D2000, SBC 415 to 3BC 620; extruded or molded neoprene or EPDM, black.
- F. Mastic: Non-solvent type adhesive as recommended by mirrored glass manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

DANFORTH ON HIGH – PORTLAND, MAINE

- A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
 - 1. Verify that openings for glazing are correctly sized and within tolerance.
 - 2. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.
- C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.

3.3 GLAZING

- A. Install glazing from interior only. No exterior glazing permitted. No glazing removal permitted from exterior.
- B. Locate setting blocks at quarter points of sill; set in sealant if heel or toe bead is required.
- C. Install spacers inside and out except where preshimmed tape or glazing gaskets are to be used.
- D. Set each piece in a series to other pieces in pattern draw, bow, or other visually perceptible characteristics.
- E. Provide glazing sealants and gaskets as required for particular glazing application. Coordinate with other Sections for material compatibility.
- F. Gaskets:
 - 1. Provide adequate anchorage, particularly for driven-in wedge gaskets.
 - 2. Miter and weld ends of channel gaskets at corners to provide continuous gaskets.
 - 3. Seal face gaskets at corners with sealant to close opening and prevent withdrawal of gaskets from corners.
- G. Do not leave voids in glazing channels except as specifically indicated or recommended by glass manufacturer. Force sealant into channel to eliminate voids. Tool exposed surfaces to slight wash away from joint. Trim and clean promptly.

DANFORTH ON HIGH – PORTLAND, MAINE

- H. Do not allow sealant to close weeps of aluminum framing.
- I. Provide filler rod where sealants are used in the following locations:
 1. Head and jamb channels.
 2. Colored glass over 75 united inches in size.
 3. Clear glass over 125 united inches in size.

3.4 CONSTRUCTION

- A. Interface with Other Work: Coordinate glazing with installation of entrances and storefronts specified in Section 08400.

3.5 FIELD QUALITY CONTROL

- A. Inspect preparation and installation of glass.

3.6 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

3.8 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 09250

GYPSUM BOARD

1. GENERAL

1.1 REFERENCES:

- A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.
- B. NOTE: Selection of Finish colors and patterns in overall color scheme to be made by Architect. Contractor to notify Architect prior to commencing Gypsum Board work, to allow adequate time for color selections, Owner's approval and material ordering lead time.

1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

- A. Drywall installation as required by Drawings and noted in these Specifications.
- B. Taping and finishing all walls and ceilings, except where other kind of finish is specified.

2. PRODUCTS

2.1 Acceptable Manufactures

- American Gypsum
- Atlantic Group Limited
- Celotix Corporation
- Continental Gypsum Company
- James Hardie Gypsum
- Lafarge Gypsum
- United States Gypsum Company

2.2 NOTE: GWB types are shown as U.S.G. brand names "Sheetrock", "Firecode", "Firecode C", "M.R. Board" and "Shaftwall". Substitutions must have equal U.L. and STC ratings. See Drawings for Specific assembly.

2.3 EXTERIOR & INTERIOR WALLS & CEILINGS: See rated & non rated assemblies and wall types on the drawings. Note: Exterior Gypsum Ceilings to be "Aqua-Tough" Interior Panels 5/8 inch thickness installed per manufactures recommendations with screw application.

2.4 NOTE: Type M.R. in bathrooms, walls and ceiling.

2.5 RESILIAN T CHANNEL: USG-RC-1

2.6 USG Drywall Suspension System.

DANFORTH ON HIGH – PORTLAND, MAINE

2.7 Corner Bead _____

3. EXECUTION

3.1 THE DRYWALL CONTRACTOR shall inspect all areas affected by his work to ascertain that all work is complete and has been accepted. Defective installations shall be corrected before finished surfaces are painted or sprayed with acoustical material.

3.2 DRYWALL INSTALLATION. Install drywall as shown on plans, noted in the UL Specifications, and as set forth in U.S.G. Handbook. Installation of non-UL rated drywall assemblies on steel studs shall comply with the following minimum requirements:

- A. Spacing for attachment members shall not exceed 24" o.c. for walls and 16" o.c. for ceilings. All drywall shall be screwed with approved drywall screws made specifically for the purpose and of length adequate for wall types. On walls, screws shall not be placed more than 16" apart for 16" o.c. framing or 12" apart for 24" o.c. framing. Screw all edges 12" o.c. maximum. See Structural Drawings S3.2 and S3.3 for shear walls sheathing attachment.
- B. The drywall contractor may use a few drywall nails to temporarily secure a sheet of drywall before securing with drywall screws. In this event, the drywall nails must be countersunk prior to taping. Corner beads shall be used on all corners and casing beads used whenever Gypsum Board abuts dissimilar material. Caulking to also be applied at these junctions. At all party and unit/corridor walls, Gypsum Board to be set in caulking (for sound).
- C. Drywall shall be laid vertically or horizontally. No tapered joints at floor base. See Structural Drawings for shear walls.
- D. Gypsum Sheathing Application
Apply 24" wide sheathing horizontally with tongue edge up. Install supplementary bracing as required by applicable code. Fasten sheathing with nails spaced 8" o.c. along each stud.
Apply 48" wide sheathing vertically with bottom edge bearing on foundation or subfloor. Install supplementary bracing (and adhesive) as required by applicable code. Fasten sheathing to studs and plates with nails 8" o.c.
- E. Exterior Ceilings and Soffits
Apply SHEETROCK Brand Exterior Gypsum Ceiling Board (perpendicular to supports) (parallel to supports) with end joints over supports and with 1/16" to 1/8" space between butted ends of boards. Use maximum practical lengths to minimize end joints. Fasten boards to supports with screws spaced 12" o.c. or nails spaced 8" o.c. Where specified, cover joints with wood battens securely fastened to framing. Finish joints, trim and fasteners with SHEETROCK Brand Setting-Type (DURABOND) or Lightweight Setting-Type (EASY SAND) Joint Compound applied according to directions.
- F. Joint System
Prefill Application
 - a. Mix SHEETROCK Brand Setting-Type (DURABOND) or Lightweight Setting-Type (EASY SAND) Joint Compound according to directions on bag. Do not overmix, or use extremely cold water or cold joint compound.

DANFORTH ON HIGH – PORTLAND, MAINE

- b. Prefill all “V” grooves formed by abutting tapered eased edges of SHEETROCK Brand Gypsum Panels, SW Edge, with SHEETROCK Brand Setting-Type (DURABOND) or Lightweight Setting-Type (EASY SAND) Joint Compound using a flexible 5” or 6” joint finishing knife or Ames Pre-Fill Tool. Fill “V” joint flush and wipe off excess compound beyond the “V” groove, leaving a clear depression to receive tape. Allow prefill to harden prior to the next application (tape or embedding coat).

SHEETROCK Brand Joint Tape

- a. Mix joint compound in strict accordance with manufacturer’s recommendations.
- b. Apply joint compound in a thin uniform layer to all joints and angles to be reinforced. Immediately apply SHEETROCK Brand Joint Tape centered over joint and seated into compound. Sufficient compound—approx. 1/64” to 1/32”— must remain under the tape to provide proper bond. Follow immediately with a thin skim coat to embed tape, but not to function as a second coat. Fold and embed tape properly in all interior angles to provide a true angle. The tape or embedding coat must be thoroughly dry prior to application of second coat. (Exception: DURABOND Setting-Type and EASY SAND Lightweight Setting-Type Joint Compounds need only have hardened prior to application of next coat.)
- c. Apply second coat of joint compound over embedding coat, filling panel taper flush with surface; cover tape and feather out at least 2” beyond first coat. On joints with no taper, cover the tape and feather out at least 4” on either side of tape. Allow second coat to dry thoroughly prior to application of finish coat. (Exception: DURABOND Setting-Type and EASY SAND Lightweight Setting-Type Joint Compounds need only have hardened prior to second coat application.)
- d. Spread finish coat evenly over and extend at least 2” beyond second coat on all joints and feather to a smooth uniform finish. Do not allow finished joint to protrude beyond plane of the surface. Where necessary, sand lightly between coats and following the final application of compound to provide a smooth surface ready for decoration. When sanding, take care not to roughen face paper.

SHEETROCK Brand Fiberglass Drywall Tape

- a. Mix joint compound in strict accordance with manufacturer’s recommendations.
- b. Center and apply SHEETROCK Brand Fiberglass Drywall Tape directly over joint, pressing tape firmly so that it adheres evenly to surface. To eliminate wrinkles and ensure maximum bond, press entire length of taper with drywall knife. Avoid overlapping tape at intersections. Cut tape with drywall knife.
- c. Cover with a layer of SHEETROCK Brand Setting-Type (DURABOND) or Lightweight Setting-Type (EASY SAND) Joint Compound, forcing compound through the tape with a drywall knife/trowel to completely fill and level the joint. Failure to completely fill the joint may result in cracking. Let dry and sand lightly as required.
- d. Apply second coat of SHEETROCK Brand Setting-Type (DURABOND) or Lightweight Setting-Type (EASY SAND) Joint Compound or SHEETROCK Brand Drying-Type Joint Compound (powder or ready mixed), feathering approximately 2” beyond first coat. Let dry and sand lightly as required.

Finishing Fasteners

- a. Apply a setting-type, all-purpose, or lightweight all-purpose compound to fastener depressions as the first coat. Follow with a minimum of two additional coats of topping or all-purpose compound, leaving all depressions level with the surface. (Exception: Setting-type and lightweight all-purpose joint compounds need only one additional coat.)

DANFORTH ON HIGH – PORTLAND, MAINE

G. SHEETROCK Brand Paper Faced Drywall Metal Bead and Trim

Application and Finishing

- a. Apply compound to both sides of corner, extending 2" on each side for outer corners, 1-1/2" for inside corners. Cut bead to desired length; align tightly to ceiling and press firmly with fingers along length of corner to set. Do not bend bead. Run taping knife over corner at a 45° angle with even pressure. Remove excess compound using knife to eliminate air bubbles under paper. Allow to dry.
- b. For outer corners, apply another coat of compound to both sides, feathering out 5"-6" on each side. Let dry; sand lightly as necessary. For inner corners, apply fill coat to one side, feathering out 1". Let dry. Apply fill coat to other side using same procedure. Let dry. Sand lightly where necessary.
- c. For outer corner, apply finishing coat, feathering 8" from nose of bead. Draw knife along one side of bead with one edge resting on nose of bead and other on surface of wallboard. Repeat for other side. Let dry. Sand and prime. For inner corners, apply finishing coat to one side, feathering 1" past previous coat. Let dry. Apply finishing coat to other side. Let dry. Sand and prime.

H. Other Bead and Trim

Installation

- a. Reinforce all vertical and horizontal exterior corners with corner bead fastened with nails or 9/16" galvanized staples 9" o.c. on both flanges along entire length of bead.
- b. Where partition or ceiling terminates against masonry or other dissimilar material, apply metal trim over gypsum panel edge and fasten with nails or galvanized staples 9" o.c.

Finishing

- a. Apply first coat to all bead and trim and properly feather out from ground to plane of surface. Compound must thoroughly dry prior to application of second coat (exception: SHEETROCK Brand Setting-Type [DURABOND] and Lightweight Setting-Type [EASY SAND] Joint Compounds need only have hardened prior to application of next coat.)
- b. Apply second coat in same manner as first coat, extending compound slightly beyond face of panel. Compound must be thoroughly dry prior to application of finish coat (exception: Setting-Type joint compounds need only have hardened prior to application of next coat.)
- c. Apply finish coat to all bead and trim, extending compound slightly beyond the second coat and properly feathering from ground to plane or surface (exception: Only two coats of SHEETROCK Brand Setting-Type [DURABOND] or Lightweight Setting-Type [EASY SAND] Joint Compound or SHEETROCK Brand Lightweight All Purpose Joint Compound Ready Mixed [PLUS 3] are needed.) When dry, sand finish as necessary to provide a flat smooth surface ready for decoration. When sanding, take care not to roughen face paper.

Note: Gypsum board to be installed behind all tubs and shower units which results in double gypsum board on some bathroom walls. See bathroom drawing sheet.

I. Ceiling suspension system:

1. Space hangers not over 48 in. o.c. in direction of main runner channels, and within 6 in. of ends of main runner runs and of boundary walls, structural steel, partitions, and similar interruptions of ceiling continuity. Install additional hangers at ends of each suspension member and at ceiling equipment not separately suspended, 6 in. from

DANFORTH ON HIGH – PORTLAND, MAINE

vertical surfaces. Do not splay wires more than 5 in. in a 4 ft. vertical drop. Wrap wire a minimum of three times horizontally, turning ends upward.

2. Attach hangers directly to ceiling structure, or to supplementary framing members supplied and installed under this section. Hangers may not be suspended from mechanical or electrical equipment such as ductwork, conduit or piping.
3. Install 1-1/2 in. main runner channels spaced not over 48 in. o.c. within 6 in. of wall. Position channels for proper ceiling height, level and secure, with hanger wire saddled along channel. Provide 1 in. clearance between runners and abutting walls and partitions. At channel splices, interlock flanges, overlap ends 12 in., and secure each end with double-strand 18 ga. tie wire.
4. Erect 3/4 in. metal furring channels at right angles to main runner channels or main support members. Space furring not over 16 in. o.c., and within 6 in. of wall. Provide 1 in. clearance between furring ends and abutting walls and partitions. Secure furring to carrying channels with clips or saddle-tie to supports with double strand 18 ga. tie wire. At splices, next furring channels at least 8 double-strand 18 ga. tie wire.
5. At openings interrupting main or furring channels, install additional cross-reinforcing as required, to restore lateral stability of ceiling framing system.
6. Finished installations shall be level to within 1/4 in. in 10 ft.

3.3 ON SURFACES TO BE PAINTED: tape and cement all joints and screw locations with three coats of compound, then sand to smooth finish, acceptable to paint.

3.4 DURING WORK PROGRESS, remove all excess materials and debris resulting from operations, which may disrupt the work of other trades, and after completion leave the premises broom clean.

END OF SECTION

SECTION 09300

TILE

1. GENERAL

1.1 REFERENCES

- A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.
- B. Cast-in-Place Concrete: Section 03300
- C. Joint Sealants: Section 07900
- D. Gypsum Drywall: Section 09250
- E. American National Standards Institute (ANSI)

1.2 DESCRIPTION OF WORK: Extent of Tile Work is shown on the drawings.

1.3 QUALITY ASSURANCE

- A. Tile materials and installation shall comply with recommendations of Tile Council of America Handbook for Tile Installation, and ANSI Standard Specification Series A108, A118, A136, and A137, as applicable.
- B. The use of asbestos shall not be permitted in any product specified in this Section.

1.4 SUBMITTALS

- A. Submittals under this Section shall include manufacturers' data and installation instructions on all specified products; manufacturer's standard color range; and full size tile of each type and color of tile specified.
- B. At job completion, supply two copies of manufacturers' maintenance instructions; and 1 Percent minimum of all types and colors of material provided under this Section as replacement stock, neatly packaged and clearly labeled.

2. PRODUCTS

2.1 TILE

- A. Manufactured by Daltile, style "Terra Antica" Porcelain tile, size 12" x 12", ¼ inch thick, cove outcorner, SS36C9T 6" x 12", color to be selected by Architect, located on 1st floor lobby areas and elevator lobbies, see plans.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Provide all matching trim necessary for finished installation, including stretcher pieces, cove bases, square inside corners, bullnose trim at outer corners and where tilework projects from jambs.
- C. Where floor tile terminates against dissimilar flooring material, provide aluminum threshold beveled as required for field conditions, centered under door or within frame, unless noted otherwise.
- D. Colors to be chosen by Architect from manufacturer's full range of colors.

2.2 SETTING AND GROUTING MATERIALS

- A. Volatile Organic Compound (VOC) emissions from adhesives and sealants must not exceed VOC limits of South Coast Air Quality Management District Rule #1168 AND sealants used as fillers must meet the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51
- B. Factory-mixed materials shall be by Boiardi Elastiment, C-Cure, H. B. Fuller, Laticrete, L&M Surco, Upco, or other manufacturer approved by tile manufacturer. Setting bed, grout, and additive materials shall be by same manufacturer.
- C. Tile shall be thin-set, using one of following:
 - 1. Dry-set mortar: factory mixture of portland cement, sand, and water-retentive additives, mixed with water in field, complying with ANSI A118.1, as recommended by manufacturer for particular type of tile used.
 - 2. Latex-portland cement mortar: factory mixture of portland cement and sand, with powdered PVA polymer or liquid PVA, styrene butadiene, or acrylic latex admixture added in field, complying with ANSI A118.4.
- D. Grout tile with factory-formulated portland cement, dry-set, or latex portland cement grout (either acrylic or styrene butadiene powder or liquid additive), complying with ANSI 118.6. On-job sand-portland cement mixture may also be used, complying with ANSI A108.1. Color to be selected from manufacturer's standard range.

2.3 Concrete Sealer: Provide manufacturer's recommended sealer compatible with concrete floor.

3. EXECUTION

3.1 INSTALLATION

- A. Provide floor protection to existing buildings when renovating or adding on.
- B. Before beginning installation inspect surfaces to receive tile for excessive dampness, irregularity, loose material, oily or waxy areas impeding adhesion, or other conditions which would prevent proper installation. Verify that surfaces are flat to within 1/4 in. in 10 ft., with no vertical irregularities exceeding 1/16 in. high. Seal concrete floors if recommended or

DANFORTH ON HIGH – PORTLAND, MAINE

- approved by the manufacturer. Broom clean substrate before beginning installation. Commencement of work constitutes acceptance of floor condition.
- C. Expansion joint location and construction shall conform to drawings and ANSI A108, Paragraph A-3.4, including requirement for joints over cold-pour, saw-cut, control, and structural joints. Sealant materials and installation procedures are specified in Section 07900, Joint Sealants.
 - D. Mix dry-set and latex-portland cement mortars in accordance with manufacturer's instructions.
 - 1. For dry-set mortars, add dry ingredients to water. Mix thoroughly and allow mortar to stand 15 minutes, then re-mix. Do not add water, additional mortar, or other ingredients after slaking period.
 - 2. For latex-portland cement mortars, use brand of pre-packed dry mortar mix specified by latex manufacturer. Add dry mortar to correct amount of latex, as specified by manufacturer, and mix thoroughly to obtain complete and visually uniform wetting of dry mortar mix. When directions require dilution of latex with water, this shall be done with adequate mixing before dry mortar mix is added. Slake for 15 minutes and re-mix before using.
 - 3. Spread mortar with notched trowel of type recommended by manufacturer. Setting compound shall be of such consistency that ridges formed by trowel shall not flow or slump. Cover surface uniformly without bare spots. Apply setting compound only to as much area as can be covered with tile before mortar skins over. Remove dried mortar, and apply new material. Protect mortar from foot traffic and dirt.
 - E. Press individual tiles or tile sheets into mortar, maintaining accurate joint alignment and spacing. Beat in tile with rubber-faced block to obtain maximum contact between tile back and setting compound. Remove paper and glue from paper-mounted ceramic mosaics before mortar is firmly set, and align individual tiles. Immediately remove setting compound from faces or front edges of tiles.
 - F. Center and balance tile areas. Smooth cut edges. Jagged or flaked edges or split tiles are prohibited. Cuts shall be no smaller than half size, located on outer edges of field. Make corners of all tile flush and level with corners of adjacent tile, with due allowance to tolerances for tile as specified in ANSI A137.1.
 - G. Keep all joint lines straight and of even width, including miters. Finish floor and wall areas shall be flat and plumb, with no variations exceeding 1/4 in. in 10 ft. from required plane.
 - H. Allow sufficient time for setting compound to cure before grouting, 48 hours minimum. Remove spacers or ropes from joints. Using a grout of type and mix specified under PRODUCTS, force maximum amount of grout into joints. Clean joints of cushion edge tile to depth of cushion.

DANFORTH ON HIGH – PORTLAND, MAINE

- I. Fill joints of square-edge tile flush with surface. Fill all gaps and skips. Do not permit mortar to show through grouted joints. Finished grout shall be uniform in color, smooth and without voids, pinholes or low spots.
- J. After mortar joints have cured, clean unglazed tile with proprietary acidic preparation such as Sure-Klean Grout and Tile Cleaner, in strict accordance with manufacturer's instructions. Apply solutions to test patches before cleaning.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 09510

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Acoustical ceiling panels.
 - 2. Exposed grid suspension system.
 - 3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
- B. Related Sections:
 - 1. Section 01450 - Codes
 - 2. Section 01450 - Code-required Special Inspections and Procedures
 - 3. Section 09250 - Plaster and Gypsum Board
 - 4. Divisions 15 - HVAC
 - 5. Division 16 Sections - Electrical Work
- C. Alternates
 - 1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.
 - 2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

DANFORTH ON HIGH – PORTLAND, MAINE

2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
 9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
 10. ASTM E 1264 Classification for Acoustical Ceiling Products.
 11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
 12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.
- B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"
 - C. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
 - D. International Code Council-Evaluation Services - Evaluation Report, ESR-1308, Fire- and Nonfire-Resistance-Rated Suspended Ceiling Framing Systems
 - E. ASCE 7 Standard - American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
 - F. Cisca Seismic Zones 3 & 4 - Ceilings and Interior Systems Construction Association Guidelines for Seismic Restraint for Direct Hung Suspended Ceiling Assemblies

1. SYSTEM DESCRIPTION

- Seismic Loads: Design and size components to withstand seismic loads in accordance with the International Building Code, Section 1621 for Category D,E, and F.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
- B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
- C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - 1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
 - a. Flame Spread: 25 or less
 - b. Smoke Developed: 50 or less
- C. Seismic Performance: Provide acoustical ceiling system that has been evaluated by an independent party and found to be compliant with the 2003 International Building Code, Seismic Category D, E, and F.
 - 1. Tested per International Code Council - Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components as evidenced by International Code Council Evaluation Report, ESR-1308.
- D. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 PROJECT CONDITIONS

- A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with Armstrong written installation instructions for that product in effect at

DANFORTH ON HIGH – PORTLAND, MAINE

the time of installation and best industry practice. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32oF (0o C) and 120oF (49o C) and not subject to Abnormal Conditions.

Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust buildup.

HumiGuard Plus Ceilings: Installation of the products shall be carried out where the temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.

The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.

1.9 WARRANTY

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
 - 1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
 - 2. Grid System: Rusting and manufacturer's defects
 - 3. Acoustical Panels with BioBlock Plus or designated as inherently resistive to the growth of micro-organisms installed with Armstrong suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
- B. Warranty Period Humiguard:
 - 1. Acoustical panels: Ten (10) years from date of substantial completion.
 - 2. Grid: Ten (10) years from date of substantial completion.
 - 3. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is thirty (30) years from date of substantial completion.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.10 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - 1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 5.0 percent of amount installed.
 - 2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

DANFORTH ON HIGH – PORTLAND, MAINE

Part 2-PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:

1. Armstrong World Industries, Inc.

2.2.0 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type ACT-1:

1. Surface Texture: Medium
2. Composition: Mineral Fiber
3. Color: White
4. Size: 24in X 24in X 5/8in
5. Edge Profile: Beveled Tegular for interface with Suprafine XL 9/16" Exposed Tee.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.55.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35
8. Articulation Class (AC): ASTM E 1111; Classified with UL label on product carton N/A.
9. Emissions Testing: Section 01350 Protocol, < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"
10. Flame Spread: ASTM E 1264; Class A (UL)
11. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.85.
12. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.
13. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
14. Acceptable Product: Fine Fissured, 1734 as manufactured by Armstrong World Industries.

2.3.0 SUSPENSION SYSTEMS

- A. Components: Main beams and cross tees In accordance with the International Building Code, Section 1621 for Category D, E and F as described in ESR-1308.
 1. Structural Classification: ASTM C 635, Heavy Duty.
 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.

DANFORTH ON HIGH – PORTLAND, MAINE

3. Represented Systems: Suprafine XL 9/16" Exposed Tee System as manufactured by Armstrong World Industries.
- B. Attachment Devices: In accordance with the International Building Code, Section 1621 for Category D, E, and F.
- C. Wire for Hangers and Ties: In accordance with the International Building Code, Section 1621.
- D. Wall Moldings: In accordance with the International Building Code, Section 1621 for Category D, E, and F or method as described in ESR-1308.
- E. Accessories:
 1. BERC2 - 2 inch Beam End Retaining Clip, 0.034 inch thick, hot-dipped galvanized cold-rolled steel per ASTM A568 - used to join main beam or cross tee to wall molding.
 2. SJCG - Seismic Joint Clip, 5 inches x 1-1/2 inch, hot-dipped galvanized cold-rolled steel per ASTM A568. The two piece unit is designed to accommodate a seismic separation joint. The clip is compatible with 15/16 inch and 9/16 inch grid systems including Prelude, Suprafine, and Silhouette The SJCG is not suitable for use with Vector panel installations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.
- B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION (Category D,E,F)

- A. Install suspension system and panels in accordance with the International Building Code, Section 1621, except as noted in Section 4.4.3.1 of ESR-1308, and with the authorities having jurisdiction.
- B. ESR-1308, Section 4.4.3.1, Alternate Seismic Design Category D,E and F Installation:

DANFORTH ON HIGH – PORTLAND, MAINE

Under this installation, the runners must be rated heavy-duty and have a minimum simple span uniform load of 16.35 pounds per lineal foot (238 N/m); maximum ceiling weight permitted is 1.80 pounds per square foot (8.78 kg/m²).

1. The BERC-2 clip is used to secure the main runners and cross runners on two adjacent walls to the structure and the two opposite walls to the perimeter trim, as detailed below. A nominal 7/8-inch (22 mm) wall molding is used in lieu of the 2-inch (51 mm) perimeter supporting closure angle required by Section 9.6.2.6.2.2 (b) of ASCE-7 for Seismic Design Categories D, E and F. Except for the use of the BERC-2 clip and the 7/8-inch (22 mm) wall molding and elimination of spreader bars, installation of the ceiling system must be as prescribed by the applicable code.
2. The BERC-2 clip is attached to the wall molding by sliding the locking lances over the hem of the vertical leg of the wall molding. Clips installed on the walls where the runners are fixed are attached to the runner by a sheet metal screw through the horizontal slot in the clip into the web of the runner.

Alternate #2: If acceptable to architect, fixed attachment may be accomplished by pop-riveting the runner to the wall molding.

3. Clips installed on the walls where the runners are not fixed to the runner allow the terminal runner end to move 3/4 inch (19.1 mm) in both directions. BERC-2 clips installed in this manner are an acceptable means of preventing runners from spreading in lieu of spacer bars required in CISCA 3-4, which is referenced in ASCE 7, Section 9.6.2.6.2.2, which is referenced in IBC Section 1621.
- C. The SJCG Seismic Separation Joint Clip is to be installed per the manufacturer's instructions, CS-3815.
 - D. The presence of a hanger wire within 3 inches of an expansion relief joint as called for in ASTM C636 shall be required in addition to the requirements of the International Building Code, Section 1621.2.5 and with the authorities having jurisdiction.
 1. Only applies when using Prelude XL Fire Guard 15/16"; Prelude Plus XL Fire Guard 15/16"; and Suprafine XL Fire Guard 9/16" Exposed Tee Systems.
 - E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
 - F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3. FIELD QUALITY CONTROL

- Suspended ceiling shall be subject to the special inspection requirements in Section 01450 - Code-Required Special Inspections and Procedures.

3.5 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09650

RESILIENT FLOORING AND VINYL BASE

1. GENERAL:

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK

A. SCOPE: The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:

B. Extent of Vinyl Composition Tile Flooring and Vinyl Base as shown on the drawings.

1.3 SUBMITTALS

A. Submittals under this Section shall include:

1. Manufacturers' data and installation instructions on all specified products;
2. Color range;
3. Samples of vinyl composition tile flooring and vinyl base
4. Shop drawings indicating materials, pattern number, tile number, and manufacturer.

2. PRODUCTS:

2.1 VINYL TILE: Shall be "Mannington Natures Path Select" Submit color for Architect's approval. See Architectural Drawings for locations.

2.2 RUBBER WALL BASE MOLDING: Shall be Johnsonite MW-315 V Submit color for Architect's approval. See Architectural Drawings for locations.

2.3 SHEET VINYL: Shall be "Armstrong Abode" Submit color for Architect's approval. See Architectural Drawings for locations.

2.4 VINYL BASE MOLDING – shall be Johnsonite Cover Base 4", 1/8 gauge. Submit color for Architect's approval. See Architectural Drawings for locations.

2.5 RUBBER STAIR TREADS- shall be Johnsonite Resilient Rubber Stair Treads Raised Round tread with integrated riser and coordinating stringer- Submit color for Architect's approval

2.6 ADHESIVES: shall be as recommended by the manufacturer.

DANFORTH ON HIGH – PORTLAND, MAINE

Volatile Organic Compound (VOC) emissions from adhesives and sealants must not exceed VOC limits of South Coast Air Quality Management District Rule #1168 AND sealants used as fillers must meet the requirements of the Bay Area AirQualityManagementDistrictRegulation8, Rule51

3. EXECUTION:

- 3.1 INSTALLATION shall be done by skilled craftsmen using the adhesives recommended by the manufacturer and in accordance with the manufacturer's instructions. The flooring contractor shall examine the subfloors and report all defects which have to be corrected before the application of flooring starts. Concrete floors shall be smooth, free of any grooves and depressions, and brushed clean of any foreign matter. Install all resilient flooring with joints tight, floor true, level and even with no bubbles, pops or other visible defects. Cut to and around all permanent fixtures keeping vinyl tight to fixtures. Vinyl also shall be installed under fixtures such as baseboard heating, and glued tight. Wrap vinyl base around exterior corners.
- 3.2 DURING WORK PROGRESS, remove all excess materials, extraneous mastic, and debris resulting from operations, which may disrupt the work of other trades. The Contractor shall be responsible for keeping the floors clean, unstained and undamaged until the final completion of the building.

END OF SECTION

Product Specifications
ESSENTIALS & DESIGNER ESSENTIALS

MANNINGTON
COMMERCIAL

PHYSICAL CONSTRUCTION

Construction	Through-Pattern Vinyl Composition Tile
Size	12" x 12" (305 mm x 305 mm)
Overall Thickness	.125 inches (3.2 mm)
Package/Count	45 per carton
Coverage Per Carton	5 sq. yds.
Average Weight	65 lbs. per carton (29.5 kg per carton) 1.4 lbs. per tile (0.6 kg per tile)
Boxes Per Pallet	30

ENVIRONMENTAL

FloorScore Indoor Air Quality	SCS Certified
CHPS 01350 Indoor Air Quality	Passed and Listed
Manufacture Location	Salem, NJ USA

TESTING

ASTM Specification (F-1066)	Class 2
HUD / FHA Requirements	Exceeds
Flooring Radiant Panel Test (ASTM-E-648)	>.45 watts / cm ² , Passes – Class 1
N.B.S. Smoke Chamber Test (ASTM-E-662)	<450 Passes
Static Coefficient of Friction	Meets ADA Guidelines
Static Load Limit	125 psi (8.79 kg/cm ²)

WARRANTIES

Vinyl Composition Tile (VCT) Warranty	Limited 5 Year Commercial Warranty
---------------------------------------	------------------------------------

INSTALLATION

Installation Adhesive	Mannington M-Guard V-11 / Full Spread
-----------------------	---------------------------------------

- Color and pattern extend through the thickness of the tile.
- VCT is not recommended for use in hospital operating suites, commercial kitchens, or in areas that require static dissipation.
- Darker colors of vinyl composition tile may be subject to scratch whitening, requiring more frequent maintenance.
- Wood subfloors directly on concrete or sleepers, either on or below grade, are unsatisfactory for VCT installation.
- VCT is not recommended in commercial areas where the surface temperature over radiant heated substrate exceeds 90° F.
- Dirt, wetness, and improper maintenance may cause significant variation in actual performance.
- Specifications are based on averages from normal manufacturing tolerances. Such variations do not affect product performance.
- This product is intended solely for use as an indoor floor covering and is not recommended or sold for any other purpose.
- Use entryway systems outside each entrance to prevent dirt, sand, grit, and other substances from being tracked onto floor.

Choices That Work

800 241 2262 manningtoncommercial.com



Product Specifications
NATURE'S PATHS SELECT

MANNINGTON
 COMMERCIAL

PHYSICAL CONSTRUCTION

Construction	Luxury Vinyl Tile & Luxury Vinyl Plank with Micro Bevel Edges
Wear Layer	Quantum Guard HP Urethane Aluminum Oxide Topcoat Cured by UV Process
Static Load Limit	750 psi
Overall Thickness	.100 inches (2.5mm)
Wearlayer Thickness	.020 inches (0.51mm)

TILE:

Size	18" x 18" (457.2 mm x 457.2 mm)
Pieces Per Carton	18
Coverage Per Carton	40.5 sq. ft. (3.76 m ²)
Weight Per Piece	2.12 lbs (.96 Kg)
Weight Per Carton	38.1 lbs (17.3 Kg)
Cartons Per Pallet	48

PLANK 3" WIDTH:

Size	3" x multiple lengths - 12", 24", 36", 48" (76.2 mm x 304.8 mm, 609.6 mm, 914.5 mm, 1219.3 mm)
Pieces Per Carton	48
Coverage Per Carton	48 sq. ft. (4.46 m ²)
Weight Per Piece	12" - .071 lbs (.32 Kg), 24" - 1.42 lbs (.64 Kg), 36" - 2.13 lbs (.97 Kg), 48" - 2.82 lbs (1.28 Kg)
Weight Per Carton	34 lbs (15.4 Kg)
Cartons Per Pallet	65

PLANK 5" WIDTH:

Size	5" x 48" (127 mm x 1219.3 mm)
Pieces Per Carton	22
Coverage Per Carton	36.7 sq. ft. (3.41 m ²)
Weight Per Piece	1.57 lbs (.71 Kg)
Weight Per Carton	34.5 lbs (15.7 Kg)
Cartons Per Pallet	63

PLANK 7" WIDTH:

Size	7" x 48" (177.8 mm x 1219.3 mm)
Pieces Per Carton	16
Coverage Per Carton	37.3 sq. ft. (3.47 m ²)
Weight Per Piece	2.20 lbs (1.0 Kg)
Weight Per Carton	35.2 lbs (15.9 Kg)
Cartons Per Pallet	65

TESTING

Specification (ASTM 1700)	Class 3, Type B
Heat Stability (ASTM F-1514)	Passes
Stain & Chemical Stability (ASTM F-925)	Passes
HUD/FHA Requirements	Exceeds
Flooring Radiant Panel (ASTM-E-648)	≥.45 watts/cm ² , Passes (Class 1)
N.B.S. Smoke Chamber (ASTM-E-662)	<450 – Passes
Static Coefficient of Friction	Meets ADA Guidelines
FloorScore Indoor Air Quality	SCS Certified
CHPS 01350 Indoor Air Quality	Passed and Listed

WARRANTIES

Warranty	Limited 10 Year Commercial Warranty & 10 Year Quantum Guard HP Warranty
----------	---

INSTALLATION

Installation Adhesive, Porous Subfloor	V-82 / Full Spread
Installation Adhesive, Non-Porous Subfloor	V-95 / Full Spread (Must use V-95 for heavy rolling loads)

- Nature's Paths Select is not recommended in commercial areas that require static dissipation.
- Nature's Paths Select is not recommended in areas where the surface temperature over radiant heated substrate exceeds 90° F.
- Dirt, wetness, finish selections and maintenance schedule may cause significant variation in actual performance.
- Specifications are based on averages from normal manufacturing tolerances. Such variations do not affect product performance.
- This product is intended solely for use as an indoor floor covering and is not recommended or sold for any other purpose.
- Use entryway systems outside each entrance to prevent dirt, sand, grit, and other substances from being tracked onto floor.

Choices That Work

800 241 2262 manningtoncommercial.com



adds
LEED
VALUE

terra antica™ porcelain

7894 C. F. Hawn Freeway
Dallas, Texas 75217
214-398-1411 800-953-TILE



18" x 18" Field Tile
(Nominal 17 7/8" x 17 7/8")
(Nominal 45.0 cm x 45.0 cm)
1/4" Thick
Square feet per carton: 15.36
Pieces per carton: 7



12" x 12" Field Tile
(Nominal 11 7/8" x 11 7/8")
(Nominal 30.0 cm x 30.0 cm)
1/4" Thick
Square feet per carton: 14.53
Pieces per carton: 15



6" x 6" Field Tile
(Nominal 5 7/8" x 5 7/8")
(Nominal 15.0 cm x 15.0 cm)
1/4" Thick
Square feet per carton: 10.76
Pieces per carton: 44



6" x 6" Corner/Insert
(Nominal 5 7/8" x 5 7/8")
(Nominal 15.0 cm x 15.0 cm)
1/4" Thick
Pieces per carton: 4



6" x 12" Decorative Border
(Nominal 5 7/8" x 11 7/8")
(Nominal 15.0 cm x 30.0 cm)
1/4" Thick
Pieces per carton: 10



Shear Variation: $\leq 8^\circ$ (Random)

Strong random loading is part of the normal loading of this product. To achieve the maximum intended results, tile should be applied from multiple centers and placement decided upon prior to installation.

Application

	Residential	Light Commercial	Commercial
Floors	X	X	X
Walls	X	X	X
Counters	X	X	X
Backsplashes	X	X	X
Pool Linings	X	X	X

Suitable for exterior floors and walls in freezing and non-freezing climates when proper installation methods are followed. Special care should be taken when grouting with dark pigmented mortar. A grout retarder is recommended to prevent fining pigments from lodging in the pores of the tile surface.

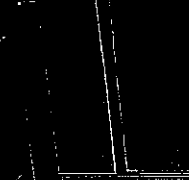
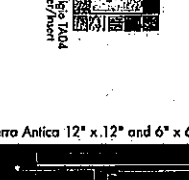
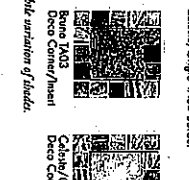
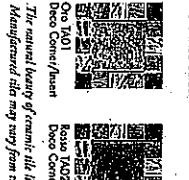
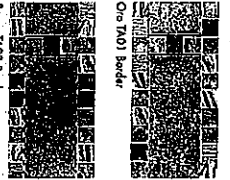
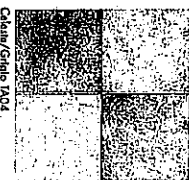
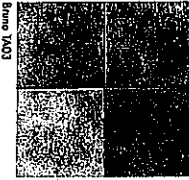
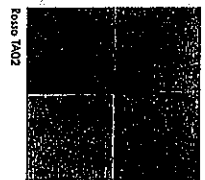
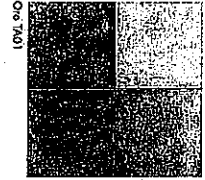
Test Results

	ASTM#	Result
Water Absorption	C373	<0.5%
Breaking Strength	C648	>432 lbs
Scratch Hardness	MOH'S	8.5
Chemical Resistance	C650	Resistant
Coefficient of Friction	C1028	Min: 0.60
Abrasion Resistance	ISO 10545/7	Dry: 20.75

Abrasion Resistance Application Classifications

ISO 10545-7
 Light Residential
 Heavy Residential
 Light Commercial
 Heavy Commercial

Send for your complete collection of Daltile products, visit our website at www.daltile.com.



Trim

Type	Number	Size
Rectangle	S-435C9	3-1/2" x 12"
Cover/Corner	S-94C9T	6" x 12"
Cover/Corner	SC36C9T	1" x 6" (Ox)

Maintenance: Routine maintenance will keep your tile looking new for years to come. Under normal situations, the tile can be cleaned using clear water with a neutral tile cleaner. Always follow-up with a time of clear water. No waxes or sealers are recommended for this product.

Photo features Terra Antica 12" x 12" and 6" x 6" Oro on floor. Wall features 6" x 6", 6" x 12" Border and 6" x 6" Deco Corner/Insert in Oro.



terra antica™ porcelain

Millwork Resilient Wall Base

1. PROPRIETARY PRODUCT/MANUFACTURER

1.1 **Proprietary Product:** Millwork Resilient Wall Base profiles replicate the look of finely milled wood.

1.2 **Manufacturer:**

Johnsonite, Inc.,
16910 Munn Road
Chagrin Falls, Ohio 44023
Phone: (800) 899-8916
(440) 543-8916
Fax: (440) 543-8920
Tech: Ext 297
Samples: Ext 299
Web: www.johnsonite.com
E-mail: info@johnsonite.com

1.3 Proprietary Product Description:

1.3.1 **Construction:** Johnsonite Millwork Resilient Wall Base is manufactured from a proprietary thermoplastic rubber formulation designed specifically to meet the performance and dimensional requirements of ASTM F-1861 Standard Specification for Resilient Wall Base, Type TP, and Group 1.

1.3.2 Physical Characteristics:

Diplomat™ (MW-XX-A): 3/8" (9.52mm) thick by 4 -1/2" (11.43cm) high, 6 per carton, 8 ft lengths, 48 ft (14.6m) per carton, 38 lbs (17.2kg) per carton, U.S. Design Patent Number #D474,548

Overlook™ (MW-XX-C): 1/4" (6.35mm) thick by 7-1/2" (19.05cm) high, 6 per carton, 8 ft lengths, 48 ft (14.6m) per carton, 56 lbs (25.4 kg) per carton

Outline™ (MW-XX-D): 5/16" (7.92mm) thick by 3-1/2" (8.89cm) high, 10 per carton, 8 ft lengths, 80 ft (24.4m) per carton, 47 lbs (21.3kg) per carton

Attaché™ (MW-XX-E): 1/4" (6.35mm) thick, by 6" (15.24cm) high, 8 per carton, 8 ft lengths, 64 ft (19.5m) per carton, 57 lbs (26kg) per carton

Reveal™ 4-1/4" high (MW-XX-F): 1/4" (6.35mm) thick by 4-1/4" (10.8cm) high with a 45° angular top and a 7/32" (5.5mm) wide surface reveal, 8 per carton, 8 ft lengths per carton, 64 ft (19.5m) per carton, 50 lbs (22.7kg) per carton

Reveal™ 6" high (MW-XX-F6): 1/4" (6.35mm) thick by 6" (15.24cm) high with a 45° angular top and a 7/32" (5.5mm) wide surface reveal, 8 per carton, 8 ft lengths, 64 ft (19.5m) per carton, 58 lbs (26.3kg) per carton

Inflection™ (MW-XX-G): 3/8" (9.52mm) thick by 5-1/4" (13.34cm) high, 6 per carton, 8 ft lengths, 48 ft (14.6m) per carton, 65 lbs (30kg) per carton

Mandalay™ 2-1/2" high (MW-XX-H25): 3/8" (9.52mm) thick by 2-1/2" (6.35cm) high wall base, a rectangular shaped profile with a 45° chamfer top, 5 per carton, 8 ft lengths, 40 ft (12.2m) per carton, 40 lbs (18.14kg) per carton

Mandalay™ 4-1/2" high (MW-XX-H): 3/8" (9.52mm) thick by 4-1/2" (11.43cm) high wall base, a rectangular shaped profile with a 45° chamfer top, 5 per carton, 8 ft lengths, 40 ft (12.2m) per carton, 52 lbs (23.6kg) per carton

Mandalay™ 6" high (MW-XX-H6): 3/8" (9.52mm) thick by 6" (15.24cm) high wall base, a rectangular shaped profile with a 45° chamfer top, 4 per carton, 8 ft lengths, 32 ft (9.75m) per carton, 54 lbs (24.5kg) per carton

Silhouette™ (MW-XX-J): 5/16" (7.92mm) thick, 1/2" (12.7mm) thick and 4" (10.16cm) in height, 6 per carton, 8 ft lengths, 48 ft (14.63m) per carton, 41 lbs (18.6kg) per carton

Ambassador™ (MW-XX-K): 3/8" (9.52mm) thick by 4" (10.16cm) in height, 6 per carton, 8 ft lengths, 48 ft (14.6m) per carton, 42 lbs (19kg) per carton

Envoy™ (MW-XX-L): 3/4" (19.05mm) thick by 5-1/2" (13.97cm) high wall base profile which replicates a finely routed wood molding profile, 4 per carton, 8 ft lengths, 32 ft (9.75m) per carton, 66 lbs (30kg) per carton

Monarch™ (MW-XX-M): 3/16" (4.76mm) thick by 6.0" (15.24cm) high wall base profile which replicates a finely routed wood molding profile, 6 per carton, 8 ft lengths, 48 ft (14.6m) per carton, 46 lbs (20.9kg) per carton

Oblique™ (MW-XX-N): 3/8" (9.53mm) thick by 3" (7.62cm) high wall base profile with a 45° angular top, 7 per carton, 8 ft lengths, 56 ft (17.0m) per carton, 42 lbs (19.1kg) per carton

Emissary™ (MW-XX-P): .531" (13.49mm) thick by 4-1/2" (11.43cm) high wall base profile, 6 per carton, 8 ft lengths, 48 ft (12.9m) per carton, 44 lbs (19.9kg) per carton

Equinox™ (MW-XX-R): 3/8" (9.53mm) thick by 4-1/2" (11.43cm) high wall base profile, 5 per carton, 8 ft lengths, 40 ft (10.16m) per carton, 50 lbs (22.6kg) per carton

2. PRODUCT PERFORMANCE AND TECHNICAL DATA

2.1 **Hardness:** ASTM D 2240: 85 Shore A

2.2 **Flexibility:** Will not crack, break, or show any signs of fatigue when bent around a 1/4" (6.4 mm) diameter cylinder.

2.3 Fire Resistance:

2.3.1 ASTM E 648/NFPA 253 (Critical Radiant Flux) – Class 1

2.3.2 ASTM E 84/NFPA 255: Flame/Smoke – Class A / less than 450 Smoke

2.4 Chemical Resistance: ASTM F 925, Passed – 5% Acetic acid, 70% Isopropyl alcohol, White mineral oil (medicinal grade), Sodium hydroxide solution (5% NaOH), Hydrochloric acid solution (5% HCl), Sulfuric acid solution (5% H₂SO₄), Household ammonia solution (5% NH₄OH), Household bleach (5.25% NaOCl), Olive oil (light), Kerosene (K1), and Unleaded gasoline (regular grade)

2.5 Meets or exceeds the performance requirements for resistance to heat/light aging, chemicals, and dimensional stability when tested to the methods, as described, in ASTM F-1861 Standard Specification for Resilient Wall Base.

3. INSTALLATION

3.1 The installation of Johnsonite Millwork Resilient Wall Base should not begin until the work of all other trades has been completed, especially overhead trades. Areas to receive wall base shall be clean, fully enclosed, weathertight, and maintained at a uniform temperature of at least 65° F for 24 hours before, during, and after the installation is completed. The wall base and adhesives shall be conditioned in the same manner. Floors and walls shall be clean, dry, free of dust, all paints, wallpaper, and all other foreign material, which may affect proper adhesive bonding. Wall Base may be installed on interior plaster, gypsum wallboard, concrete, masonry, mineral-reinforced cement board or similar porous surfaces. Wall Base shall not be installed on surfaces that will be exposed to drastic temperature changes or moisture. Cut the wall base to finished length and miter cut the ends for inside and outside corners.

3.2 Adhesives:

Porous Surfaces

3.2.1 Johnsonite #960 Acrylic Cove Base Adhesive

Application - 1/8" square notch trowel

Approximate Coverage in Linear ft/gal

MW-XX-A (Diplomat) = 222 to 267
MW-XX-C (Overlook) = 135 to 160
MW-XX-D (Outline) = 285 to 340
MW-XX-E (Attaché) = 170 to 200
MW-XX-F (Reveal) = 235 to 280
MW-XX-F6 (Reveal) = 170 to 200
MW-XX-G (Inflection) = 190 to 225
MW-XX-H25 (Mandalay) = 400 to 480
MW-XX-H (Mandalay) = 222 to 267
MW-XX-H6 (Mandalay) = 170 to 200
MW-XX-J (Silhouette) = 250 to 300
MW-XX-K (Ambassador) = 250 to 300
MW-XX-L (Envoy) = 185 to 220
MW-XX-M (Monarch) = 170 to 200
MW-XX-N (Oblique) = 335 to 400
MW-XX-P (Emissary) = 222 to 267
MW-XX-R (Equinox) = 222 to 267

Non-porous Surfaces

3.2.2 Johnsonite #945 Contact Bond Adhesive

Application - Brush or roller

Coverage - approximately 360 sq ft /gallon

3.3 Installation Manual: Refer to Johnsonite Millwork Resilient Wall Base Installation Instructions for complete installation details.

4. AVAILABILITY AND COST

4.1 Available through authorized Johnsonite distributors nationwide.

5. WARRANTY

5.1 Limited 1 year warranty. For complete details, contact Johnsonite or an authorized Johnsonite distributor.

6. MAINTENANCE

Refer to Johnsonite Millwork Resilient Wall Base Installation Instructions for complete maintenance details.

7. TECHNICAL SERVICES

7.1 Samples: Submittal samples for verification and approval available upon request from Johnsonite. Samples shall be submitted in compliance with the requirements of the Contract Documents. Accepted and approved samples shall constitute the standard materials which represent materials installed on the project.

7.2 For current Installation and Maintenance Instructions, Product Specifications, and other technical data, visit us on the web at www.johnsonite.com or contact Johnsonite at 1-800-899-8916.

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 09680

CARPET

1. GENERAL

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION OF WORK:

- A. Installation of "Roberts Strips" for carpeting.
- B. Installation of Carpeting as shown on plans or noted in these Specifications.

1.3 QUALITY ASSURANCE

- A. Finished installation shall comply with fire test specified in applicable Building Code.
- B. Architect/Engineer shall review first finished space for workmanship. Accepted space shall serve as project standard.
- C. All carpets will meet UM44D
- D. Carpet to meet CRI Low Emission Label Standard.

1.4 SUBMITTALS

- A. Submittals under this Section shall include:
 - 1. Manufacturer's specifications and installation instructions on all specified products.
 - 2. Samples: one piece, 18" x 18", of each color and type of carpet provided.
- B. Deliver to Owner, neatly packaged and labeled, all usable carpet scraps over 2 sq. ft. or 8 in. in least dimensions: 1 percent of each type and color of carpet provided, in 12 ft. wide rolls; and 1 percent of each type of edge strip provided, in standard lengths.
- C. Provide written maintenance program.

2. PRODUCTS

Floor areas designated for carpeting shall be covered with material meeting following specifications:

- A. Construction: Tufted level loop or textured loop. Continuous filament nylon with anti-microbial processing, permanent static control, 3.0 K.V. meeting test method AATCC 134-1969.
- B. Dye Method: 1st Choice: 100% solution dyed; 2nd Choice: At least 70% solution dyed, remaining to be yarn dyed.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Gauge: Minimum 1/8.
- D. Stitches per inch: Minimum 9.
- E. Face Weight: Minimum 28 oz.
- F. Pile Height: 3/16 inch minimum.
- G. Primary Backing: 100% Polypropylene.
- H. Secondary Backing: Action back or unitary back with 20 lb. Tuft lock if floors are rough, contain moisture, or are exposed to concentrated same directional traffic.
- J. All carpet must meet UM44d.

SEE MSHA'S GREEN BUILDING STANDARDS FOR FURTHER REQUIREMENTS.

2.1 CARPET shall be as follows:

Carpet #1: First floor common area to be direct glue Mannington Commercial Style "Landmark" 100% Antron Lumena 24 x 24, color to be selected.

Carpet #2: Unit carpentry- Shaw "Potential III" 26 oz. on classic back.

Pad: Endurance 27oz. synthetic cushion

Note: On first floor carpet to be direct glue. All handicap units carpet to be direct glue on 1/4" plywood on homosote board. All other units carpet to be on pad. See attached specification sheet as end of this section.

2.2 CARPET must carry stamp confirming conformance to above and submitted to Architect for approval.

2.3 Volatile Organic Compound (VOC) emissions from adhesives and sealants must not exceed VOC limits of South Coast Air Quality Management District Rule #1168 AND sealants used as fillers must meet the requirements of the Bay Area. AirQualityManagementDistrictRegulation8,Rule51

2.4 Carpet systems must meet or exceed Carpet & Rug Institute (CRI) Green Label Indoor Air Quality Test Program.

IF MODULAR CARPETS ARE SCHEDULED they must meet the following criteria:

- a) Construction: tufted Level and Textured Level Loop
- b) Fiber: 100% nylon
- c) Dye Method: 70% or greater solution dyed
- d) Face Weight: 22 oz or greater
- e) Backing: high-performance, PVC-free with min 15% recycled content backing with fiberglass or equal stabilizer
- f) Standard: HUD UM44d
- g) Warranties: Fiber- abrasion wear and static protection, Backing-tuft bind, edge relevel and delamination
- h) All modular carpets must meet green label and green label plus program requirements for product and adhesives
- i) Carpet Emission limits: Same as broadloom

DANFORTH ON HIGH – PORTLAND, MAINE

	Moderate Traffic <i>includes carpets inside units</i>	Heavy Traffic <i>Common corridors, community rooms and public spaces</i>
Carpet		
Construction:	Tufted Level & Textured Level Loop	Tufted Level & Textured Level Loop
Fiber:	100% Nylon	100% Nylon
Dye Method:	70% or greater solution dyed	70% or greater solution dyed
Face Weight:	24 oz or greater	24 oz or greater
Secondary backing:	Action Backing or Unitary Backing w/20lbs Tuft or Equal	Unitary Backing w/20lbs Tuft or Equal
Gauge:	1/8 min.	1/10 min.
Standard:	UM44d, Green Label Plus Certification Program	UM44d, Green Label Plus Certification Program
Carpet Emission Limits		
VOC:	0.50 mg/m ² • hr	0.50 mg/m ² • hr
4-Phenylcyclohexane:	0.05 mg/m ² • hr	0.05 mg/m ² • hr
Formaldehyde:	0.05 mg/m ² • hr	0.05 mg/m ² • hr
Styrene:	0.40 mg/m ² • hr	0.40 mg/m ² • hr
Standard:	Green Label Plus Certification	Green Label Plus Certification
Cushion (Recommended, but not required.)		
Material:	Synthetic Fiber	Synthetic Fiber
Thickness/Weight:	.25" thick / 6-8 lbs	.3" thick / 6-8 lbs
Standard:	Green Label Plus Certification	Green Label Plus Certification
Cushion Emission Limits		
TVOC's:	1.00 mg/m ² • hr	1.00 mg/m ² • hr
BHT:	0.30 mg/m ² • hr	0.30 mg/m ² • hr
Formaldehyde:	0.05 mg/m ² • hr	0.05 mg/m ² • hr
4-PCH:	0.05 mg/m ² • hr	0.05 mg/m ² • hr
Standard:	Green Label Plus Certification	Green Label Plus Certification

3. EXECUTION:

3.1 JOB CONDITIONS:

- A. Examine Subfloor for dampness, loose material, excessive irregularity, oily or waxy areas impeding adhesion, or other conditions which would prevent proper installation. Verify that no incompatible curing compound has been used on newly-poured concrete. Commencement of work constitutes acceptance of subfloor.
- B. Allow newly-poured concrete to cure as long as possible before installation of carpet, a minimum of 7 days, 28 days preferable. Perform bond and moisture tests in accordance with carpet manufacturer's instructions, to verify that concrete is sufficiently cured, dried and then sealed.
- C. Broom-clean or vacuum surfaces to receive carpet, before beginning installation. Apply primer-sealer to plywood or concrete sub-floor, if recommended by carpet or adhesive manufacturer.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Before proceeding with complete installation of carpet, install a representative sample area of each type of carpet provided over each type of substrate, to test for compatibility of adhesive to substrate at glue-down installation, and verify general appearance of finished installation. If sample is securely bonded after 72 hours, final installation may proceed.

3.2 INSTALLATION

- A. On first floor all carpet direct glue. On floors 2-4 carpet direct glue on ¼" plywood on homosote. In all handicap units carpet direct glue on ¼" plywood on homosote board.
- B. Field measure each space to receive carpet. Do not scale drawings. Before beginning installation, verify that floor telephone and electrical outlets have been installed.
- C. At glue-down installations, apply manufacturer's recommended adhesive in accordance with manufacturer's instructions, observing proper safety precautions. Apply adhesive in a uniform film with a steel trowel and proper size notches for correct coverage. Avoid applying excess quantities so that adhesive bleeds through joints. Apply adhesive only in area which dries or films over. Avoid soiling adjacent walls and floors with adhesive. Promptly remove any spillage. Broom or roll carpet to remove air bubbles and insure bond.
- D. Install carpet wall to wall unless noted otherwise. Fit carpet neatly into breaks, recesses, closets and alcoves, against bases, around pipes and penetrations, under saddles and thresholds, and around permanent cabinets and equipment. Install Schluter metal strip wherever carpet edge does not abut vertical surface, of appropriate configuration to provide smooth transition to adjacent material. Allowable variation from level for finished installation: 1/4 in. from level in any direction when tested with 10 ft. straight-edge.
- E. Seams shall be flat, free from puckering, without twists, free from frayed edges. Coat edges with seam adhesive at glue-down installation, hot-melt tape at cushion, and as recommended by manufacturer. Patterns at seams shall match exactly. Cut raw edges on a slight angle with surface yarns extending outward over backing material so that surface yarns mingle neatly at seams.
- F. Seams shall be in accordance with approved seaming shop drawings and samples. No seams will be accepted perpendicular to openings such as doors, stairs, and entries. Seams at doors shall be centered directly under doors. Seam at corridor change of direction shall follow inner wall line across corridor.
- G. Provide removable cut-out pieces over flush equipment requiring access such as telephone and power outlets. Cut-outs shall be neatly edged and securely held in place with double-edged tape all around.
- H. Remove adhesive spots from carpet immediately with solvent. Trim loose pieces of face yarn with sharp scissors. Upon completion of installation, remove rubbish, selvages, wrapping paper, small scraps, etc., and vacuum with commercial-type vacuum cleaner. Remove soiling, by shampoo if necessary. Cover finished work with kraft paper or polyethylene until Substantial Completion.

DANFORTH ON HIGH – PORTLAND, MAINE

- I. At completion of job, remove protective paper, vacuum or shampoo again if required.

END OF SECTION

Product Specifications
PROVENANCE -- INFINITY RE MODULAR

MANNINGTON
COMMERCIAL

PHYSICAL CONSTRUCTION:

CONSTRUCTION:	Graphic Loop Pile
FACE FIBER:	Invista Antron Lumena Type 6,6 Four Hole, Hollow Filament Nylon, with Permanent Stain and Bleach Protection, Static Control, and Duratech Soil Resistant Treatment
DYE METHOD:	Solution
GAUGE:	1/10
STITCHES PER INCH:	11.3
PILE THICKNESS:	.101 Inches
TUFTED YARN WEIGHT:	18 Ounces Per Square Yard
DENSITY:	Average Density = 6,415; Weight Density = 115,485
PRIMARY BACKING:	100% Woven Synthetic
PRIMARY PRECOAT:	100% Non-Aqueous Closed Cell Polymer, Providing Lifetime Warranty Against Stain Wick-Back
SECONDARY BACKING:	Infinity RE Modular Reinforced Composite Closed Cell Polymer with Recycled Content
STANDARD SIZE:	24" X 24" Modular Tiles
INSTALLATION METHOD:	Brick Ashlar or Quarter-Turn; Other Methods at Owner's Discretion

ENVIRONMENTAL:

RECYCLED CONTENT:	Minimum 30% Total Recycled Content by Total Product Weight; Minimum 10% Post-Consumer Recycled Content by Total Product Weight*
MANUFACTURE LOCATION:	Calhoun, Georgia 30701 USA
NSF / ANSI-140 CERTIFICATION:	Platinum
CRI GREEN LABEL PLUS ID:	GLP7616

WARRANTIES:

WARRANTY:	Lifetime Limited Warranty, Including Face Wear, Moisture Barrier, Wick-Back, Delamination, Tuft Bind, Unraveling, and Static Protection
BLEACH RESISTANT WARRANTY:	ColorSafe with 15 Year Limited Warranty Against Color Loss from Bleach Spills
STAIN RESISTANT WARRANTY:	XGUARD with 15 Year Limited Warranty Against Staining

PRODUCT TESTING:

CRI TM101 APPEARANCE RATING:	Severe Traffic
RADIANT PANEL (ASTM E-648):	Class I (Direct Glue)
SMOKE CHAMBER (ASTM E-662):	Less than 450 (Flaming Mode)
METHENAMINE PILL TEST (ASTM D-2859):	Passes
DIMENSIONAL STABILTY AACHEN TEST:	Passes
ELECTROSTATIC PROPENSITY (AATCC 134):	Less than 3.0 KV

RECOMMENDED ADHESIVE:

RELEASEABLE ADHESIVE:	Mannington Infinity Pressure Sensitive Adhesive
CRI GREEN LABEL PLUS ID:	GLP70522
VOC LIMITS:	Meets SCAQMD Rule #1168
BOND WARRANTY:	Lifetime Limited Warranty When Used With Mannington Carpet

Specifications are subject to normal manufacturing variances. Specifications are subject to change without notice when technological advancements provide improved product performance.

* Most products contain a higher percentage of recycled content than the minimums listed above. Please contact Mannington Technical Services at 1-800-241-2262 for updated, specific recycled content percentages for each product.

Choices That Work

800 241 2262 manningtoncommercial.com

shaw contract group®

scholar II

performance broadloom specifications

style name	scholar II
style number	60641
construction	pattern loop
fiber	eco solution q® nylon
dye method	100% solution dyed

	english	metric
pattern repeat	none	
tufted weight	20.0	678.11 g/m ²
gauge	1/10	39.37 per 10cm
stitches per inch	7.5	29.53 per 10cm
finished pile thickness	0.108	2.74 mm
total thickness	0.264	6.71 mm
average density	6667	247.21 kg/m ³
product size	12 foot	3.66 m
primary backing	synthetic	
secondary backing	ecoworx® performance broadloom	
protective treatments	ssp® shaw soil protection	

testing

radiant panel	class I
nbs smoke	less than 450
electrostatic propensity	less than 3.5 kv

warranties

lifetime commercial limited

installation method

direct glue

coordinating products

environmental certification

green label plus certification number	glp 9968
nsf140 platinum	
cradle to cradle silver certified	



shawcontractgroup.com | 1 800.257.7429

Specifications are subject to nominal manufacturing variances. Material supply and/or manufacturing processes may necessitate changes without notice.

SECTION 09900

PAINTING

1. GENERAL

1.1 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.
- B. The extent of work shall be as shown on Drawings and called for in these Specifications. Performance shall meet the requirements of these Specifications. The work covered by this section of Specifications consists of the following:
 - 1. Painting or staining all interior and exterior surfaces as called for in the Finish Schedule on Drawings or in these Specifications.
 - 2. Painting interior walls, door trim, window trim, etc.
 - 3. Staining and varnishing rails as called for on Drawings.
 - 4. Painting all exterior doors as specified.
 - 5. Painting and finishing any other work requiring finishing left unfinished by others.
 - 6. Walls painted accent as called for on Drawings.
 - 7. Frames and exterior doors.
- C. Volatile Organic Compound (VOC) emissions from paints & coatings must not exceed the VOC limits of Green Seal's Standards GS-11 requirements.
 - 1. Non-flat: 150 g/l
 - 2. Flat: 50 g/l

NOTE: All colors to be selected by Architect. The Contractor shall submit to the Architect, for approval, color samples of stain finishes, See general Note Section 09250.

1.2 SUBMITTALS

- A. Issue submittals in accordance with Section 01300, Submittals.
- B. Submit as follows:
 - 1. Manufacturer's data, application instructions, and color chips on all specified products.

Danforth on High – Portland, Maine

2. Paint schedule covering all surfaces to be painted.
3. Contractor to provide 4' x 8' test panels in finished spaces for up to 3 trials for each required color selection. Test panel colors to be selected by Architect. Final color to be approved by Architect from test panels.
4. Provide as maintenance material, a minimum of one gallon of each type and color of paint used on job, in labeled and well-sealed containers, for future touch-up. Also provide typed list of each type and color of paint used on job, including name of distributor from whom paint may be obtained.

2. PRODUCTS

2.1 General

- A. Paint: Acceptable manufacturers, unless specific manufacturer is noted: California Products Corporation, Benjamin Moors, Pratt & Lambert, Sherwin-Williams, Tnemec.
- B. All products used shall be manufacturer's top quality product for each type of finish specified.

2.2 MATERIALS

- A. Where primer is called for, use primer recommended by manufacturer for particular combination of substrate and finish coat. Where painting over shop-applied primers, verify that finish paint proposed for field application is compatible with shop primers actually used.
- B. Exterior Doors: Steel-Clad: Benjamin Moore Ironclad Retardo
- C. All Gypsum Walls and Ceilings to be painted: Primer - Benjamin Moore Vinyl Latex Primer Sealer.
- D. Finish-Walls - Benjamin Moore Moorcraft Latex Eggshell.
- E. Finish Ceiling – Flat Ceiling White Latex
- F. Interior exposed softwood woodwork as noted on Drawings: One (1) coat Primer; two (2) finish coats Semigloss Latex. All Hardwood: three (3) coats urethane.
- G. Wood Door Frames & Trim, & Miscellaneous interior wood trim: Benjamin Moore Wood Primer and two (2) coats Latex Semigloss.
- H. Exterior Cement Board Clapboards & Trim – (2) coats latex exterior grade paint within 180 days of installation. Note: seal all cut edges.
- I. Interior garage gypsum board walls - alkyd primer and alkyd eggshell enamel.
- J. Exterior steel railings, balconies Sherwin Williams Alkyd Systems

Danforth on High – Portland, Maine

- K. Exterior AZEK trim, two (2) coats 100% acrylic latex, check with paint manufacturer for light reflectivity.

3. EXECUTION

3.1 JOB CONDITIONS

- A. Store materials in sealed containers. Provide a fire extinguisher in storage room. Remove flammable rags and waste from building at end of day.
- B. Do not perform exterior work in rain or when precipitation is forecast imminently; or in hot, dry, or windy weather which would cause finish to cure too rapidly, or be marred by windstorm dust; or at temperatures below 40 degrees F.
- C. Maintain temperature at interior locations between 50 and 75 degrees F, maximum 80 percent relative humidity, while paint is being applied. Provide adequate ventilation, by mechanical means if necessary, for drying of paint and prevention of condensation and mildew. Do not apply finish in areas in which dust is being generated.
- D. Protect finished surfaces and equipment not being painted with masking tape, canvas drop cloths, polyethylene sheets, etc. Items such as lighting switch covers, fixture canopies, and door handles shall be temporarily removed, carefully stored, and replaced after painting, or carefully covered during painting operations.

3.2 PREPARATION

- A. Preparation of newly-installed materials to receive finish painting is specified under those Sections installing materials. This includes, but is not necessarily limited to: touch-up of damaged shop coats; taping, sealing and sanding of drywall; patching masonry; sanding finish wood; and cleaning off grease, oil, dirt, mildew, factory-applied protective coatings, and other foreign materials.
- B. At wood surfaces to be painted, scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried. Caulk all interplay between wood trim, door frames and base boards with gyp board.
- C. Before beginning work under this Section, verify that preparation of substrates under other Sections has been done as specified. Thoroughly remove water, dirt, and dust with clean cloths, brooms, or brushes. Allow masonry mortar joints to cure as long as possible before beginning paint application, 7 days minimum, 28 days preferably.

3.3 APPLICATION

Danforth on High – Portland, Maine

- A. Apply all materials in accordance with the manufacturer's recommendations.
- B. Apply materials with suitable brushes, rollers, and spraying equipment. Keep application equipment clean, dry, and free from contaminants. Thoroughly stir materials before applying, and periodically during application.
- C. Rate and method of application and drying time between coats shall be strictly in accordance with manufacturer's recommendations.
- D. Prepare field test panels in accordance with paragraph 1.4-B.3 of this Section for each type and color of finish specified. Request review of first completed room, color scheme, special items, etc., which shall serve as project standard after approval.
- E. Touch-up shop applied primers before field painting.
- F. Do not apply first coat until surface is dry to touch. Moisture content of surface shall be within limitations recommended by paint manufacturer.
- G. Leave all parts of moldings and ornaments clean and true to detail, without excessive paint in corners and depressions. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping. Paint surfaces visible through grilles one coat flat black.
- H. Finish coats shall be smooth, free of brush marks, streaks, laps or pile-up of paint, and skipped or missed areas. Refinish whole wall if unacceptable finish is extensive or of such a nature that it cannot be repaired by normal touch-up.
- I. After completion of painting work, remove spilled or spattered paint. Touch-up and repair finishes damaged in any way by work under this Section. Protect finished surfaces.

3.4 Exterior

- A. Exterior and interior - Steel-Clad door: Two (2) coats exterior enamel over factory primer. Doors shall be laid flat if sprayed. Doors may be rolled or brushed in place, however with no visible brush marks, drips or imperfections.
- B. All exterior metal work (steel) to include railings, brackets, grids and deck.
 - a. Alkyd Systems
Gloss Finish
 - 1st Coat: S-W All surface Enamel Primer, A11w210
 - 2nd Coat: S-W All Surface Enamel, A11 Series
 - 3rd Coat: S-W All Surface Enamel, A11 Series
(4 mils wet, 1.6 mils dry per coat)

Danforth on High – Portland, Maine

- C. Cement clapboard two (2) coats latex.
- D. AZEK trim two (2) coats acrylic latex.

3.5 Interior

- A. Interior Painting: Paint shall be applied in the following number of coats, primer and finish. Tint all primers to match finish color.
 - 1. One (1) fully applied finish coat of even coverage. NOTE: Contractor to adequately cover M.R. (Blueboard) or other colored drywall by primer or finish coat as necessary to eliminate any visible "bleed through".
 - 2. Drywall: All interior walls to receive paint: one (1) coat latex base primer-sealer, two (2) finish coats latex eggshell. Ceiling: One (1) coat primer and two (2) coats latex flat.
- B. Interior Window Sill, Door Frames & Trim, and Miscellaneous Interior Wood Trim- one (1) coat primer and two (2) coats finish for all soft wood. Contractor to verify with construction manager as to window type.
- C. All hardwood to receive three (3) coats urethane. Apartment entry doors, three (3) coats urethane.
- D. Interior garage – Gyp-board Surfaces Only - One (1) coat alkyd primer and sealer. One (1) coat alkyd eggshell enamel.
- E. NOTE: Painting Contractor to verify that interior apartment doors are prefinished.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 10440

SIGNAGE

Part 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide products that meet or exceed the requirements of these specifications as manufactured by Welch Signage *and digital graphics*, 7 Lincoln Avenue, Scarborough, ME 04092. Phone (800) 635-3506 - Fax (800) 225-6859

2.2 SIGNAGE - GENERAL

- A. Provide all interior signage required by code. Provide numbers on all apartment doors. Note: One raised set at 5' 0" off finish floor and one set 18" off finish floor.

2.3 COMPLIANCE

- A. All signs must comply with the Americans with Disabilities Act including all conditions noted and all other requirements.
 1. **Sign Finish & Contrast** - The color selected for the character and symbols should be in marked contrast to the sign background. Characters and background must be matte or other non-glare finish.
 2. **Tactile & Braille** - Characters must be raised 1/32" and be accompanied by Grade II Braille.
 3. **Typestyle** - Characters must be uppercase and San Serif or simple Serif style. Directional and informational signs are allowed to include lower case letters. Characters must have width-to-height ratio of between 3:5 to 1:1. Characters must have a stroke to height ratio of 1:5 to 1:10.
 4. **Character Height** - Tactile characters height must be between 5/8" and 2", all caps. Characters on projected or overhead signs must be a minimum of 3" high. Characters on directional signs and informational signs must be sized appropriate or the viewing distance.
 5. **Pictograms** - Pictograms shall be accompanied by the equivalent written description placed directly below pictogram and be in a background area of at least 6" x 6".

2.4 SIGN TYPES

- A. Interior Panel Signs - Provide signs having the following characteristics:
 1. **Substrate:** Fabricate signs from 1/8 inch thick matte clear acrylic with edges mechanically and smoothly finished to eliminate cut marks. Background color to be subsurface.
 2. **Background Color:** Choose from - Colors to be selected by Architect from manufacturer's standards. Or custom color to be selected by Architect
 3. **Edges:** Straight
 4. **Corners:** Choose from - square or 3/8" radius
 5. **Size:** As indicated or if not indicated provide 6" x 6"
 6. **Copy:** Helvetica or as shown on drawings
 7. **Copy Color:** To be selected by Architect from manufacturer's standards

DANFORTH ON HIGH – PORTLAND, MAINE

8. **Letterform:** Apply 1/32" computer precision cut tactile copy. All uppercase, normal spacing, 5/8" minimum letter height. Tactile letters will be applied in a manner which avoids scoring of the sign's surface at base of tactile letters.
 9. **Braille:** Use engraved process for all Braille areas. Engrave Braille dots into surface of clear material.
- B. Message Insert Signs - Provide signs having the following characteristics:
1. **Substrate:** Fabricate signs from 1/8 inch thick matte clear acrylic with edges mechanically and smoothly finished to eliminate cut marks. Background color to be subsurface.
 2. **Assembly:** Sandwich two exact sized acrylic pieces with foam tape as dividers. Face plate to have clear windows for message inserts. (See drawings for details.)
 3. **Background Color:** Choose from -
Colors to be selected by Architect from manufacturer's standards.
Or custom color to be selected by Architect
 4. **Edges:** Straight
 5. **Corners:** Choose from - square or 3/8" radius
 6. **Size:** As indicated or if not indicated provide 6" x 6"
 7. **Copy:** Helvetica or as shown on drawings
 8. **Copy Color:** To be selected by Architect from manufacturer's standards
 9. **Letterform:** Apply 1/32" computer precision cut tactile copy. All uppercase, normal spacing, 5/8" minimum letter height. Tactile letters will be applied in a manner which avoids scoring of the sign's surface at base of tactile letters.
 10. **Braille:** Use engraved process for all Braille areas. Engraved Braille dots into surface of clear material.

SECTION 10550

POSTAL SPECIALTIES (MAILBOXES)

1. GENERAL

1.1 DESCRIPTION OF WORK

- A. Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.
- B. The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the items listed as indicated on Drawings.

2. PRODUCTS:

- 2.1 Mailboxes shall be manufactured by Auth – Florence 1400 Series, black, front loading, installed to Postal Regulations. Provide for twenty-six (26) mailboxes. Refer to Drawings for configurations per building.
- 2.2 The lock on each compartment door shall be keyed to the resident's door. It shall be a pin tumbler type with spring bolt. Provide Locking Device 2090. Provide a "Key Keeper" by entry door for mailman.

3. EXECUTION:

- 3.1 Mailboxes shall be framed into wall as shown on drawings. Care shall be taken to insure tight fit and that Vertical Placement (Ht. to boxes) meets Postal Regulations. Properly secure, block and align unit as shown in manufacturer's installation guidelines. All work shall be done in first-class manner insuring high-grade finish.
- 3.2 NOTE: The Contractor shall submit drawings on every item specified in this section. There shall be no substitutions without a written explanation from the subcontractor that the specific item is equal with the item specified by the Architect. All substitutions shall be approved by the Architect and the Owner.

END OF SECTION

SECTION 10800

TOILET AND BATH ACCESSORIES

1. GENERAL
 - 1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.
 - 1.2 DESCRIPTION OF WORK: The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the items listed as indicated on Drawings.
2. PRODUCTS:
 - 2.1 TOWEL BARS AND TOILET PAPER HOLDERS: shall be Taymor. Toilet Paper 01-9409, Towel Bar 01-9400 Series (size as shown on drawings), Stainless Steel Towel Bar with polished chrome finish.
 - 2.2 SOAP DISH: shall be integral with sink.
 - 2.3 DOUBLE HOOK FOR BATHROOM DOOR: shall be equal to Taymor 01-9402.
 - 2.4 SHOWER CURTAIN ROD: Rod shall be equal to Taymor 01-9500SS (sized to fit as shown on drawings). Rod Flange shall be polished chrome Taymor 01-9661. Curtains are not included.
 - 2.5 GRAB BARS: Stainless steel, 1 ¼ " diameter, concealed mounting with snap flange, satin finish; Bobrick B-5806 Series, lengths as shown on drawings.
 - 2.6 ALL APARTMENT UNITS: Surface Mounted Medicine Cabinet: NuTone Specialty Cabinet with integrated light 555IL stainless steel.
 - 2.7 **NOTE:** Blocking for all accessories and grab bars must be provided. See Section 06100 - Rough Carpentry.
 - 2.8 **NOTE:** The contractor shall submit shop drawings on every item specified in this section. There shall be no substitutions without a written explanation from the subcontractor that the specified item is equal with the item specified by the architect. All substitutions shall be approved by the Architect and the Owner.
 - 2.9 **HARDWARE:** Provide cabinet door and drawer pulls to meet "Amerock" Hardware type BP1950-26D, or equal. Substitutions must be approved by Architect.
3. EXECUTION:
 - 3.1 All work shall be done by experienced craftsmen in first-class manner and high-grade finish.
 - 3.2 All installations shall be in accordance with layout shown on plans and in strict conformity with the manufacturer's recommendations and secured into blocking or other framing with screws of adequate length and size to properly support accessories. Grab bars must be able to sustain a 300# direct load pulling down or out on it.

END OF SECTION

SECTION 11450

RESIDENTIAL EQUIPMENT AND KITCHENS

1. GENERAL:

1.1 REFERENCES

- A. Drawings and general provisions on Contract, including General Conditions and Division 1 specifications, apply to work in this section.
- B. Rough Carpentry: Section 06100
- C. Finish Carpentry: Section 06200
- D. Gypsum Drywall: Section 09250

1.2 DESCRIPTION OF WORK

- A. The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the following items as indicated on Drawings.
- B. Kitchen Cabinets - wall hung and base and countertops according to layout on drawings.
- C. Bathroom Vanities and Countertops
- D. Refrigerator
- E. Kitchen Ranges and Range Hoods
- F. Plastic Laminate on wall adjacent to range.

1.3 SUBMITTALS

- A. Submit manufacturer's product data and installation recommendations for all specified products.
- B. Architect reserves the right to require samples of all products to be submitted. Acceptable samples will be returned and may be used in the work.
- C. Submittals for countertops shall be in accordance with Section 06200, Finish Carpentry.

DANFORTH ON HIGH – PORTLAND, MAINE

2. PRODUCTS

2.1 Kitchen Cabinets:

- A. Shall be of wood construction, with wood finished reverse beveled doors, self closing hinges, adjustable shelves, dual tracks for drawers with nylon guides.
- B. Cabinets to be Extreme Series by Armstrong. Countertops to be postform plastic laminate. Cabinet front panels to be Coronet Series by Armstrong. Kitchen counter tops to be rounded edge preformed plastic laminate color by Architect.

2.2 Bathroom Vanities: shall be equal to "Oasis Marble Tops" with built in bowl available through FW Webb Co. (207) 784-4575. Coordinate with plumber for drilling holes to receive faucet. Base cabinet to be "Extreme" Series by Armstrong.

2.3 Unit Refrigerator shall be Kenmore Model #46-61752, Energy Star, frost free, refrigerator-freezer, 17 cu. Ft, white.

2.4 Unit Kitchen Range to be; Kenmore Model #22-96002, white, self clean, radiant. Handicap units Kitchen Range to be Kenmore Model # 22-46582, slide in, up front controls, white, self clean, coil. Range cords, (43) #22-49614 3 wire, 50 amp, 4 feet.

3. EXECUTION:

3.1 INSTALLATION

- A. All installation shall be done in a quality first-class manner according to Drawings and layouts shown, and shall be according to manufacturer's recommendations.
- B. Kitchen cabinets and vanities: shall be installed by experienced cabinet installers in a craftsmanlike manner, as though this were really "cabinets". Securely screw cabinets to blocking in the walls. Blocking shall be in place at top and bottom of wall and base cabinets (see Rough Carpentry Sec. 06100), and screws shall be long enough to penetrate blocking 1-1/4" minimum. Cabinets shall be level and plumb. If leveling cabinets puts them visually out of line with other elements (wall line, window sill, door casing, etc.) Architect shall be notified. Countertops shall be tight to the wall and joints caulked. Cabinets shall be tight to each other and in line. All doors and drawers to open freely. Work shall be left clean and right.
- C. Refrigerators and ranges: Shall be set in place properly hooked up and leveled. Ranges to be installed with tip over clips.
- D. Range hoods shall be new secured in place by means of screws hidden from view.
- E. The contractor shall check and make necessary adjustments to insure that all installed items operate faultlessly.

DANFORTH ON HIGH – PORTLAND, MAINE

- F. Touch up any dings, scratches or other marks with color matching original.
- G. Contractor to coordinate installation of items in this Section with that of related mechanical trades: 15000 Plumbing and HVAC; 16000 Electrical.
- H. All work under this SECTION shall be guaranteed to the Owner IN WRITING for a period of at least one (1) year. Appliance Warranty and Operation Manuals to be provided to Owner with typed listing of appliance # correlated to Apt. #.
- I. Note, removable accessible cabinet fronts and finishes, refer to drawings for details. Contractor shall provide a mockup/sample of one (1) removable accessible cabinet front for Architect's approval prior to fabrication of full run cabinets.

END OF SECTION

Bike Trac Parking System

Item 116-1039 Mounting Instructions

Mounting Bike Trac

Bike Trac can be mounted to any wall, corner, pillar, or post strong enough to hold the bikes. Each unit comes with two pan head screws which work for mounting the Bike Trac to wooden studs. If mounting to any other surface consult your local hardware store for applicable hardware. Use mounting holes as shown in illustration. **Note:** *To protect wheel, slide rubber sleeve onto wheel hook of Bike Trac.*

Bike Trac Placement

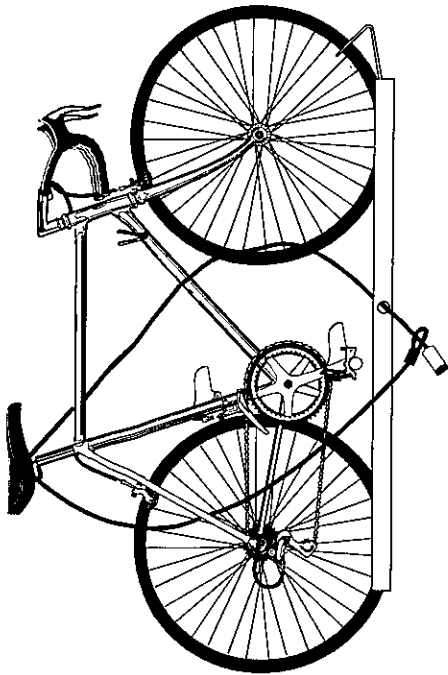
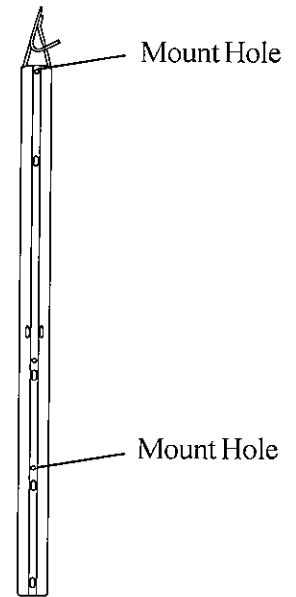
Option 1: Stagger tops of the Bike Tracs (High, Low, High).

Approx. space between each 12-15".

Option 2: Level tops of Bike Tracs, hanging every other bike by rear tire. Approx. space between each 15-18".

Option 3: Level tops of Bike Tracs, hanging all bikes by front tire. Approx. space between each 18-21".

Note: Be sure to leave enough room between each Bike Trac so that the bike's handlebars do not interfere with each other. Optimum distance between Tracs will depend on make and model of bike.



Locking Bike To Bike Trac (Item 116-1035)

In most cases the locking cable is long enough to thread through your seat, frame, front and rear wheel. Thread cable through desired parts of the bicycle and then pass the metal end of the cable through the hole punched into the Bike Trac. **Note:** *Locking cable is only a intended to be a theft deterrent. Loss of bicycle is not covered under warranty.*

Parts List

<u>Qty</u>	<u>Description</u>
1	Bike Trac Assembly
2	5/16" Washer
2	1" Slotted Pan Head Screw
1	Wheel Hook Rubber Sleeve

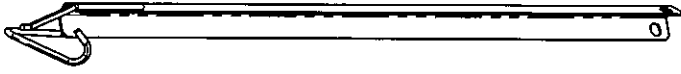
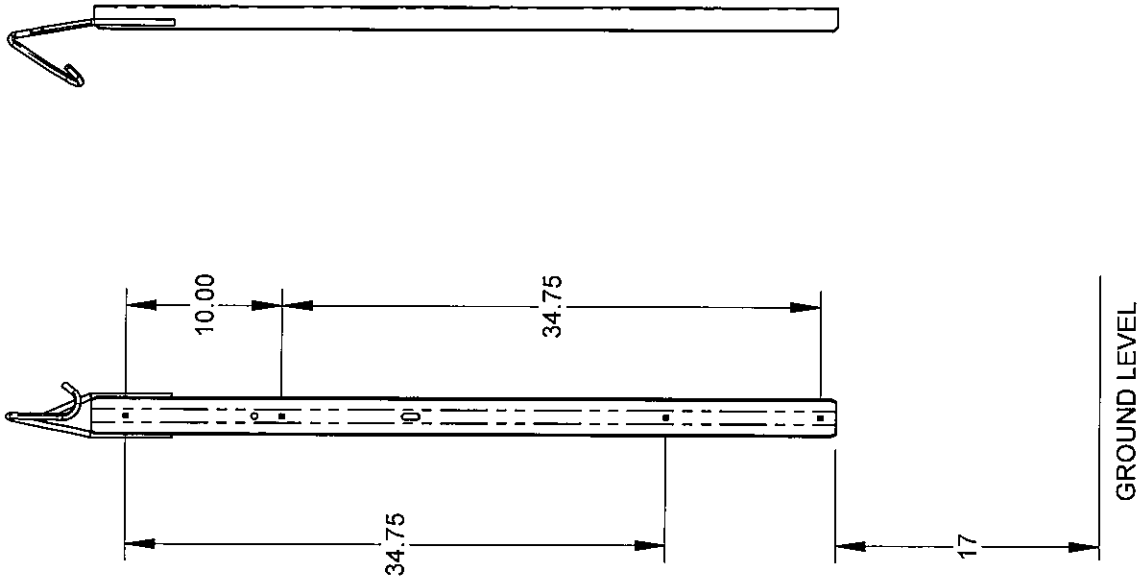
Locking Model Only (116-1035)

<u>Qty</u>	<u>Description</u>
1	Locking Cable

HIGHLAND
PRODUCTS GROUP LLC

3350 NW Boca Raton Blvd., Suite B2 Boca Raton, FL, 33431
Phone: 561.620.7878 Fax: 561.620.8668

Specifications for Item 116-1039



NOTE:

1. DO NOT SCALE DRAWING.
2. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.



3350 NW Boca Raton Blvd., Suite B2 Boca Raton, FL, 33431
Phone: 561.620.7878 Fax: 561.620.8668

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 12500

WINDOW TREATMENT

1. GENERAL:

1.1 REFERENCES: Drawings and general provisions of Contract, including General Conditions and Division 1 specifications, apply to work in this section.

1.2 DESCRIPTION: The extent of work shall be as shown on Drawings and called for in these Specifications. The work under this section of Specifications includes furnishing and installing the following items:

A. Shades for each window in residential units as described.

1.3 SUBMITTALS: Contractor to submit product data on shades and blinds

2. PRODUCTS:

2.1 Window shades: Black-Out Shade

A. 12 oz. 4-ply opaque darkening shade available from Reo Window Shade Company, Portland, Maine (207) 773-7992.

1. Construction – 4- Ply fiberglass (1 ply fiberglass, 3 ply vinyl)

REQUIREMENTS	521-E FEDERAL SPECS	BUTLER 4-Ply Opaque
Finished weight – oz/sq		12.0
Breaking strength – lbs. in.	Warp 130 Fill 120	meets/ or exceed meets/ or exceed
	2. Flame Resistance (U.S. Government Specification CCC-C 521E and NFPA 701 Small Scale)	
After Flame Seconds	Warp 2.0 Fill 2.0	meets/ or exceed meets/ or exceed
Char Length Inches	Warp 4.0 Fill 4.0	meets/ or exceed meets/ or exceed
		No evidence of holes, breaking or cracking

DANFORTH ON HIGH – PORTLAND, MAINE

Adhesion

Vinyl Films Inseparable

Meets Federal Spec. CCC-C521E

2.2 Spring wood rollers to be pine 1" for up to 46" wide 1 ¼" for over 46" wide.

3. EXECUTION:

- 3.1 All work to be done by experienced craftsman in first-class manner and high-grade finish. All installations shall be in accordance with layout shown on plans and in strict conformity with the manufacturer's recommendations.
- 3.2 Window Shade holding hardware shall be installed to provide level and secure system for attaching window shade and rods. Work shall be free of dents, dings and other damage to finish (paint, etc.) and clean.
- 3.3 Solid backing is required for all window treatment hardware. Hardware attached otherwise will not be acceptable.
- 3.4 The Contractor shall furnish all wood blocking within wall, filler pieces, angles, mouldings and other finish items necessary for complete installation of the equipment.
- 3.5 The Contractor shall check and make necessary adjustments to insure that all installed items operate faultlessly.

END OF SECTION

SECTION 14200

ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric Traction elevators.

1.02 RELATED SECTIONS

A. Section 015000 - Temporary Facilities and Controls

B. Section 033000 - Cast-in-Place Concrete:

C. Section 042000 - Unit Masonry

D. Section 055000 - Metal Fabrications

E. Section 071600 - Cementitious Waterproofing

F. Section 230000 - Heating, Ventilating, and Air Conditioning

G. Section 260000 - Electrical

H. Section 263000 - Electric Power Generating and Storing Equipment

I. Section 273000 - Voice Communications

J. Section 283100 - Fire Detection and Alarm

K. Section 310000 - Earthwork

1.03 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION:

A. Hoist Beam

1.04 PRODUCTS SUPPLIED AND INSTALLED UNDER THIS SECTION:

A. Pit ladder

1.05 WORK SUPPLIED UNDER OTHER SECTIONS:

A. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.

B. Hoistway ventilation shall be in accordance with local and national building code requirements.

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
- D. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
- E. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
- F. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.
- G. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.
- H. Access Doors: As required for access to mechanical brake release. Access door shall be self-closing, self-locking if necessary and operable from the inside without a key.

1.06 RELATED SECTIONS

- A. Section 015000 - Temporary Facilities and Controls
- B. Section 033000 - Cast-in-Place Concrete
- C. Section 042000 - Unit Masonry
- D. Section 055000 - Metal Fabrications
- E. Section 071600 - Cementitious Waterproofing
- F. Section 230000 - Heating, Ventilating, and Air Conditioning
- G. Section 260000 - Electrical
- H. Section 263000 - Electric Power Generating and Storing Equipment
- I. Section 273000 - Voice Communications
- J. Section 283100 - Fire Detection and Alarm
- K. Section 310000 – Earthwork

1.07 REFERENCES

- A. Industry and government standards referenced include the following:
 - 1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
 - 2. ADAAG - Accessibility Guidelines for Buildings and Facilities
 - 3. ANSI/NFPA 70, National Electrical Code
 - 4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
 - 5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.08 PERFORMANCE REQUIREMENTS

- A. Car Performance

DANFORTH ON HIGH – PORTLAND, MAINE

1. Car Speed \pm 5% of contract speed under any loading condition or direction of travel.
2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.

B. System Performance

1. Vertical Vibration (maximum): 25 mg
2. Horizontal Vibration (maximum): 25 mg
3. Jerk Rate (maximum): 1.3 ft. /sec³
4. Acceleration (maximum) 1.3 ft. /sec²
5. In Car Noise: \leq 55 dB (A)
6. Leveling Accuracy: \pm 0.2 inches
7. Starts per hour (maximum): 120

1.09 SUBMITTALS

A. Conform to requirements of Section 013300 Submittal Procedures and Section 017800 Closeout Submittals

B. Product Data: Submit manufacturer's product literature for each proposed system.

1. Cab design, dimension and layout
2. Layout, finishes, and accessories and available options.
3. System capacity and performance.
4. Controls, signals and operating system.
5. Color selection charts for cab and entrances.

C. Shop Drawings:

1. Clearances and travel of car.
2. Clear inside hoistway and pit dimensions.
3. Location and layout of equipment and signals.
4. Car, guide rails, buffers and other components in hoistway.
5. Maximum rail bracket spacing.
6. Maximum loads imposed on building structure.
7. Hoist beam requirements.
8. Location and sizes of access doors.
9. Location and details of hoistway door and frames.
10. Electrical characteristics and connection requirements.

D. Closeout Submittals:

1. Two sets of manufacturer's standard operation and maintenance information; provide in CD format.
2. Inspection certificates and permits.
3. Standard manufacturer warranty

DANFORTH ON HIGH – PORTLAND, MAINE

1.10 QUALITY ASSURANCE

- A. Manufacturer: Shall have a minimum of 10 years' experience in the fabrication, installation and service of elevators. Manufacturer shall be ISO 9001 certified, and have a documented quality assurance program.
- B. Installer: Elevator shall be installed by the manufacturer, or a manufacturer recommended installer with a minimum 5 years' experience in the installation and service of traction elevators.
- C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.
- D. Prior to beginning work of this Section, attend a pre-installation meeting. Owner, Design Professional, and contractors with adjacent or related work shall attend.

1.11 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of elevator material throughout construction. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the General Contractor shall be responsible to provide a safe, dry, and easily accessible storage area on or off the premises. Additional labor costs for double handling will be the responsibility of the general contractor.
- B. Store elevator materials in protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet per elevator is required adjacent to the hoistway at the main egress landing.

1.12 WARRANTY

- A. Provide Manufacturer warranty for a period of 12 months. Warranty period to begin upon final acceptance of elevator work and turnover into operation. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect does not constitute defective material or workmanship.

1.13 MAINTENANCE SERVICE

- A. Provide maintenance service consisting of examinations and adjustments of the elevator equipment for a period of 12 months after final acceptance of elevator work and turnover into operation.
- B. Maintenance service shall be provided by elevator manufacturer recommended service personnel. Manufacturer recommended parts and supplies shall be used in maintenance service as in the original manufacture and installation.
- C. Maintenance service be performed during regular working hours of regular working days and shall include call back service during regular working hours.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification, including nonproprietary controls and technology. Elevator manufacturers may include but are not limited to one of the following:

1. Basis of Design: EcoSpace™ traction elevators by KONE, Inc. (www.kone.com).

2.02 MATERIALS

A. Steel

1. Sheet steel for Exposed Work: Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.
2. Sheet Steel for Unexposed Work: Hot-rolled, commercial-quality carbon steel, pickled and oiled, complying with ASTM A569.
3. Structural Steel Shapes and Plates: ASTM A36 and AISI 1018.

- B. Stainless Steel: Type 300 Series complying with ASTM A167, with standard tempers and hardness required for fabrication, strength and durability.

1. Supply with mechanical finish on fabricated work in the location shown or specified with texture and reflectivity required (Federal and NAAMM nomenclature). Protect with adhesive plastic film or paper covering.
2. All finishes specified as "satin" to be manufacturer's standard directional polish that complies with commercial NO.4 requirements.
3. Material may vary per specification.

- C. Aluminum: Extrusions per ASTM 8221; sheet and plate per ASTM 8209.

- D. Plastic Laminate: ASTM E84 Class A and NEMA LD3, 0-1/20" (1.3 mm) up to 0-1/16" (1.6 mm) nominal thickness. Exposed surfaces to have color selected by architect from manufacturer's standard selection.

- E. Fire-Retardant Treated Particleboard Panels: Minimum 0-1/2" (13 mm) thick backup for plastic laminate veneered panels, provided with suitable anti-warp backing; to meet ASTM E84 Class "A" rating with flame-spread rating of 25 or less.

DANFORTH ON HIGH – PORTLAND, MAINE

F. Paint:

1. Concealed Steel and Iron: Clean metal of oil, grease, scale and other foreign matter and paint one shop coat of manufacturer's standard rust-resistant primer. Galvanized metal need not be painted.
2. Exposed Steel: Clean exposed metal of oil, grease, scale and other foreign matter. Eliminate any dents, scratches, or other defects that would affect the final finish. For material delivered with primer coat only, apply enamel primer. For material delivered with a finish coat, apply two coats enamel.

2.03 EQUIPMENT: CONTROL COMPONENTS

- A. Controller: Provide microcomputer based control system to perform all of the functions. The system shall also perform car and group operational control.
1. All high voltage (11 OV or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
 2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
 3. Provide a serial card rack and main CPU board containing a non-erasable EPROM and operating system firmware.
 4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.
- B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.
- C. Controller Location:
Controller shall be located in a control room within 10'-0" of the hoistway at any landing.

2.04 EQUIPMENT: HOISTWAY COMPONENTS

- A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.
- B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.
- C. Buffers, Car and Counterweight: Polyurethane buffer.
- D. Hoistway Operating Devices:
1. Emergency stop switch in the pit
 2. Terminal stopping switches.

DANFORTH ON HIGH – PORTLAND, MAINE

3. Emergency stop switch on the machine

- E. Positioning System: System consisting of magnets and proximity switches.
- F. Guide Rails and Attachments: Steel rails with brackets and fasteners. Side counterweight arrangements to have a dual-purposed bracket that combines one car rail with one counterweight rail on the machine side. Additional bracket supports the other counterweight rail on the machine side and a separate bracket supports the other car rail opposite the machine.
- G. Governor Rope: Provide 3/8-inch diameter steel cable governor rope minimum eight strands wound about a sisal core center.
- H. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.

2.05 HOISTWAY ENTRANCES

- A. Sills: extruded aluminum
- B. Doors: Hollow metal construction with vertical internal channel reinforcements.
- C. Fire Rating: Entrance frames and doors shall be UL fire-rated for 1-1/2 hour.
- D. Entrance finish:
Powder Paint, color as selected from manufacturer's standard selection
- E. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plates shall be surface mount mounted. Plate finish to match surface mount.

2.06 EQUIPMENT: CAR COMPONENTS

- A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.
- B. Platform: Platform shall be all steel construction.
- C. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.
- D. Load weighing device shall be strain gauge type mounted to dead-end hitch attached atop the hoistway guide-rail.
- E. Steel Cab

- 1. Car Wall finish:

DANFORTH ON HIGH – PORTLAND, MAINE

Non-removable vertical panels, plastic laminate selected from manufacturer's standard selection

2. Car Front Finish: Brushed stainless steel.
3. Car Door Finish: Brushed stainless steel.
4. Ceiling:
KONE "LF88" - Suspended ceiling shall consist of panels finished in brushed stainless steel with round holes for LED downlights.
5. Handrail:
Handrail to be located on car enclosure.
6. Flooring: By others.
7. Threshold: Aluminum
8. Protective pad hooks and fire retardant protective pads are to be provided for side & rear walls.

F. Emergency Car Signals

1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.
2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

G. Ventilation: Provide single-speed fan

2.07 EQUIPMENT: SIGNAL DEVICES AND FIXTURES – KONE KSS 140 Vandal Series

- A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation.
 1. Provide integral car operating panel. Panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan (if provided). Buttons have amber illumination (halo) and shall be flat flush. All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be a 7-segment amber display. All texts, when illuminated, shall be amber. The car operating panel shall have a brushed stainless steel finish.
 2. Additional features of car operating panel shall include:
 - a. Car Position Indicator within operating panel (amber).
 - b. Elevator Data Plate marked with elevator capacity and car number on car top.
 - c. In car stop switch per local code.
 - d. Firefighter's hat.

DANFORTH ON HIGH – PORTLAND, MAINE

- e. Firefighter's cabinet containing firefighters Phase /I emergency in-car operating instructions, Phase /I key switch, and call cancel button.
 - f. Help Button/Communicator: Activation of help button will initiate two-way communication between car and a 24-hr answering service, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
- B. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall have a brushed stainless steel finish.
- 1. Hall fixtures shall feature round, mechanical, buttons in applied mount face frame. Hall fixtures shall correspond to options available from that landing. Buttons shall be flat flush in vertically mounted fixture. If provided, hall lanterns and hall indicators shall be illuminated by means of amber illumination.
 - 2. Access key switch at top floor and lowest floor in entrance jamb.

2.08 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation: Simple Collective Operations: Using a microprocessor-based controller, the operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

B. Standard Operating Features to include:

- 1. Full Collective Operation
- 2. Light Control.
- 3. Fan Control
- 4. Load weighing Bypass.
- 5. Ascending Car Uncontrolled Movement Protection
- 6. Top of Car Inspection Station.

C. Additional Operating Features to include:

- 1. Hoistway Access Bottom Landing
- 2. Hoistway Access Top Landing
- 3. Independent Service
- 4. Automatic Standby Power Operation with Manual Override. This operation shall return each car automatically to a designated landing when the system is initially switched to standby power. Preference is given to loaded cars. Manual Override of Standby Power Operation is achieved by a manual input for each car via a rotary selector, individual key switch for each car switch. A manually selected car may be run either in a return operation to a designated landing or in normal operation under standby power. If a manually selected car has not yet returned to the designated landing, it will perform this operation first then immediately go into normal operation

D. Elevator Control System for Inspections and Emergency

- 1. Provide devices within controller to run the elevator in inspection operation.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Provide devices on car top to run the elevator in inspection operation
3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
7. Provide the means for the control to reset elevator earthquake operation.

2.09 EQUIPMENT: DOOR OPERATOR AND CONTROL

- A. Door Operator: A closed loop permanent magnet VWF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electromechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
- B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.
- C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
- D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.
- E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 - EXECUTION

3.01 EXAMINATION

DANFORTH ON HIGH – PORTLAND, MAINE

- A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.
- B. Do not proceed with work until unsatisfactory conditions are corrected
- C. Prior to start of Work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.
- D. Prior to start of Work, verify projections greater than 2 inches (4 inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less than 75 degrees from horizontal.
- E. Prior to start of Work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- F. Prior to start of Work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
- G. Prior to start of Work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including Sleeves and penetrations.
- H. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.02 PREPARATION

- A. Coordinate installation of anchors, bearing plates, brackets and other related Accessories

3.03 INSTALLATION

- A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.
- B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.
- C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.
- D. Lubricate operating system components in accordance with manufacturer recommendations.

DANFORTH ON HIGH – PORTLAND, MAINE

- E. Perform final adjustments and necessary service prior to substantial completion

3.04 CONSTRUCTION

- A. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
- B. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
- C. Ensure adequate support for entrance attachment points at all landings.
- D. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.
- E. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
- F. Coordinate interface of elevators and fire alarm system.
- G. Coordinate interface of dedicated telephone line for each elevator.

3.05 TESTING AND INSPECTIONS

- A. Perform recommended and required testing in accordance with authority having jurisdiction.
- B. Obtain required permits and provide originals to Owner's Representative.

3.06 DEMONSTRATION

- A. Prior to substantial completion, instruct Owner's Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures

3.07 SCHEDULE OF ELEVATOR EQUIPMENT

- A. Elevator Equipment: EcoSpace™ gearless traction elevator
- B. Equipment Control: Microprocessor KCM831 control system
- C. Quantity & Elevator Number: 1
- D. Number of Stops: 3
- E. Openings: 3 Front / 0 Rear
- F. Rise: 30'-8 ¾"

DANFORTH ON HIGH – PORTLAND, MAINE

- G. Rated Capacity: 2500#
- H. Rated Speed: 150 fpm
- I. Clear Inside Dimensions 6'-8" x 4'-3"
- J. Cab Height: 8'-0"
- K. Clear height under suspended ceiling: 7'-3"
- L. Entrance Width & Type: 3'-6"; Single speed side opening
- M. Entrance Height: 7'-0"
- N. Main Power Supply: 208 Volts + 5%, three-phase
- O. Operation: Simplex Collective Operation
- P. Machine Location: Mounted on car guide rail
- Q. Elevator Equipment shall conform to the requirements of seismic zone: 2

END OF SECTION

**SECTION 15400
PLUMBING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings, Addenda, General Provisions of Contract, including General and Supplementary conditions and General Requirements apply to work specified in this Section.

1.02 DEFINITIONS

- A. ADA: Designed to meet the requirements of the Americans with Disabilities Act.
- B. Adaptable: Designed so in the future it can be easily adapted to meet most of the essential requirements of the Americans with Disabilities Act with minor additions and adjustments, such as change of height of counter or addition of a lift seat.
- C. Concealed: Shall mean in walls, in chases, above ceilings, within enclosed cabinets, otherwise enclosed.
- D. Equal: Shall mean essentially the same as that product specified, but a model of a different manufacturer
- E. Exposed: Shall mean in finished spaces, in closets, under counters, behind and/or under equipment and/or otherwise visible.
- F. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- G. Materials: Shall mean any product used in the construction, including but not limited to: fixtures, equipment, piping and supplies.
- H. Others: Shall mean provided by sections other than this section. If not purposely assumed by another section, shall be provided by the Contractor.
- I. Piping: Shall mean pipe, fittings, hangers and valves.
- J. Provide: Shall mean the furnishing and installing of materials.
- K. Reviewed equal: Shall mean that the Architect or a designated Consultant, not the contractor, shall make final determination whether materials are an equal to that which is specified.
- L. Substitution: Shall mean of materials of significantly different physical, structural or electrical requirements, performance, dimensions, function, maintenance, quality or durability, than that specified.

DANFORTH ON HIGH – PORTLAND, MAINE

1.03 ALTERNATES

There are NO alternates that apply to this section of the project.

1.04 DESCRIPTION OF WORK

A. Work Included

1. Furnish all labor, materials, equipment, transportation, and perform all operations required to install complete plumbing systems in the building, in accordance with these specifications and applicable drawings.
2. Provide the following:
 - a. Sanitary, waste and vent systems.
 - b. Domestic hot and cold water system.
 - c. Fuel gas system.
 - d. Pipe, valve and fittings
 - e. Water specialties
 - f. Drainage specialties
 - g. Circulating pumps
 - h. Sump pump
 - i. Plumbing fixtures and accessories
 - j. Insulation
 - k. Installation and/or connections to fixtures/equipment provided by others.
3. Specifications and accompanying drawings do not indicate every detail of pipe, valves, fittings, hangers, fixtures and equipment necessary for complete installation; but are provided to show general arrangement and extent of work to be performed.

1.05 PERMITS

- A. This Contractor shall be responsible for providing and filing all Plans, Specifications and other documents, pay all requisite fees and secure all permits, inspections and approvals necessary for the legal installation and operation of the systems and/or equipment furnished under this Section of the Specifications.
- B. The Contractor shall frame under glass/ clear plastic all permits, secured by him, adjacent to the respective system and/or equipment and required to be displayed by Code, law or ordinance. Those permits secured but not required to be displayed shall be laminated in plastic and included in the Owner's maintenance manual.

1.06 CODES AND ORDINANCES

- A. All work performed under this Section of the Specifications shall be done in accordance with applicable Federal Laws, Maine State Laws, Uniform Plumbing Code, Subsurface Wastewater Disposal Rules, and local plumbing codes and ordinances. The following standards are also to be followed when applicable:

ADA	Americans With Disabilities Act
ANSI	American National Standards Institute

DANFORTH ON HIGH – PORTLAND, MAINE

ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
BOCA	Building Officials & Code Administrators International, Inc.
NFPA	National Fire Protection Association (a.k.a. NFC, National Fire code)
NEMA	National Electrical Manufacturer's Association
OSHA	Occupational Safety and Health Act
UL	Underwriter's Laboratories

- B. If an obsolete code section or standard is specified, the latest replacement issue of each Code or standard for the application, in effect at the time of bidding, shall be used. Code requirements are the minimum quality and/or performance acceptable. Where the Specifications and/or Drawings indicate more stringent requirements, these requirements shall govern.

1.07 QUALITY ASSURANCE

- A. Use sufficient qualified workmen and competent supervisors in execution of this portion of the work to ensure proper and adequate installation of the system throughout. Work performed shall conform to manufacturers' recommendations, good standard practice and industry standards.
- B. Technical training of workmen installing the systems specified, by the systems manufacturer, shall be mandatory prior to commencement of work. Documentation of such certification shall be made available to the Architect upon request within 5 business days
- C. Any work deemed unacceptable by the Engineer, Architect or Clerk of the Works shall be redone correctly, at no additional cost to the owner.

1.08 ELECTRONIC DRAWINGS AND FILE SHARING

Plans and specifications may be made available in electronic format on request. Plans may be provided in either Adobe (.pdf) or CAD (.dwg or .dxf) formats and will be compressed using WinZip (.zip format). Recipient is responsible to obtain the necessary software to open the files. Note: CAD drawings will be made available to successful bidders only after a contract is awarded.

CAD drawings are produced with AutoCAD 2006 and may be provided in either the 2000 or 2004 file formats. Upon request for CAD files a release form will be provided which must be signed and returned to the Engineer prior to transmission of electronic files. Physical mailing address, telephone numbers and e-mail address for this office are indicated on each drawing. A signed release will not be required for Adobe based files.

All contract documents are copyrighted material. No portion of materials may be reproduced or duplicated except as indicated in the release form. Where release forms are not required (Adobe based files), materials may be printed for use by the intended recipient only and may not be reproduced or copied in any other manner unless written permission is obtained.

1.09 MATERIALS AND SUBSTITUTIONS

All materials and equipment shall be new and of the latest design of respective manufacturers. All materials and equipment of the same classification shall be the product of the same manufacturer, unless specified otherwise.

- A. Any proposal for substitution of Plumbing equipment shall be made in writing PRIOR TO OPENING OF BIDS. Submit full details for consideration and obtain written approval of the Architect. The phrase "or approved equal" shall be intended to mean that the Architect, not the contractor, shall make final determination whether or not substitute materials are an equal to that which is specified. The contractor shall be responsible to certify within his submittals that any equipment to be considered as an "approved equal" meets or exceeds the requirements of this specification in all aspects and will physically fit within the space provided and still provide adequate space adjacent to the equipment for service. If requested by the Architect the contractor shall provide said certification in the form of scale drawings before review will be made. Architect will not be responsible to provide drawings for substituted materials unless the substitution is agreed upon prior to opening of bids. Architect's decision on acceptability of substitute materials shall be final.
- B. Approval by Architect for such substitution shall not relieve the Plumbing Contractor from responsibility for a satisfactory installation and shall not affect his guarantee covering all parts of work
- C. Any material or equipment submitted for approval which are arranged differently or is/are of different physical size from that shown or specified shall be accompanied by shop drawings indicating different arrangements of size and method of making the various connections to equipment. Final results will be compatible with system as designed.
- D. Materials and equipment determined as an "approved equal" and /or substitutions must meet the same construction standards, capacities, code compliances, etc. as the equipment (i.e. manufacturer, model, etc.) specified.
- E. Any additional cost resulting from the substitution of equipment shall be paid by this Contractor.

1.10 PLANS AND SPECIFICATIONS FOR SUPPLIERS

This Contractor shall provide his Suppliers, and any related subcontractors, with a copy of the specification pages, and letter sized photocopies of equipment details and schedules, that pertain to the item to be supplied.

1.11 SHOP DRAWINGS & SUBMITTALS

- A. As soon as possible after award of Contract (but not longer than 21 calendar days), before any material or equipment is purchased, Plumbing Contractor shall submit to the Architect no less than ten (10) copies of shop drawings for approval. If shop drawings are not submitted within the allotted time frame all substitutions included the late shop drawings will be invalid and the equipment specified must be provided. Any costs resulting from delays in the project schedule due to failure to submit shop drawings related to this section in a timely manner shall be the responsibility of the Plumbing Contractor.
- B. Each item shall be properly identified, preferably by fixture/equipment tag number (such as WC-3), and shall describe in detail the material and equipment to be provided, including all dimensional data, performance data, pump curves, computer selection print-outs, etc. Capacities indicated are minimums. Equipment submitted with capacities below specified parameters will be refused.

- C. Corrections or comments made on the shop drawings do not relieve the contractor from compliance with requirements of the drawings and specifications. Shop drawing review is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades and performing his work in a safe and satisfactory manner.
- D. Should any materials or products be purchased and/or installed without prior review and comment the contractor shall be required to remove or replace those products and/or materials if directed by the Architect at his own expense. If the materials are not removed (or replaced) or if the project is delayed as a result the Architect reserves the right to order the withholding of payment until the situation is resolved in a manner satisfactory to the Architect.
- E. Plumbing shop drawings shall be separate from Mechanical shop drawings. All submittals shall have a clear area on the front no less than 4inches x 3inches to be reserved exclusively for the Engineers' shop drawing stamp or they will be refused for re-submittal.
- F. It is desirable for shop drawings to be submitted electronically, including all documentation outlined in paragraph "A" above. Hard copies of shop drawings must be original documents or good quality photocopies of original documents (photocopies of color samples are not acceptable). Faxed copies of submittal sheets will be refused.
- G. Review must be obtained on all items specified in Section 2 Products or shown on the drawing, and any significant items implied or otherwise required but not specified.
- H. Format
 - 1. Related items shall be stapled or Bound together as a package. The number of copies of each package shall be as listed above. Examples of packages of related items include:
 - a. Hangers and Supports
 - b. Identification
 - c. Insulation
 - d. Valves
 - e. Piping
 - f. Plumbing Fixtures with accessories
 - g. Drainage Specialties
 - h. Water Specialties
 - i. Pumps
 - 2. If due to circumstances beyond his control, the contractor is unable to include all the related items in the submitted package, he shall insert in its place a plain sheet of paper with a notation stating that the item will be submitted separately.

1.12 PRODUCT HANDLING

Use all means necessary to protect materials before, during and after installation, and to protect the

DANFORTH ON HIGH – PORTLAND, MAINE

installed work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

1.13 AS-BUILT DRAWINGS

Keep in good condition at the job, apart from all other prints used in actual construction, one complete set of all blueprints furnished for this job. On this special set of blueprints, record *completely and accurately* all differences between the work as actually installed and the design as shown on the drawings. These record prints must be kept up to date by recording all changes within one week of the time that the changes are authorized. At the completion of the work, this set of drawings shall be delivered to the Architect for the Owner electronically in the form of CAD drawings. If a complete record of changes is not made and electronic CAD drawings not provided by the Plumbing Contractor, a record shall be made by the Engineers, and *the cost of the record shall be paid by the Plumbing Contractor*. Copies of the plumbing CAD drawings may be made available electronically to the Contractor if desired. Drawings shall be dated accordingly and clearly identified as “AS-BUILT”. Contact the Architect directly or the Engineer via e-mail at mechsyst@maine.rr.com. Specify required CAD format when requesting the files. CAD drawings were generated using AutoCAD 2006 and utilize both paper space and model space with external references to various other drawings. Files will be compressed and will require “WinZip” (<http://www.winzip.com>) for extraction. A release form will be provided which must be signed and returned to the Engineer prior to transfer of files.

1.14 MAINTENANCE MANUAL

On completion of this portion of the work, and as a condition of its acceptance, submit for review two copies of a manual describing the system. Plumbing equipment manuals shall be separate from mechanical manuals. All manuals shall be original copies, not photocopies, or they will be refused for resubmittal. Prepare manuals in durable 3-ring binders approximately 8.1/2” by 11” in size with at least the following:

- A. Project name on the spine and front cover, and identification on the front cover stating the project name, general nature of the manual, and name, address and telephone number of the General and Plumbing Contractors.
- B. Neatly typewritten index.
- C. Complete instructions regarding operation and maintenance of all equipment involved.
- D. Complete nomenclature of all frequently replaceable parts and supplies, their part numbers, and name, address and telephone number of the vendor.
- E. Copy of all guarantees and warranties issued, and dates of expiration.
- F. Shop drawings and equipment/fixtures manufacturer’s catalog pages. Clearly indicate the precise item included in this installation and delete, cross out or otherwise clearly indicate, all manufacturers’ data with which this installation is not concerned.

1.15 OBJECTIONABLE NOISE AND VIBRATION

All equipment shall operate without objectionable noise and vibration. Should objectionable noise or vibration be transmitted to any occupied part of the building by apparatus or piping, as determined by

DANFORTH ON HIGH – PORTLAND, MAINE

the Architect, the necessary changes eliminating the noise or vibration shall be made by this Contractor at no extra cost to the Owner.

1.16 GUARANTEE

This Contractor shall guarantee all materials and workmanship furnished by him or his sub-contractors to be free from all defects for a period of no less than one (1) year from date of final acceptance of completed system and shall make good, repair or replace any defective work which may develop within that time at his own expense and without expense to the Owner. Any additional costs required to extend manufacturer's guarantee and warranty for the period specified, shall be included in Contractor's base bid.

1.17 DEVIATIONS, DISCREPANCIES AND OMISSIONS

A. The drawings are intended to indicate only diagrammatically the intent, extent, general character and approximate locations of plumbing work. Work indicated, but having details obviously omitted, shall be furnished complete to perform the functions intended without additional cost to the Owner. This shall include but not be limited to:

1. All items that are required to meet all applicable codes and referenced standards.
2. Piping for cold and hot water supply, drain, vent, gas, etc to each plumbing fixture/equipment shown on the drawings, or scheduled as required.
3. Shut-off valves on lines feeding individual fixtures without integral stops.
4. Minor single phase electrical wiring, or control wiring, between Plumbing provided items that require it, unless indicated on the Electrical Drawings.
5. Plumbing related items indicated on the drawings of other trades.
6. Items indicated on one plumbing drawing but not shown on a corresponding drawing.
7. Items implied on the plumbing drawings but not shown.
8. All plumbing related items clearly shown in dark print on the Plumbing drawings but not included in the specification, unless it is noted as being provided by the owner or other contractor or unless other sections assume the responsibility.

B. The drawings and specifications are complimentary to each other and what is called for in one shall be as binding as if called for by both. In the event of conflicting information on the drawings, or in the specifications, or between drawings and specifications, or between trades, that which is better, best or most stringent shall govern.

1.18 WORKPLACE SAFETY

A. The Trade Contractor alone shall be responsible for the safety, efficiency and adequacy of his plant, appliances and methods, and for any damage, which may result from their failure of their improper construction, maintenance, or operation.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. All Trade Subcontractors shall notify the Construction Manager of any flammable, combustible and/or toxic materials intended for use on the project and shall furnish literature pertinent to the use and control of such materials.

1.19 CHANGE ORDERS

- A. No change shall be made from the work, equipment, or materials under this section except as directed in writing by the Architect or Engineer of record.
- B. All requests for change in contract price and scope shall be accompanied by a breakdown list of materials with unit and extended prices and labor hours with unit and extended price, plus markups that have been applied.

1.20 COMMISSIONING

- A. A commissioning agent has been retained by the Owner. The commissioning agent's primary responsibility will include ensuring the plumbing systems function as designed. A full scope of the agent's duties may be provided on request.
- B. This contractor shall provide any documentation, submittals or information on plumbing fixtures, materials and equipment that may be requested by the commissioning agent, with notification provided to the Architect of such.
- C. Should the commissioning agent requested changes or alterations to the systems, said changes or alterations must be authorized by the Architect or Engineer of record prior to work.
- D. The scope of the plumbing contractor's responsibility regarding commissioning shall be (but not limited) to:
 - 1. Attending commissioning meetings when requested.
 - 2. Providing information as requested.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Unless otherwise indicated, the materials to be furnished under this contract shall be new and the standard products of manufacturers regularly engaged in the production of such equipment, and shall be the manufacturer's latest standard design that complies with the specification requirements.
- B. All materials and equipment of the same classification shall be the product of the same manufacturer, unless specified otherwise. An entire product line may be rejected if one or more of the products submitted are not an equal to that specified.
- C. All products shall be manufactured within the United States, unless specified otherwise, and supplied locally (within the State) wherever possible. It is preferable to obtain materials that are manufactured within 500 miles of the work site when practical.
- D. Unspecified items shall be by the same manufacturer and level of quality and as similar items specified, whenever possible. Whenever items have no similarity to those specified in this section, provide the equivalent item as specified in other Division 15 Sections. When no similarity exists in other sections, the Contractor shall submit for review an appropriate commercial/institutional quality item, complete to perform the functions intended, using his best discretion. The Architect or a designated Consultant, not the contractor, shall make final determination whether materials are of suitable quality and perform the functions intended.

2.02 HANGERS AND SUPPORTS

A. General

- 1. All hangers and supports shall be especially manufactured for that purpose and shall be the pattern, design and capacity required for the location of use.
- 2. Piping specified herein shall not be supported from piping of other trades.
- 3. All steel hangers shall be factory painted.
- 4. Hangers shall be heavy-duty steel adjustable clevis type, plain for steel, cast iron and plastic pipe, and copper plated for piping in direct contact with copper tubing (i.e. copper hot water piping) shall be equal to Carpenter & Paterson Inc., Fig. 100 (Fig. 100CT copper plated).
- 5. Hangers shall go outside of insulation for domestic water piping. Each hanger shall be furnished with metal shield; Fig. 100 SH.
- 6. Exposed vertical risers $\frac{3}{4}$ inch and smaller shall be supported at 6 foot intervals between floor and ceiling with split ring type hangers; copper plated for piping in direct contact with copper tubing equal to Carpenter & Paterson Inc., Fig.81 (Fig. 81CT copper plated). ALL PIPING DROPS TO FIXTURES SHALL BE ANCHORED SOLID TO WALL WITH A STEEL SUPPORT BRACKET WITH ADJUSTABLE CLIP, ESPECIALLY PIPING TO FLUSH VALVES

7. Piping suspended from walls and partitions shall be supported by steel support bracket with adjustable clips equal to Carpenter & Paterson Inc., Fig. 69. All attachments to bar joists shall be from top chord.

B. Hanger Rods & Attachments

1. Hanger rods shall be galvanized all thread rod. Rod size shall be as follows:

<u>Pipe Size</u>	<u>Rod Size</u>
3/8" to 2"	3/8"
2.1/2" to 3.1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

2. All nuts for hanger rods and hangers to be galvanized steel.
3. Provide lag points with rod couplings for fastening to wood, toggle bolts in concrete blocks and compound anchor shields and bolts in poured concrete.
4. Provide toggle bolts with rod couplings for fastening in the pre-cast concrete plank decks.
5. Provide and install angle iron supports for pipe hangers in locations as required. Angle iron supports shall be adequate size for span and piping or equipment.
6. Hot and cold water piping at each fixture shall be securely fastened in wall with split ring type hanger fastened to studs within wall.

2.03 SEISMIC RESTRAINT

All seismic restraints shall be in accordance with the International Building Code.

A. Piping Suspended by Hangers

Piping suspended by individual hangers 12 inches or less in length, need not be braced. The following piping shall be braced:

1. Fuel Oil, Fuel Gas, 1 inch and larger
 - a. Brazed or Soldered Joints - Transverse bracing every 20 feet and longitudinal every 40 feet.
 - b. Threaded or Mechanical Joints - Transverse bracing every 10 feet and longitudinal every 20 feet.

B. Piping Risers

1. All vertical pipe risers shall be laterally supported with a riser clamp at each floor.
2. No-hub joints shall be braced or stabilized between floors.

DANFORTH ON HIGH – PORTLAND, MAINE

C. Equipment

1. All floor/pad mounted equipment including: water heaters, above ground water storage tanks, pneumatic pressure tanks, expansion tanks and boilers shall be anchored to the floor.
2. Suspended equipment shall be cross braced in all directions.

2.04 IDENTIFICATION

- A. Tag each new pump /equipment, and switch with 2½ inches x ¾ inch rectangular engraved nameplates with white letters on black, #2060-20 by Seton Name Plate Corp. or reviewed equals. Nameplates shall be mechanically fastened to equipment (adhesives are not acceptable). Embossed labels are not acceptable.
- B. Identify all new water and drain piping with “Set Mark” snap-around pipe markers by Seton Name Plate Corporation or reviewed equal. Markers shall include both identification and arrows indicating direction of flow. Markers shall be placed on pipe segments 5 feet and longer, and spaced no less than 10 feet apart. Heating hot water piping shall be labeled differently from Domestic hot water piping. On parallel runs of piping, plumbing markers shall be grouped together, and grouped with heating markers whenever practical.

<u>Legend</u>	<u>Background/Letter Color</u>
“Cold Water”	Green/ white letters
“Domestic 120°F Water”	Yellow/ black letters
“Domestic 120°F Return”	Yellow/ black letters
“Domestic 140°F Water”	Yellow/ black letters
“Gas”	Yellow/ black letters
“Plumbing Vent”	Green/ white letters
“Sanitary Drain”	Green/ white letters

- C. Tag all new valves with Seton #M4506 1½ inch square brass tags and #6 bead chains, stamped with the following identification: “CW”, “HW”, “HWR” or “140HW”. Tag shall be consecutively numbered. **DO NOT DUPLICATE EXISTING VALVE IDENTIFICATION NUMBERS.** Fixture stops, control valves or valves adjacent to equipment, the use of which is obvious, are not to be tagged.
- D. Provide valve charts identifying valve number, valve identification and service (i.e. Apt. 203, HW). Mount charts in Boiler Room and Mechanical Room in 8½ inch x 10 inch and 8½ inch x 11 inch self-closing aluminum frame with plastic windows. Provide additional copies for maintenance manuals.

2.05 INSULATION

A. All Domestic Water Piping and Sanitary Piping in Unheated Areas

1. Exposed Piping: Insulate exposed piping above slab/grade with Owens Corning Evolution SSL II paper free ASJ with tough, wrinkle resistant, easy to-clean jacket, or approved equal. Install with great care for appearance, turning any writing or seams toward the wall. Or reviewed equal.

DANFORTH ON HIGH – PORTLAND, MAINE

- a. Option: use standard Owens Corning fiberglass insulation with ASJ or approved equal, and carefully and neatly cover it with a white PVC plastic covering material. Covering shall be applied in no less than 4 foot lengths with shingle joints. Longitudinal joints shall be on the top or back sides so as to be out of sight and sealed with adhesive materials provided with the jacketing. Material shall be butted to finish walls or Insulation. Jacketing material shall be Zeston pre-cut, pre-curved 0.030 thickness. Or reviewed equal.
2. Concealed piping and piping in Mechanical rooms: Insulate with well installed and sealed Armaflex Pipe Insulation with pressure sealing lap adhesive, or equal.
 - a. Option: use standard Owens Corning fiberglass insulation with ASJ or approved equal.
3. Thickness as follows:
 - a. Hot water mains, recirculated hot water branches and recirculation returns: 1½ inch thick minimum.
 - b. Unrecirculated hot water branches: 1" thick.
 - c. Cold water piping: ½" thick minimum.
 - d. Pex run-outs to individual fixtures, any temperature: ½ inch thick to allow bending.
 - e. Sanitary Piping in and above unheated space, such a parking garage: 2" thick minimum.
4. Insulate any below grade hot water piping run outs with ½" Armaflex closed cell piping insulation.

B. Fittings

1. All fittings and valves shall be covered with a one piece PVC insulated fitting cover secured.
2. The ends of insulation on exposed pipes at valves, flanges, unions, etc., shall be finished neatly with covering to match jacket and secure with mastic.
3. Valves, flanges and unions on hot water piping shall not be insulated.

C. Installation

All insulation work shall be executed by skilled insulation workmen regularly in the trade.

2.06 VALVES

A. General

1. Valves shall be provided as shown and as required to make the installation and its apparatus complete in operation; locate to permit easy operation, replacement and repair.
2. All valves must be so constructed that they may be repacked under pressure while

open.

3. Check valves shall be installed in all lines where flow may reverse from intended direction.
4. Valves shall have name and/or trademark of manufacturer as well as working pressure stamped or cast on valve body.
5. Valves shall comply with Manufacturer's Standards Society (MSS) specifications and be so listed.

B. Types and Manufacturers

All valves shall be of one manufacturer and by one of the manufacturers listed. The following list is provided as a means of identifying the quality and type required.

1. Gate Valves 3 inches in size and smaller

Shall have bronze bodies, rising stem, solid wedge, union bonnet, rated for 150# WSP, 300# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1169	1151
Stockham	B-124	B-120
NIBCO	S-134	T-134
Hammond	IB648	IB629

2. Globe Valves 2 inches in size and smaller

Shall have bronze bodies, union bonnet, renewable composition disc for service intended, rated for 150# WSP, 300# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1590-T	590-T
Stockham	B-24-T	B-22-T
NIBCO	S-235-Y	T-235-Y
Hammond	IB423	IB413T

3. Angle valves

Same general description and manufacturers as globe valves above, only outlet at 90 degree angle from inlet.

4. Ball valves 1¼ inches in size and smaller

Shall have bronze bodies, Type 316 stainless steel stems and balls, reinforced Teflon seats and seals, blowout proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Ports shall be "full port". Rated for 400# WOG and 350°F:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	BA-350S	BA-300S

DANFORTH ON HIGH – PORTLAND, MAINE

Apollo	82-200	82-100
Watts	B-6081	B-6080
NIBCO	-----	-----
Hammond	8614	8604

5. Ball valves 1½ inches in size and larger

Shall have bronze bodies, Type 316 stainless steel stems and balls, reinforced Teflon seats and seals, blowout proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Ports shall be “conventional port”. Rated for 400# WOG and 350°F:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Apollo	70-200	70-300
Watts	B-6000-SS	B-6001-SS
NIBCO	S-585-66	T-585-66
Hammond	8514	8503

6. Check Valves 2 inches in size and smaller

Shall be horizontal swing type with bronze body, Teflon disc. Rated for 125# WSP, 200# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1509-T	509-T
Stockham	B-310-T	B-320-T
NIBCO	S-413-Y	T-413-Y
Hammond	IB945	IB904

7. Spring loaded check valves 2” and smaller:

Bronze body, bronze trim, stainless steel spring, stainless steel center guide pin, Class 125, Teflon seat unless only bronze available.

	<u>Solder or Screwed Ends</u>
ConBraCo	61 series
Grinnell	3600SJ
Mueller	203BP
Nibco	S480Y
Val-Matic	S1400 series.

8. Drain Valves

Shall be conventional ball valves and provided with hose nipples and threaded metal cap on chain. Watts B-6001-CC or reviewed equal.

9. Balancing Valves (BV)

Shall be Globe valve as specified above. Initially set full open, then close incrementally until the desired flow is achieved.

DANFORTH ON HIGH – PORTLAND, MAINE

10. Flow Rate Monitor (FRM)

Shall be ERNST Flow Industries EFI Inflow flow rate monitor, Basic style for liquid, brass material, NPT connections.

- a. Type "1" Boiler room near recirc pump
ERNST model B4B6C20, 2-20 GPM.
- b. Type "2" Recirculated Branches
ERNST model B4B6C10, 1-10 GPM.

2.07 DOMESTIC WATER PIPING

A. Water and Fire Service Lines

1. Provide water and fire service lines from where the site work ends. Coordinate interface with site utilities. Match site work materials until inside building.

B. Interior Exposed, High temperature and Supportive

1. All exposed piping carrying domestic water, all piping with a temperature above 130 deg. F., all piping supporting inline equipment, and piping within 6 ft of the water heaters, shall be hard-drawn type "L" copper tube with cast or wrought fittings and made up with Silvacite 100 lead-free solder. Care shall be taken not to over flux.

C. Concealed

All concealed hot (below 130) and cold water piping above finish floor (not buried) shall be one of the following:

1. Copper as specified above, all sizes
2. Flowguard Gold CPVC pipe and fittings, all sizes.
3. PEX, sizes 1-1/2" and smaller
 - a. AquaPEX (cross linked polyethylene tubing) piping and fittings, specifically designed for domestic water. ASTM F 877, SDR 9 tubing. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper crimp rings and matching PEX tube dimensions. Manifold (if used): Multiple-outlet, corrosion-resistant-metal assembly complying with ASTM F 877 and with corrosion-resistant-metal valve for each outlet.
 - b. Some direct nominal substitution is not allowed due to smaller tubing diameters, and restrictions caused by interior mounted fittings. Increase pipe size by one nominal size for all piping 1-1/4" or less, unless it is a direct run out to an individual fixture with 1/2" NPT or smaller connections.
 - c. Piping shall be installed in a neat and orderly manner. No wild spaghetti

installations will be tolerated. Piping shall be run straight and parallel, and level or sloped slightly to low points with no droops exceeding 1/8". Use PEX bend supports to keep turns tight and supported. Any work that in the opinion of the Architect or Engineer of Record that does not meet these standards will be removed and redone at the Contractor's expense.

- d. All PEX piping shall be insulated as indicated under Insulation. Use Armaflex insulation on manifold piping run outs to individual fixtures to allow bending.
 - e. Provide the correct spacing of hangers (w/ saddles) for PEX; every 3' or as recommended by the Manufacturer. Do not use the spacing designated for CPVC or copper piping.
 - f. The piping shown on the drawing is configured as a standard branch system. If the contractor wishes to use a manifold once inside the respective unit it is allowed, provided the contractor submits a typical sketch showing:
 - a. Where the manifold will be located, and how accessed, i.e. valve box, access panel or above tile ceiling.
 - b. All tubing, bends and fittings.
 - c. A detail showing how the insulated piping turns to drop/rise in walls.
 - d. A detail showing the pipe hangers, insulation and saddles.
 - e. A detail showing how the piping penetrates fire rated walls with the U.L. Listed fire stopping system approved for that wall type.
 - g. All work shall be done in accordance with the manufacturer's recommendations.
4. All buried water and trap primer piping shall be AquaPEX or type "K" soft copper tubing. No joints below slab.
 5. All buried hot water piping shall be insulated and sealed with 1/2" Armaflex. **Do not direct bury copper hot water piping.**
 6. All exposed, uninsulated water piping near fixtures in finished areas shall be chromium plated I.P.S. copper or red brass pipe or tubing and fittings. Valves shall also be chrome plated brass or bronze. Any chrome trim with wrench marks shall be removed and new trim installed.
 7. Type of tubing shall be stamped or printed on each length by Manufacturer.

2.08 PIPE EXPANSION FITTINGS AND LOOPS

Provide expansion loops on hot water supply (120 degrees and above) and recirculating return lines where shown and on any straight pipe lengths over 100 feet that occur as a result of relocating piping to meet field conditions. Loop shall be 2 feet long by 4 feet offset, and located near center of length. Anchors shall be bolted collars held by angular braces in direction of piping near opposite ends of the pipe. Provide guides on each expansion joint.

2.09 STORMWATER (IF ANY), SANITARY WASTE AND VENT PIPING

A. All Vent Piping, and Most Sanitary Waste and Storm Water Piping

Piping and fittings shall be PVC Schedule 40 polyvinyl chloride plastic, as per ASTM-A-2665 or latest standard. Solvent as per ASTM-D-2564. Exposed vent piping above roof shall be **black** PVC or CPVC for appearance and solar heat dissipation of frost.

B. Storm Water and Sanitary Waste near Sound Sensitive Areas, if any.

The piping has been laid out to avoid sound sensitive areas, such as bedrooms. If shown above such, or redirected due to unavoidable field conditions, any piping that runs over or drops adjacent to such areas shall be standard weight cast-iron, conforming to Commercial Standards CS188-66. Fittings shall be cast-iron, no-hub ASA Group 022 pipe, complete with neoprene elastomer, corrosion-resistant stainless steel shield and clamping assemblies conforming strictly to ASME Standard C654 and requirements of CISPI Standard 310.

Substitution with PVC piping, or other piping system with inferior sound deadening characteristics, is not allowed. Substitution of piping system with equal or superior sound deadening characteristics can be submitted for review provided it is accompanied by the manufacturer's literature citing proof of acoustic properties by an independent laboratory testing agency.

C. Indirect Waste Piping and Condensate Piping with Potential Water Temperature above 130 deg. F.

All piping, not buried, shall be type "L" hard drawn copper tubing with drainage fittings made up with 95-5 solder. All exposed piping or tubing in finished areas shall be chrome plated copper or brass. All chrome trim with wrench marks shall be removed and new trim installed. Cool condensate shall be run in PVC or CPVC unless indicated otherwise in the Mechanical Specs.

2.10 RADON VENT PIPING (if any)

A. Radon vent piping and fittings shall be PVC Schedule 40 polyvinyl chloride plastic, as per ASTM-A-2665 or latest standard. Solvent as per ASTM-D-2564. 4" underslab piping shall be perforated type. Exposed vent piping above roof shall be **black** PVC or CPVC for appearance and solar heat dissipation of frost.

2.11 PIPE SLEEVES AND ESCUTCHEONS

A. Sleeves

1. Contractor shall set sleeves for all piping penetrating walls and floors. Sleeves through masonry shall be steel pipe sleeves two sizes larger than pipe. Piping passing through walls other than masonry shall be provided with # 24 gauge galvanized steel tubes with wired or hemmed edges.
2. Sleeves set in concrete floors shall finish flush with underside, but extend minimum of 1 inch above finish floor. Weld clips to sleeves for support in concrete pre-cast planks of a size that will be covered by concrete topping. Sleeves set in partitions

DANFORTH ON HIGH – PORTLAND, MAINE

shall finish flush with each side.

3. Space between sleeves and pipes shall be sealed to make smoke and water tight with 3M Brand Fire Barrier Caulk CP25 or Putty 303.
4. Masonry sleeves shall be Schedule 40 steel pipe.
5. This Contractor has the option to use the Pro-set system on lieu of the above.

B. Exterior Sleeves

Where piping passes through exterior walls, provide and install a complete pipe sleeve/hydrostatic wall closure system.

1. Wall sleeve shall be schedule 40 steel pipe, two pipe sizes larger than carrier pipe. Sleeve shall be the same length as the thickness of the wall served.
2. The hydrostatic closure device shall consist of identical interlocking links of solid synthetic rubber compounded to resist ozone, water, chemicals and extreme temperature variations. Each link shall be connected by corrosion resistant bolts and nuts to form a belt that is to fit snugly around the pipe. Under each bolt and nut there shall be a metal pressure plate so that when each nut is tightened the rubber links will expand between the pipe and sleeve to form a continuous, air tight and water tight seal.
3. Units to be Link-Seal system Model LS wall seal by Thunderline Corp. or reviewed equal.

C. Escutcheons

Where piping passes through finish walls, floors, ceilings and partitions, provide and set two piece nickel plated steel floor and ceiling plates.

2.12 PLUMBING FIXTURES

A. CW-1 Clothes Washer

1. Appliance is not provided by this Plumbing contractor.
2. Guy Gray WB-200 recessed supply and drain unit for automatic washers, ½" Watts Duo-cloz valve, 2" drain. Or approved equal.
3. Provide two (2) PPP Laundry Mini water hammer arresters. Or approved equal.
4. Provide two (2) Braided Stainless Washing Machine Hoses one side has 90 degree elbow, NSF 61 listed, UPC rated 3/4" FHT x 3/4" 90 degree FHT 5ft (60") hose.
5. Provide Dura-Pan 30"x32" molded fiberglass washer pan with center outlet and removable stainless steel front. Or approved equal.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. DW-1 Dishwasher, Under Counter (if any)
1. Appliance is not provided by this Plumbing contractor.
 2. Provide PPP Mini water hammer arrester. Or approved equal.
- C. LV-1 Lavatory, Wall Mounted - ADA
1. AMERICAN STANDARD 00356.421 LUCERNE wall hung lavatory, for concealed arm support, single center hole, vitreous china, front overflow, self draining deck, color "white". Mount rim at 33-7/8" AFF. Any reviewed equal must not be wider than this model.
 2. Moen model 8419, commercial brass, single-handle lavatory faucet, single center hole, ceramic control components, aerator, pop-up drain assembly, chrome, meets ADA. Replace aerator with 0.5 GPM model. Or reviewed equal. Note: if providing an equal, top faucet (handle) must not exceed 5-3/4" above the sink deck when closed.
 3. McGuire ProWrap insulated 1-1/4" P-trap with supply covers, chrome plated angle supplies, wheel stops, wrought (not bell) escutcheons.
 4. Provide concealed arms carrier.
- D. LV-2 Lavatory, Public, Wall Mounted - ADA
1. AMERICAN STANDARD 955.000 Murro Universal Design wall hung lavatory, for concealed arm support, single center hole, vitreous china, rear overflow, self draining deck, color "white". 0059.020 shroud/Knee Contact Guard, vitreous china. Or reviewed equal.
 2. Moen model 8419, commercial brass, single-handle lavatory faucet, single center hole, ceramic control components, aerator, pop-up drain assembly, chrome, meets ADA. Replace aerator with 0.5 GPM model. Or reviewed equal.
 3. McGuire P-trap, chrome brass grid drain, chrome plated angle supplies, wheel stops, wrought escutcheons. Or reviewed equal. Must fit inside shroud/knee guard. Provide concealed arms carrier.
- E. SS-1 Service Sink / Mop Basin
1. The mop basin shall be Fiat MSB-2424, molded stone or reviewed equal. The molding shall be done in matched metal dies under heat and pressure resulting in a one-piece homogeneous product. Size of unit shall be 24"x24"x10" high.
- The drain body shall be cast brass, chrome plated, complete with cast brass lock nut and gaskets. A combination dome strainer and lint basket made from #302, 16 gauge stainless steel attached with tamper proof screws shall be included. The drain body shall provide for a lead caulked joint to be 3" I.P.S.

Provide the following accessories:

DANFORTH ON HIGH – PORTLAND, MAINE

- a. Stainless steel wall guard, MSG-2424
 - b. Service faucet with vacuum breaker; integral stops and wall brace plate #830-AA, or reviewed equal by Moen.
 - c. 30" Hose with 3/4" coupling at one end; Plate #832-AA.
 - d. Mop Hanger, stainless steel, 24" long with (3) holders, Plate #889-CC.
 - e. Silicone sealant #833-AA.
 - f. Vinyl bumper guard #-77-AA.
- F. SH-1 Shower, Roll-in, right hand – ADA
1. Lasco Bathware model 1623BFSTD ADA/ANSI Freedomline shower, 62"x32-1/4"x76-1/8" exterior dimensions, 1/2" dam height, fiberglass gelcoat, three year warranty, grab bars, fold-up seat, soap dish, 1" curtain rod. Stainless steel strainer drain. Vinyl flexible dam. Or approved equal. Provide heavy duty weighted shower curtain. Or reviewed equal. Note: dimensional tolerances are small, so when providing an equal, any dimensional deviation will be the responsibility of the contractor to coordinate, correct and or mitigate, notify the Architect directly of the differences and obtain his approval before ordering.
 2. Controls shall be Moen model 8342EP15 metal commercial shower system with fixed and hand shower heads, Posi-temp pressure balanced valve with trim, single handle, integral stops, fixed head, diverter valve, chrome single function hand shower with slide bar, chrome, 69" flexible hose assembly, integral vacuum breaker. Or reviewed equal. Note: If providing an equal shower head flow to be 1.7 GPM or less. Or reviewed equal.
 3. Provide heavy duty chrome brass roller ball curtain rings available from www.clawfootsupply.com. Or reviewed equal.
- G. SH-2 Shower, Roll-in, left hand – ADA
- Same as SH-1 except a left hand unit with controls mirrored.
- H. SK-1 Sink, Single Bowl – ADA
1. Elkay LRAD-2522-65-4 double bowl stainless steel sink, 6-1/2" deep bowl, 18 gauge, type 302 SS, self-rim, satin finish, sound guard undercoating, 4 hole drilling, rear drain. Or reviewed equal. LK35 Strainer.
 2. Moen model 8707 M-Dura brass commercial single lever kitchen faucet with hose and spray, deck plate, 9" spout reach, chrome, meets ADA.
 3. McGuire ProWrap insulated 1-1/2" P-trap with supply covers, chrome plated angle supplies, wheel stops, wrought (not bell) escutcheons. Or reviewed equal.
 4. Installation note: as the sink cabinet might be designed to have the front removable, rough-in accordingly. Also care must be taken not to install any piping in such a manner that would cause an obstruction to full wheelchair access.

DANFORTH ON HIGH – PORTLAND, MAINE

- I. TS-1 Tub / Shower, Right Hand – Adaptable/Senior
 - 1. Enclosure shall be Lasco Freedomline model 2603SMTE, gel-coated fiberglass, right hand valve, open top, 12-3/4” tub height at finished floor, outside dimensions 60” x 32” x 77-1/4”, textured floor, color white. Accessories: Factory mounted 1-1/2” white grab bars, tri-fold plastic removable seat (on left hand side), heavy duty shower curtain, curtain rod. Or reviewed equal. Note: dimensional tolerances are small, so when providing an equal, any dimensional deviation will be the responsibility of the contractor to coordinate, correct and or mitigate, notify the Architect directly of the differences and obtain his approval before ordering.
 - 2. Controls shall be Moen model 8341 metal commercial tub shower system with tub spout and hand shower system with diverter and mixing valve – Posi-temp pressure balanced valve with trim, single handle, integral stops, single function hand shower with slide bar, chrome, 69” flexible hose assembly, integral vacuum breaker. Substitute 8349LF16 1.6 GPM or equivalent EP model for hand held shower head. Install slide bar with A750 secure mount anchor. Or reviewed equal. Note: If providing an equal shower head flow to be 1.7 GPM or less. Or reviewed equal.
 - 3. McGuire 1221TL22, height 12 to 14”, chrome plated brass commercial bath waste and overflow, trip lever, flat strainer, 17 gauge tubing. McGuire P-trap
- J. TS-2 Tub / Shower, Left Hand – Adaptable/Senior
 - 1. Same as TS-1 except mirrored.
- K. WC-1 Water Closet, Floor – ADA
 - 1. AMERICAN STANDARD 2018.214 Champion 4 Right Height, 16-1/2”, Elongated Toilet, vitreous china, 1.6 GPF, 4” non-adjustable flapper-free flush valve, siphon jet action, left handed side mounted trip lever, close coupled tank, bolt caps, fully glazed trapway, color “white”, 10 year warranty. Order with Aquaguard liner (4266.504) Or Reviewed equal, if any.
 - 2. AMERICAN STANDARD 5280.016 elongated molded closed front seat with cover, commercial duty, stainless steel bolts. Or reviewed equal by Church, or Beneke.
 - 3. McGuire chrome water closet supply with wheel handle stop. Or reviewed equal.
 - 4. Install water closet solidly to floor; any wobbly water closets will be redone and all costs, direct and incidental, paid for by this contractor.
- L. WC-2 Water Closet, Floor – ADA

Same as WC-1 except order with alternate tank configuration 4266.954 with trip lever located on right side and Aquaguard liner.
- M. WC-3 Water Closet, Floor, flushvalve – Public ADA
 - 1. AMERICAN STANDARD 2305.100 elongated “Madera” Aquameter, 1.6 GPF, white, vitreous china, 1.1/2” top spud, floor mounted, siphon jet action, bolt caps,

DANFORTH ON HIGH – PORTLAND, MAINE

rim 16.1/8" above finished floor. Or reviewed equal with bowl between 16-1/8" to 16-1/2".

2. Sloan Royal WES-111-YO, dual flush, chrome, quiet exposed flush valve for 1.1/1.6 GPF, wall flange, 1" screwdriver angle check stop, vacuum breaker, spud coupling flange, ADA green handle, sweat solder adapter kit, two adhesive backed wall plates (place one over flush valve). Rough-in flushvalve with handle on open side of fixture. Or reviewed equal, by Zurn or Delany.
3. Church 3155SSC white, elongated, extra heavy duty, solid plastic open front seat with self-sustaining external checks, antimicrobial, stainless steel posts and hardware. Or reviewed equal by Beneke or American Standard.

2.13 EQUIPMENT OR PLUMBING FIXTURES BY OTHERS

Any equipment and fixtures by other sections will be provided and set in place by those sections. This contractor will connect gas, domestic hot water, waste and vent as required.

A. Hot water storage tanks

1. Tank(s) is provided and set in place by Section 15600. Provide and connect all domestic water piping, fittings, valves, and pumps as shown on drawings.
2. Water temperature in storage tank shall be 140° F. Water temperature to most fixtures shall be 120° F. set by thermostatic mixing valve at tank.

B. Boilers

1. By Section 15600. Provide gas connection and water make-up as required.

2.14 PLUMBING SPECIALTIES, DRAINAGE

A. Carriers

1. Wall hung fixtures including water closets, lavatories, lav-decks and drinking fountains shall be supported with adjustable floor mounted carriers to fit building conditions, piping system, and fixtures specified. Each carrier shall be provided with a wall finishing frame. All carriers shall be secured to the floor with tie down lugs.
2. Carriers shall be as manufactured by Zurn or reviewed equal.

B. Traps

1. Traps of material and design as approved by the State and shall be furnished and installed at all fixtures and appliances. Trap each fixture separately, keeping all trap screws below water line; vent each trap. Make offsets in vent piping with 45-degree angle fittings when possible. Pitch horizontal vents toward waste lines, group vents and take through roof as shown. All traps, at fixtures and appliances shall be provided with accessible clean outs.

DANFORTH ON HIGH – PORTLAND, MAINE

C. Cleanouts

Provide cleanouts for soil and waste where shown on the drawings and as required by code.

1. Floor Cleanouts (FCO)

All floor cleanouts in concrete or tile shall be flush with finish floor.

a. Type “1”, Round, for Unfinished areas

Zurn ZB-1400-BP-K, polished bronze top, bronze plug, anchor flange. Can also use type “1” nickel bronze top instead.

b. Type “2”, Round, Heavy Duty

Zurn ZS-1402-BP, Heavy Duty, non-adjustable, stainless steel top, Dura coated cast iron body, bronze plug, anchor flange.

2. Wall Cleanouts

All wall cleanouts shall be Zurn Z-1445 cleanout tee with threaded plug. Polished nickel bronze cover, Zurn ZANB-1462 or reviewed equal.

3. Flashing

Flash each above grade floor clean out with Chloraloy® 240 thermoplastic elastomeric sheet membrane for concealed waterproofing, or other approved flashing material, extending 24” beyond perimeter of clean out and lock into clamping collar.

D. Floor Drains (FD)

1. All floor drains above grade shall be complete and each provided with flashing flange, flange device, and 24”x24”, Chloraloy® 240 thermoplastic elastomeric sheet membrane for concealed waterproofing, or other approved flashing material, lock into drain clamping collar.

2. Traps for floor drains shall be deep seal traps.

a. Type “1” General. Round

Cast iron body, flashing collar, nickel bronze, 6” adjustable strainer head, inside caulk, trap primer connection. Zurn ZN-415-6B-P or equal by Josam, Wade or Smith.

b. Type “2” Indirect Waste w/ recessed grate

Cast iron body, flashing collar, polished bronze, 7” adjustable raised flanged grate, inside caulk, trap primer connection. Zurn ZB-415-7I-P or equal by Josam, Wade or Smith. Install with top of flange flush with floor so grate is recessed, or approved equal

c. Type “3” Boiler Room

Cast iron body, flashing collar, sediment bucket, polished bronze, 7” adjustable deep flanged grate, inside caulk, trap primer connection. Zurn ZB-415-7N-P-Y or approved equal.

2.15 PLUMBING SPECIALTIES, WATER

A. Trap Primer (TP)

1. Type “1” General

Precision Plumbing Products Inc. Model PR-500 Self-adjusting automatic trap primer. Provide DU-2 distribution unit where indicated. Or reviewed equal. NOTE: As the trap primer may be on a line larger than 1/2”, submitting / providing a “flow through” type trap primers smaller than the actual pipe size is not acceptable.

B. Hose Bibs (HB)

1. Type “1” Exterior Hose Bib

Zurn Z-1321 exposed Ecolotrol “Anti-Siphon” automatic draining, non-freeze wall hydrant, integral backflow preventer, all bronze interior parts, operating key. Or reviewed equal.

C. Shock Absorbers (SA)

Shock protection shall be provided where shown on drawings and at all quick closing devices. Devices shall be stainless steel shell, welded expansion bellows surrounded by on-toxic mineral oil or gas, pressurized compression chamber charged and factory sealed, all, in-line design, threaded nipple and PDI reviewed. Sized to meet the conditions.

1. Type “1”, 'A' P.D.I. units

Zurn Z-1700, #100. Or reviewed equal.

2. Type “2”, 'B' P.D.I. units

Zurn Z-1700, #200. Or reviewed equal.

D. Thermometer (T)

Units to be dial type, 4.1/2” with 30° to 180° range; Terice Universal angle or reviewed equal.

E. Pressure Gauge (P.G.)

Furnish and install pressure gauges with gauge cocks on piping where shown on drawings. The dial range shall be such that the normal pressure shall be approximately mid-way of dial.

DANFORTH ON HIGH – PORTLAND, MAINE

Gauges shall be Trerice No. 600 or equivalent by Weiss or Nurnburg, 4.1/2” dial size, cast aluminum case, with brass “T” handle cocks and No. 872 bronze pressure snubbers on water units.

F. Vacuum Relief Valve

Watts Model N36 or reviewed equal.

G. Backflow Preventers (BFP)

Provide and install all necessary components to provide protection against potentially hazardous backflow or back siphonage and the contamination of the potable water system at the required GPM demand. Unit shall be UL, USC, ASSE, IAPMD and A WWA approved.

1. Type “1”, Entrance

Watts 007M2QT-S double check backflow preventer, 2”, quarter turn full port ball valves, strainer. Or reviewed equal.

2. Type “2” Mechanical Equipment

Watts #9DM2 double check with atmospheric port, or reviewed equal.

H. Mixing Valves (MV)

1. Type "1" Master Mixer

Symmons thermostatic mixing valve Model 5-500, inlet size 1”, outlet size 1.1/4” capacity 38 GPM @ 10 psi differential pressure for exposed piping, solid bi-metal thermostat scale hot to cold, rough bronze, check stops, set at 120°F. Or reviewed equal.

I. Expansion Tank

Watts Model ET-30. Potable water expansion tank, 4.7 gallon, 3 gallon acceptance, 3/4” connection, precharged to 40 psi. Or reviewed equal.

J. Relief Valve

Watts #530 calibrated pressure relief valve. Set at 100 PSI. Or reviewed equal.

K. Braided Stainless Steel Water Connectors

EPDM tubing jacketed by type 304 stainless steel braid, stainless ferrule, brass nuts. By Zurn or reviewed equal.

L. Dielectric Unions

Series 3000 as manufactured by Watts or reviewed equal.

DANFORTH ON HIGH – PORTLAND, MAINE

M. Meter

Provide a meter that meets the criteria of the local water district and has remote reader.

2.16 SUMP PUMP (SP)

Type 1, Elevator Pit

Stancor model SE-50 sump pump with oil minder probe and alarm, 1/2 hp 115 V, 1 phase, or reviewed equal.

2.17 DOMESTIC HOT WATER CIRCULATOR PUMPS (DCP)

A. Circulators

Provide and install in-line all bronze, corrosion proof, circulating pump on hot water circulating lines with capacity as shown on the drawings. Unit to be provided with internal overload protection.

1. Type 1 – 120 deg System

Circulator to be Taco Mode 008, bronze construction, 3/4" union ends, 8 GPM at 10 ft. head, 1/25 HP, 115V/60/1 or reviewed equal.

B. Control – Manual shut-off switch, but no timer; pump to run continuously on aquastat.

C. All power wiring and manual power switch with indicator light shall be provided and installed by Division 16.

2.18 PAINTING

Painting shall be provided for all steel/iron equipment supports, steel/iron fuel piping, exposed flanges, fittings and valves within boiler rooms, basements and outside and where specified elsewhere within this section. Painting shall consist of no less than two (2) coats of rust inhibiting paint, Rust'O'leum or approved equal. Paint shall be capable of withstanding temperatures of up to 250°F. Colors shall be as follows:

Equipment supports	Flat black
Fuel Gas Piping outside	Prime, then paint GREY.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that plumbing may be installed in strict accordance with all pertinent codes and regulations and the reviewed Shop Drawings.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.02 COORDINATION WITH OTHER TRADES

A. Before installation, participate in a coordination meeting with the Clerk of the Works, Construction Manager, Mechanical/HVAC, Fire Protection and Electrical trades. Establish and resolve areas of conflict and congestion, especially those indicated on the drawings. Priority to be given to HVAC equipment and large ductwork, then gravity piping, then small ductwork, then piping based on descending order of size. Special consideration given to allow access to valves, dampers etc.

B. Failure to coordinate will result in this contractor removing and relocating his piping at no additional expense to the owner.

3.03 INSTALLATION OF PIPING AND EQUIPMENT

A. General

1. Install all piping promptly, making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
2. Provide uniform pitch of at least ¼ inch per foot for all horizontal waste and soil piping 3” or less. For piping 4” and above, slope at 1/8” minimum per foot
3. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions; promptly remove all defective material from the jobs site.
4. Install pipes to clear all beams and obstructions. Do not cut into or reduce the size of load carrying members without the approval of the Architect.
5. Plumbing vents
 - a. Back vent all plumbing fixtures.
 - b. Pitch all vents at 1/64” per foot minimum toward waste lines for proper drainage to prevent unintended traps.

- c. Install vent piping with each bend 45 degrees minimum from the horizontal, wherever structural conditions will permit.
 - d. Group plumbing vents and take through roof as shown.
 - e. Increase vents 3" and smaller one size before going thru roof. Make size transition a minimum of 12" below the surface of flat roofs and 72" (or as structure permits) below sloped roofs.
 - f. Terminate 18" to 24" above roof.
 - g. If installing in locations other than as shown on the drawings, line up with other plumbing vents for a neat appearance.
 - h. Do not install plumbing vents within 10 feet of an operable window or door or within 25 feet of a ventilation air intake.
- 6. All risers and off-sets shall be substantially supported.
 - 7. Pipe hangers shall be placed on center as follows:

<u>MATERIAL</u>	<u>HORIZONTAL</u>	<u>VERTICAL</u>
Copper 1-1/4" & less	6'	6'
1-1/2"	6'	10'
2" & up	10'	10'
PVC, DWV	4'	4'
Steel	10'	10'

- 8. Arrange all piping to maintain required grade and pitch to lines to prevent vibration. Expansion loops to anchors shall be provided where shown on drawings.
- 9. Make all changes in pipe size with reducing fittings.
- 10. All low points in water piping shall be drained with 1/2" gate valve with hose nipple and metal cap.
- 11. No piping shall be installed in such a manner to permit back-siphonage or flow of any liquid in water piping under any conditions.
- 12. No water piping shall be installed outside of building or in an exterior wall unless adequate provisions are made to protect such pipe from freezing.
- 13. All piping and drain openings left unattended will be capped, plugged or securely covered to prevent accidental entry of foreign matter. Roof drains in use will be provided with domes.

B. Joints and Connections

- 1. Smoothly ream all cut pipe; cut all threads straight and true; apply best quality Teflon tape to all male pipe threads but not to inside the fittings; use graphite on all clean out plugs. DO NOT use Teflon tape on gas piping.
- 2. Smoothly ream all cut P.V.C. pipe. Clean and use solvent for fitting connection and in strict accordance with the manufacturer's recommendations.
- 3. Make all joints in copper water tube with solder applied in strict accordance with the

manufacturer's recommendations.

- C. Coordinate with the concrete contractor to depress the finished floor where indicated on drawings. Install floor drains at low points of surface areas to be drained. Adjust grates of drains 1/32" below finished floor, unless otherwise indicated. Finished floor shall be depressed according to the following drainage area radii:
 - 1. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - 2. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - 3. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3.04 STERILIZATION AND FLUSHING OF PIPES

- A. After preliminary purging of the system, chlorinate the new potable water system in accordance with the current recommendations of the American Water Works Association, and in accordance with all pertinent codes and regulations. Chlorinate only when the building is unoccupied.
- B. Upon completion of the sterilization, thoroughly flush the entire potable water system.
- C. After sterilization and flushing are complete, a sample shall be collected from the end of the longest main, or at any other location selected by the Architect, and a water analysis test provided. The test must prove the water acceptable or additional disinfecting of system performed. A copy of the test report shall be submitted to the Architect.

3.05 CLOSING IN UNINSPECTED WORK

- A. Do not cover up or enclose work until it has been properly and completely inspected and approved.
- B. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Architect and at no additional cost to the Owner.

3.06 TESTING OF PIPING

Tests shall be applied to the plumbing installation as required by codes and where as directed by the Architect, and in all cases before work is covered by earth fill or pipe covering.

- A. Sanitary piping shall be tested when all underground work is complete (before covering) and again, after all piping is installed, but before it is further closed in. Sanitary systems shall be securely stopped, except at the highest point, and the entire system filled with water to the point of overflow for 24 hours. All leaks shall be repaired. Cracked pipes and fitting shall be removed and replaced. No doping of soil pipe or fittings will be allowed. Plan testing around expected weather and temperature conditions or provide protection so that pipes do not freeze.

- B. New domestic water piping shall be filled and subjected to a hydrostatic pressure test of 150 psi for 8 hours with no leaks. If leaks are detected they shall be repaired and the test repeated until work is tight. NOTE: Testing with compressed air only is NOT ACCEPTABLE.
- C. Testing of Fuel Gas piping shall conform to NFPA 54. Testing of natural gas piping shall also conform to the requirements of the gas supplier.

3.07 BALANCING

Balance the domestic hot water recirculation system. Divide the rated pump flow by the number of recirc branches so that the expected return flows from each branch are approximately equal. Start with all the balancing valves fully open, then close (and/or reopen) them slightly, starting with the one closest to the pump, then repeat incrementally each until the desired flow is reached in each. This is most quickly accomplished with a man placed at each valve, communicating through walkie-talkies.

3.08 CLEANING

- A. Prior to acceptance of the buildings, thoroughly clean all exposed portions of the this installation, removing all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the plumbing item, being careful to avoid all damage to finished surfaces. Additional attention may be required to thoroughly clean any used, re-used or owner provided fixtures.
- B. Clean out all strainers and aerators and adjust or replace washers, cartridges, etc

3.09 INSTRUCTIONS

On completion of the job, this Contractor shall provide a competent technician to thoroughly instruct the Owner's Representative in the care and operation of the system. The time of instruction shall be arranged with the Owner.

3.10 RECYCLING

Discarded materials, both new and removed, shall be recycled whenever practical through metal salvage dealers (piping, etc.), paper salvage (cardboard shipping containers, etc.), wood products, etc. The Plumbing Contractor shall retain the salvage value of discarded materials and may use this value to offset his project bid price if so desired. Toxic materials such as adhesives, coolants, etc. SHALL be disposed of in a manner acceptable to the State of Maine Department of Environmental Protection.

3.11 HAZARDOUS MATERIALS

Mercury or any other material deemed by the Federal Environmental Protection Agency or the State Department of Environmental Protection to be hazardous shall not be used in any components of the plumbing systems.

END OF SECTION

**SECTION 15600
MECHANICAL**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

General Provisions of Contract, including General and Supplementary conditions and General Requirements (if any) apply to work specified in this Section.

1.02 ALTERNATES

There are alternates that apply to this section of the project. See Part 4, "ALTERNATES".

1.03 DEFINITIONS

ATC	Automatic Temperature Control
EC	Electrical Contractor (Division 16)
GC	General Contractor
HC	Heating (mechanical) Contractor
PC	Plumbing Contractor

1.04 INTENT

It is the intent of the drawings and specifications to provide for the installation of heating, ventilating and dehumidification systems which are safe, quiet, and economical in operation and complete in all respects. The heating system will provide a uniform temperature of 74°F. in all living spaces as may be noted on the drawings, when the outside temperature is -2°F. All materials and equipment necessary to accomplish the intent shall be furnished and installed by the heating (mechanical) contractor.

1.05 COMMISSIONING

- A. A commissioning agent has been retained by and works directly for the Owner. The commissioning agent's primary responsibility shall include ensuring the mechanical systems function as designed. A full scope of the agent's duties may be provided on request.
- B. This contractor shall provide documentation on mechanical equipment that may be requested by the commissioning agent with notification provided to the Architect of such.
- C. Should the commissioning agent requested changes or alterations to the mechanical systems, said changes or alterations must be authorized by the Architect or Engineer of record prior to work. See part 1.20, "CHANGE ORDERS".
- D. The scope of the mechanical contractor's responsibility regarding commissioning shall be (but not limited) to:
 - 1. Attend commissioning meetings.

2. Coordinate factory start up of the ATC and boiler systems to include the commissioning agent. Coordination shall include as a minimum 1 week notice of factory start up tests.
3. Coordinate and provide at least one week notice of testing and balancing contractor being on site to allow the commissioning agent to observe the process.
4. Complete one page check lists on boilers, hot water heat pumps and controls.
5. Demonstrate all sequences of operation of all equipment within the boiler room.

1.06 DESCRIPTION OF WORK

A. Work Included

1. Furnish all labor, materials, equipment, transportation and perform all operations required to install a complete heating, ventilating, heat recovery and dehumidification system in the building, in accordance with these specifications and applicable drawings.
2. All temperatures are expressed in degrees Fahrenheit.
3. Perform demolition and removal as required.
4. Work to be performed shall include, but is not limited to, the following:
 - a. Provide and install forced hot water heating system in building areas indicated on drawings.
 - b. Provide and install forced hot water snow melting system in areas indicated on drawings (see part 4, "ALTERNATES").
 - c. Provide and install forced air heat recovery ventilating systems in building areas indicated on drawings.
 - d. Provide and install direct expansion dehumidification system in building areas indicated on drawings.
 - e. Pipe, valve and fittings
 - f. Hot water specialties
 - g. Circulating pumps and boiler work
 - h. Radiation
 - i. Air handling units
 - j. Unit heaters and cabinet unit heaters
 - k. Insulation
 - l. Fans
 - m. Sheetmetal
 - n. Automatic Temperature Control (ATC)
 - o. Tests and balance
5. Specifications and accompanying drawings do not indicate every detail of pipe, valves, fittings, hangers, ductwork and equipment necessary for complete installation; but are provided to show general arrangement and extent of work to be performed.
6. Before submitting proposal, Mechanical Contractor shall be familiar with all conditions. Failure to do so does not relieve Mechanical Contractor of responsibility regarding satisfactory installation of the system.

7. Mechanical contractor shall be responsible for rigging to hoist his own (and his sub-contractors') materials and equipment into place.
8. Mechanical contractor and his sub-contractors shall be responsible for start-up of all equipment provided under this section.

B. Related Work Described Elsewhere

1. Excavation and backfill
2. Cutting and patching
3. Firestopping between building construction and pipe sleeves and between building construction and ductwork.
4. Electrical conduit and wiring, except as noted below
5. Roofing, curb openings and framing of openings.
6. Setting of sleeves in masonry work (sleeves provided by Mechanical Contractor)
7. Door louvers
8. All finish work

C. Mechanical Electrical Work

1. Provide and erect all motors, temperature controls, limit switches as specified.
2. Power supply to switches, fused switches, outlets, motor starters, to line terminals of equipment, and all related wiring and fuses to properly connect and operate all electrical equipment specified shall be furnished and installed under Division 16, "ELECTRICAL". Division 16 shall not mount electrical equipment to indoor mechanical equipment without the consent of Division 15. Division 16 shall not drill wiring holes in equipment casings but shall make use of factory wiring knockouts when present. Coordinate all wiring between Mechanical and Electrical to provide a complete and operating system.
3. All wiring provided under this section shall be in accordance with the latest rules and regulations of the National Fire Underwriters, National Electric code, National Fuel Gas Code and Local Codes. Install all wiring under the supervision of Division 16. Any wiring that is not installed according to these standards, and which does not match wiring installed by Division 16 in type, quality and appearance shall be corrected by Division 16 at the expense of this section.
4. Automatic Temperature Control (ATC) Systems

Electric wiring shall be furnished and installed by ATC Contractor under supervision of Division 16. Any wiring that is not installed according to these standards, and which does not match wiring installed by Division 16 in type, quality and appearance shall be corrected by Division 16 at the expense of this section.

Low voltage control wiring must be plenum rated and adequately supported with no sags or "droops". Low voltage wiring need not be installed in conduit unless required by local code.

5. Boilers

Division 16 shall provide a separate circuit breaker for each boiler and wire to line terminals on unit control. Licensed boiler contractor shall provide all other wiring, including control and safety circuits, low water cut-off, door safety switch, and fusible switches. Note: Boilers may require only a power receptacle rather than hard wiring to unit line terminals. Division 15 to coordinate with Division 16.

6. Fans

- a. Single phase 120 volt units: Division 16 to wire to unit mounted disconnect switch with overload protection provided with unit.
- b. Fans shall operate as indicated on "FAN SCHEDULE", drawing M14 and as indicated in "Automatic Temperature Control" section of this specification.
- c. Division 16 to provide 120 volt power from exhaust fans to motor operated dampers associated with each fan (where indicated). Dampers and actuators to be provided by ATC Contractor.

7. Automatic Temperature Control (ATC) Panels

Division 16 shall provide a dedicated 120 volt, 15 amp circuit breaker for each temperature control panel. Wiring from circuit breaker to temperature control panels will be provided and installed by the ATC Contractor. Division 16 shall also provide a duplex convenience receptacle on a separate circuit within 6 feet of each panel.

8. Heat Recovery Unit

Division 16 shall provide and install disconnect switch and wire to line terminals in unit junction box.

9. Compressor/condenser (Outdoor) Unit

Division 16 shall provide and install disconnect switches and wire to line terminals in unit.

10. Air Handling (Dehumidification) Units

Division 16 shall provide and install disconnect switches and wire to line terminals in unit junction box.

11. Circulating Pumps

Division 16 shall provide and install disconnect switches and wire to line terminals in unit junction box.

12. Unit Heaters

- a. Cabinet Type: Division 16 shall wire to disconnect switch provided with unit.
- b. Propeller type: Division 16 shall provide and wire service switch with overload protection.

13. Lighting and Convenience Receptacles

Division 16 is requested to provide and install duplex convenience receptacles within 8 feet of each heat recovery ventilator and within 2 feet of ATC panel.

14. All motors 1/3 HP and smaller shall be wired for 120 volt, 1 phase, 60 hz; motors 1/2 hp and larger shall be wired for 208 volt, 1 or 3 phase, 60 hz, unless specifically shown otherwise.

15. Duct Smoke Detectors

Duct smoke detectors shall be furnished and wired by Division 16. Wiring shall include connection to heat recovery unit starting circuit(s) to interrupt power to the unit fan(s) to stop unit(s) on smoke alarm. The ATC system shall not be used to stop equipment on signal from fire alarm system. Mechanical Contractor shall install detectors in ductwork.

1.07 PERMITS

- A. This Contractor shall be responsible for providing and filing all Plans, Specifications and other documents, pay all requisite fees and secure all permits, inspections and approvals necessary for the legal installation and operation of the systems and/or equipment furnished under this Section of the Specifications.
- B. The Contractor shall frame under glass/ clear plastic all permits, secured by him, adjacent to the respective system and/or equipment and required to be displayed by Code, law or ordinance. Those permits secured but not required to be displayed shall be laminated in plastic and included in the Owner's maintenance manual.

1.08 CODES, ORDINANCES AND PERMITS

- A. All work performed under this Section of the Specifications shall be done in accordance with applicable National, State and local Codes, Laws and Ordinances. The following abbreviations are used for reference to standards which are to be followed:

AABC	Associated Air Balance Council
ADA	Americans With Disabilities Act
AMCA	Air Movement & Control Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials

BOCA	Building Officials and Code Administrators
NEC	National Electrical Code
NFPA	National Fire Protection Association
NEMA	National Electrical Manufacturer's Association
OSHA	Occupational Safety and Health Act
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriter's Laboratories

- B. The latest issue of each Code in effect at the time of bidding shall be used. Code requirements are the minimum quality and/or performance acceptable. Where the Specifications and/or Drawings indicate more stringent requirements, these requirements shall govern.

1.09 QUALITY ASSURANCE

- A. Mechanical Contractor shall have prior experience with at least two projects of this nature, size and scope and be capable of producing references indicating as such.
- B. Use sufficient qualified workpersons and competent supervisors in execution of this portion of the work to ensure proper and adequate installation of systems throughout. Technical training and certification of workpersons installing the systems specified, by the systems manufacturer, shall be mandatory prior to commencement of work. Documentation of such certification shall be made available to the Architect upon request within 5 business days.
- C. Work performed shall conform with all Local and State Rules and Regulations, as well as those of the International Building Code and National Fire Protection Association (N.F.P.A.).
- D. Piping design shall conform to ANSI, ASME B31.9 and AWS D10.9 codes.
- E. Welding standards shall conform to ANSI Boiler Code, Section IX, B31.1

1.10 MATERIALS AND SUBSTITUTIONS

All materials and equipment shall be new and of the latest design of respective manufacturers. All materials and equipment of the same classification shall be the product of the same manufacturer, unless specified otherwise.

- A. Any proposal for substitution of Mechanical equipment, materials or vendors shall be made in writing *prior to opening of bids*. Submit full details for consideration and obtain written approval of the Architect. Allow sufficient time for the Architect to include any approval to submit substitutions in an addendum so all bidders may be made aware. The phrase "or approved equal" shall be defined to mean that the Architect, not the contractor, shall make final determination whether or not substitute materials are an equal to that which is specified. The contractor shall be responsible to certify within his submittals that any equipment to be considered as an "approved equal" meets or exceeds the requirements of this specification in all aspects and will physically fit within the space provided and still provide adequate space adjacent to the equipment for service. If requested by the Architect the contractor shall provide said certification in the form of

scale drawings before review will be made. Architect will not be responsible to provide drawings for substituted materials unless the substitution is agreed upon prior to opening of bids. Architect's decision on acceptability of substitute materials shall be final.

- B. Approval by Architect for such substitution shall not relieve Mechanical Contractor from responsibility for a satisfactory installation and shall not affect his guarantee covering all parts of work
- C. Any material or equipment submitted for approval which are arranged differently or is/are of different physical size from that shown or specified shall be accompanied by shop drawings indicating different arrangements of size and method of making the various connections to equipment. Final results will be compatible with system as designed.
- D. Materials and equipment determined as an "approved equal" and/or substitutions must meet the same construction standards, capacities, code compliances, etc. as the equipment (i.e. Manufacturer, model, etc.) specified.
- E. Any additional cost(s) resulting from the substitution of equipment, regardless of acceptance by the Architect or Engineer, shall be paid by this Contractor. Additional costs may include, but not be limited to, electrical and/or structural alterations from the contract documents. Contractor shall be solely responsible to verify that substitutes will fit within the designated spaces provide while permitting adequate clearances for servicing of equipment as required by the manufacturers. Contractor shall, upon request from the Architect or Engineer of record, provide such verification of ample space and clearances in the form of drawings or any other manner requested.
- F. All materials not specified otherwise shall be manufactured within the United States and supplied locally (within the State of Maine) when available. It is preferable to obtain materials that are manufactured within 500 miles of the work site when practical.

1.11 PLANS AND SPECIFICATIONS

Mechanical Contractor shall provide his sub-contractors with a copy of the entire portion of Part 1 of this specification, portions of this specification and copies of drawings which pertain to the equipment to be supplied at no cost to the sub-contractor. Provide ATC Contractor with entire set of Electrical plans and specifications. Provide Testing and Balancing sub-contractor with copies of shop drawings indicating coil gpm's, air handling unit air volumes, etc. Failure to do so may result in the Architect providing the required materials at the Contractor's expense.

Sketches pertaining to changes and amendments during construction (ASI's, RFI's and RFP's for example) shall be contract form documents issued by the Architect and/or Engineer for use during construction and it shall be the Architect's and/or Engineer's discretion to provide sketches or full size drawings. Requests for documentation other than what is provided (full size revised drawings for instance) and deemed suitable for the particular situation shall be paid for by the contractor making the request. The cost(s) shall include, but not limited to, drafting time and reproduction costs.

1.12 ELECTRONIC DRAWINGS AND FILE SHARING

Plans and specifications may be made available in electronic format on request. Plans may be provided in either Adobe (.pdf) or CAD (.dwg or .dxf) formats and will be compressed using WinZip (.zip format). Recipient is responsible to obtain the necessary software to open the files. Note: CAD (.dwg and .dxf) files will be made available to successful bidders only after a contract is awarded.

CAD drawings are produced with AutoCAD and may be provided in the 2004 or 2010 file format. Upon request for CAD files a release form will be provided which must be signed and returned to the Engineer prior to transmission of electronic files. Physical mailing address and telephone number for the engineer of record are indicated on each drawing. E-mail address for drawing requests is rob@mechanicalsystemseng.com A signed release will not be required for Adobe based files.

All contract documents are copyrighted material. No portion of materials may be reproduced or duplicated except as indicated in the release form. Where release forms are not required (Adobe based files), materials may be printed for use by the intended recipient only and may not be reproduced or copied in any other manner or for any purpose other than for use pertaining to the construction of this project unless written permission is obtained.

1.13 SHOP DRAWINGS & SUBMITTALS

- A. As soon as possible after award of contract (*but not longer than 21 calendar days*), before any material or equipment is purchased, Mechanical Contractor shall submit shop drawings for review. Unless prior arrangements are made with the Architect all shop drawings must be submitted to the General Contractor who in turn will forward them to the Architect. The quantity of copies shall be as outlined in Division 01. If shop drawings are rejected or returned for re-submittal, Mechanical Contractor shall provide said re-submittals within 14 calendar days of receipt of original submittals with engineer's comments. If original or re-submitted shop drawings are not submitted within the allotted time frames indicated all substitutions included in the late shop drawings will be invalid and the equipment primarily specified must be provided. Any costs resulting from delays in the project schedule due to failure to submit shop drawings related to this section in a timely manner shall be the responsibility of the Mechanical Contractor. Mechanical Contractor's and vendor's name, address, telephone & fax numbers and e-mail addresses shall be provided with every shop drawing submission. Capacities indicated are minimums. Equipment submitted with capacities below specified parameters will be refused.
- B. Shop drawings shall be properly identified and shall describe in detail the material and equipment to be provided, including all dimensional data, performance data clearly indicated, fan curves, pump curves, computer selection print-outs, etc. Capacities indicated are minimums. Equipment submitted with capacities below specified parameters will be refused.
- C. Corrections or comments made on the shop drawings do not relieve the contractor from compliance with requirements of the drawings and specifications. Shop drawing review is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selecting

fabrication processes and techniques of construction; coordinating his work with that of all other trades and performing his work in a safe and satisfactory manner.

- D. Should any materials or products be purchased and/or installed without prior review and comment the contractor shall be required to remove or replace those products and/or materials, if directed by the Architect, at his expense. If the materials are not removed (or replaced) or if the project is delayed as a result of the contractor's actions, the Architect reserves the right to order the withholding of payment until the situation is resolved in a manner satisfactory to the Architect.
- E. Mechanical shop drawings shall be separate from Plumbing shop drawings. Submittals not separated from plumbing shop drawings will be refused for re-submittal.
- F. Electronic submission of shop drawings is required. Paper copies are not acceptable. Electronic files must be accessible and in an open format, meaning files must not be locked and comments may be added without altering the original content, or have interactive fields intended specifically for commenting. Locked files will not be reviewed. Hard copies of shop drawings must be original documents or good quality photocopies of original documents (photocopies of color samples are not acceptable). Faxed copies of submittal sheets will be refused unless prior arrangements are made.
- G. Review must be obtained on the following items:
 - 1. Ductwork and Accessories
 - a. Registers, diffusers, and grilles
 - b. Duct access doors
 - c. Volume control dampers (manual and automatic)
 - d. Duct sealant
 - e. Fire dampers and sleeves
 - f. Turning vanes
 - g. Side takeoff fittings
 - h. Flexible duct
 - i. Ceiling and wall access panels
 - j. Backdraft dampers
 - k. Manual dampers
 - l. Louvers and brick vents - provide color chips (photocopies not acceptable) – provide samples if substituting
 - m. Filters
 - n. Vents from gas heating appliances
 - o. Roof vents
 - 2. Mechanical Equipment (sound data must be provided with all interior motorized equipment).
 - a. Full warrantee information must be included with all submittals.
 - b. Air handling units and accessories
 - c. Outdoor (compressor/condensing) unit
 - d. Boiler units and accessories
 - e. Cabinet unit heaters - provide color chips (photocopies not acceptable)
 - f. Horizontal unit heaters

- g. Domestic hot water storage heater and accessories
- h. Fans and accessories - provide full fan curves and computer selection printouts.
- i. Heat recovery units and accessories - provide computer selection printouts.
- j. Pumps and accessories - provide full pump curves and computer selection printouts.
- k. Water to water converter and accessories
- l. Equipment identification tags

3. Piping and Accessories

- a. Pipe, valves, unions and flanges
- b. Air separator
- c. Air vents (automatic and manual)
- d. Backflow preventer
- e. Balancing valves with read-out gauge and pressure tappings. Provide a schedule clearly indicating every valve, its location, GPM, size and pressure drop.
- f. Expansion tank(s) and accessories
- g. Exterior piping support system.
- h. Flow control valves
- i. Flow measuring stations
- j. Sight flow monitors
- k. PEX tubing, fasteners, connectors and accessories
- l. Pipe and valve markers
- m. Pipe hangers and insulated pipe supports
- n. Pipe sleeve wall closure devices
- o. Pressure gauges and thermometers
- p. Pressure reducing valves
- q. Relief valves

4. Terminal Units

- a. Duct heating coils - provide computer selection printouts.
- b. Convectors
- c. Finned radiation
- d. Radiant snowmelt system and accessories (see part 4, "ALTERNATES").

5. Insulation

- a. Duct
- b. Equipment
- c. Pipe
- d. Pipe fittings
- e. Hydraulic separator

6. Automatic Temperature Control (ATC) System

1.14 PRODUCT HANDLING

A. Protection

Use all means necessary to protect heating, ventilating and dehumidification materials before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements

In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

1.15 AS-BUILT DRAWINGS

Keep in good condition at the job, apart from all other prints used in actual construction, one complete set of all blueprints furnished for this job. On this special set of blueprints, record *completely and accurately* all differences between the work as actually installed and the design as shown on the drawings. These record prints must be kept up to date by recording all changes within one week of the time that the changes are authorized. At the completion of the work, this set of drawings shall be delivered to the Architect for the Owner electronically in the form of CAD drawings. If a complete record of changes is not made and electronic CAD drawings not provided by the Mechanical Contractor, a record shall be made by the Engineers, and *the cost of the record shall be the responsibility of the Mechanical Contractor*. Copies of the mechanical CAD drawings (minus professional engineering stamps) may be made available at no cost to the Mechanical Contractor of record if desired. Drawings shall be dated accordingly and clearly identified as "AS-BUILT". See par. 1.12, "ELECTRONIC DRAWINGS AND FILE SHARING" for additional information.

1.16 MAINTENANCE MANUAL

A. On completion of this portion of the work, and as a condition of its acceptance, submit for approval two copies of a manual describing the system. Mechanical equipment manuals shall be separate from plumbing manuals. All manuals shall be original copies, not photocopies or they will be refused for re-submittal. Prepare manuals in durable 3-ring binders approximately 8½ inches by 11 inches in size with at least the following:

1. Identification on the front cover and spine stating general nature of the manual.
2. Neatly typewritten index.
3. Complete instructions regarding operation and maintenance of all equipment involved.
4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name, address and telephone number of nearest vendor of parts.
5. Copy of all guarantees and warranties issued.
6. Where contents of manuals including manufacturer's catalog pages, clearly indicate the precise item included in this installation and delete, or otherwise clearly indicate, all manufacturers' data with which this installation is not concerned.

- B. In addition to above, provide two (2) separate offset style binders properly identified, each containing a copy of all reviewed shop drawings and catalog cuts. (NOTE: May be incorporated in Maintenance Manuals, if binders are of adequate size.)
- C. Provide to the Owner, all shop drawings on CD media in a hard plastic case.

1.17 OBJECTIONABLE NOISE AND VIBRATION

Mechanical equipment shall operate without objectionable noise and vibration. Should objectionable noise or vibration be transmitted to any occupied part of the building by apparatus, piping or ducts, as determined by the Architect, the necessary changes eliminating the noise or vibration shall be made by this Mechanical Contractor at no extra cost to the Owner.

1.18 GUARANTEE

This Contractor shall guarantee all materials and workmanship furnished by him or his sub-contractors to be free from all defects for a period of no less than one (1) year from date of final acceptance of completed system and shall make good, repair or replace any defective work which may develop within that time at his own expense and without expense to the Owner. Any additional costs required to extend manufacturer's guarantee and warranty for the period specified, shall be included in Contractor's base bid.

1.19 DEVIATIONS AND DISCREPANCIES

- A. The drawings are intended to indicate only diagrammatically the extent, general character and approximate locations of mechanical work. Work indicated, but having minor details obviously omitted, shall be furnished complete to perform the functions intended without additional cost to the Owner. Follow the architectural, structural, plumbing and electrical drawings so that work under this section is properly installed and coordinated with other Sections.
- B. The drawings and specifications are complimentary to each other and what is called for in one, shall be as binding as if called for by both. In the event of conflicting information on section 15600 drawings, or between section 15600 drawings and this specification notify the Architect immediately so a clarification may be issued by addenda.
- C. Questions to the Architect or Engineers are encouraged, however any answers and/or advice is non-binding unless incorporated into the contract documents in the form of addenda, change order, etc. Inquiries requiring an answer prior to opening of bids should be made at least 4 days prior to when bids are due to allow time for a clarifying addendum to be issued.
- D. Any conflicts arising from duplication of equipment specified in different portions of the specifications shall be brought to the attention of the Architect prior to submitting bids. Failure to do so does not relieve the Contractor from responsibility of providing said materials and equipment and a credit will be taken for the duplicated item(s).
- E. Should unforeseen job conditions require re-arrangement of piping and/or ductwork resulting in deviation from the intent of the contract documents or potentially compromising the integrity of the mechanical systems, the Architect shall be notified immediately prior to commencement of work. Failure to do so will result in the

contractor being responsible to correct any work installed that is contrary to the contract documents at his own expense.

1.20 CHANGE ORDERS

- A. No change shall be made from the work, equipment, or materials under this section except as directed in writing by Engineer.
- B. All requests for change in contract price and scope shall be accompanied by a breakdown list of materials with unit and extended prices and labor hours with unit and extended price, plus markups that have been applied.

1.21 COORDINATION

- A. Contractor shall be responsible to coordinate his work with that of other trades to adjust to field conditions prior to commencing work. It is also this contractor's responsibility to coordinate locations of his own piping and ductwork to ensure the two do not conflict. If a reasonable solution cannot be achieved without compromising the integrity of the intended design or would result in additional cost the Architect must be notified immediately prior to commencement of work. Failure to do so does not relieve the Contractor from providing and installing the systems to the satisfaction of the Architect at no additional cost.
- B. Contractor shall be responsible to review job conditions and identify conflicts and/or obstructions to ductwork and piping prior to fabrication. If conflicts and/or obstructions are noted the Architect must be notified immediately prior to commencement of work. The cost of any fabrication work performed without confirmation and notification of conflicts and/or obstructions shall be the responsibility of the contractor.

1.22 REQUESTS FOR INFORMATION

Requests for Information (RFI) or other correspondences which are submitted electronically must be in an open format, meaning files must not be locked and comments may be added without altering the original content, or have interactive fields intended specifically for commenting. Locked files will not be accepted.

Requests for design criteria of the mechanical systems must be submitted in the form of an RFI and shall include the purpose for the request.

1.23 WORKPLACE SAFETY

Mechanical contractor shall be responsible for the safety of his workpeople.

1.24 MAINE HOUSING GREEN BUILDING STANDARDS

A. SECTION 4 R1: ENERGY EFFICIENCY – SYSTEMS & APPLIANCES

Standard - Energy Star labeled systems and appliances

Intent - Energy Star systems and appliances are the most fuel efficient and save resources, energy and money.

Requirements

1. Energy Star rated furnaces, boilers utilizing sealed combustion up to 300,000 BTU sizes, then use AFUE greater than or equal to 85%
2. Energy Star rated refrigerators for all units
3. Energy Star rated clothes washers for on-site laundry facilities
4. Where installed - Energy Star rated dishwashers, freezers
5. Where installed - Energy Star rated heat pumps
6. Where installed - Energy Star rated ceiling Fans
7. Energy Star rated exhaust fans
8. Energy Star rated range hoods

Verification

1. Submittals for systems and appliances highlighting Energy Star rating
2. Construction Analyst to verify installation

Resources - Consortium for Energy Efficiency: www.cee1.org/

Energy Star: www.energystar.gov/index.cfm?c=home.index

Rehab/Renovation - The requirements of this standard must be followed where building systems and appliance improvements are included within the scope of the renovation project.

Cost Implications:

Low cost - Energy Star appliances are currently often specified.

B. SECTION 4 R2 : ENERGY EFFICIENCY – SYSTEMS & APPLIANCES

Standard - Bathroom exhaust fans shall meet the requirements of ASHRAE 62.2 - 2003 Ventilation & Acceptable Indoor Air Quality in Low-Rise Residential Buildings.

Intent - To provide systems adequate for spot ventilation that could also provide background whole house ventilation if needed.

Requirements

Fan CFM rating and sone level to be sized according to ASHRAE 62.2 2003 Guidelines regarding the number of bedrooms in the unit and whether or not fans run continuously or intermittently.

Verification

1. Contractor submittals
2. Construction Analyst to verify on site.

Resources

1. Maine PUC: www.state.me.us/mpuc/doing_business/rules/part9.htm

Notes:

1. Timer controls (such as Airtrak or equivalent) can be installed to cycle the air on a set schedule in order to provide supplemental ventilation and improve air quality - this is an option and is not required by MaineHousing.
2. Airtrak Controller, Tamarack Technologies: www.tamtech.com
3. Rehab/Renovation - The requirements of this standard must be followed in all rehab projects.

Cost Implications - Low cost

C. SECTION 4 R5: ENERGY EFFICIENCY – SYSTEMS & APPLIANCES

Standard - Seal ductwork with duct mastic to prevent air leakage

Intent - Optimize performance and prevent air leakage from ductwork

Requirements - Seal duct connections with water based* duct mastic.

Areas that must be sealed include:

1. Swivel elbows
2. Branch take-offs from trunk ducts
3. Finger jointed connections
4. Folded corners of boots & fittings
5. Filter racks & plenum connections

Verification

1. Provide appropriate language in project specifications
2. Construction Analyst to verify installation

Resources – None

Notes - * Water based duct mastic has low VOC content

Rehab/Renovation - The requirements of this standard must be followed in all rehab projects

Cost Implications - Very low additional labor and material costs

PART 2 - PRODUCTS

2.01 PIPING

A. General

Provide and erect in accordance with best practice of trade all hot water supply and return, refrigerant, pump discharge, drain and vent piping shown on the plans and as required to complete intended installation. Contractor shall make offsets as shown or required to place all piping in proper position to avoid other work, and to allow application of insulation and finish painting.

B. Pipe Materials:

- | | | |
|----|--|---|
| 1. | Heating hot water | Schedule 40 standard weight black steel, ASTM 120 |
| 2. | Heating water branches above grade, 200°F. maximum | PEX crosslinked flexible tubing, ASTM F876 and F877. |
| 3. | Snow melt tubing (see part 4, 'ALTERNATES') | PEX crosslinked flexible tubing, ASTM F876 and F877. |
| 4. | Cold water, drains from relief valves and automatic vents. | Type "L" hard drawn copper tubing |
| 5. | Refrigerant | Type "L" hard drawn copper tubing. |
| 6. | Boiler vents and combustion air piping | Schedule 40 polyvinyl chloride plastic, ASTM-A-2665 or latest standard. |

C. Pipe Fittings:

- | | | |
|----|---------|---|
| 1. | Screwed | 125# cast iron screwed pattern ASTM A126, ASA B16.1 |
| 2. | Welded | Standard weight butt weld carbon steel ASTM A234, ANSI B16.9 from A106 Gr. B. seamless Tube |
| 3. | Unions | 250 malleable iron, brass to iron seats |
| 4. | Flanges | 150# forged steel slip-on ASTM A234 |
| 5. | Sweat | Cast bronze or wrought copper made up with 95-5 solder |
| 6. | PVC | Standard socket fittings with glued joints. Solvent as per ASTM-D-2564. Elbows to be long radius. |

7.	Connections to equipment	2 inches and smaller - screwed unions 2½ inches and larger – flanged
8.	Refrigerant	Cast bronze or wrought copper, long radius elbows, made up with Sil-Fos silver solder.
9.	Dielectric fitting	Steel or copper pipe to ASTM A-53, zinc electroplated body with non-corrosive thermoplastic lining, thread connections. Victaulic Style 47-TT or approved equal.

- D. All mains 2½ inches and larger shall have welded connections using standard factory-fabricated tees, elbows, reducers, and caps. Branch outlets in welded sizes shall be made with tees for full size or one size reduction and with either "Weldolets" and "Threadolets" or factory shaped nipples for all other sizes. All welds shall be made by welders certified by the State of Maine and shall be capable of welding in any position "in the field". All welds shall conform with the rules set forth in the Standard Manual on Pipe Welding of the Heating, Piping and Air Conditioning Contractors national Association. All slip on fittings shall be back welded. Fire extinguishing equipment shall be kept within 25 feet of welding areas at all times. Contractor shall take additional measures when welding close to wood structures to protect the wood from igniting.
- E. Steel piping 2 inches and smaller shall have screwed connections. All threads on piping must be full length and clean-cut with inside edges reamed smooth to the full inside bore.
- F. The Mechanical Contractor may, at his option, use type "L" hard drawn copper tube for piping 2 inches and smaller in lieu of steel. His option of steel or copper MUST be stipulated in his bid and thereafter no deviation will be acceptable. If copper is to be used, the piping system shall be 100% copper with no mixture from copper to steel. New piping which is to be connected to existing shall be schedule 40 steel.
- G. The Mechanical Contractor may also, at his option, use Victaulic grooved piping products in lieu of welded and screwed joints on steel piping 2½ inches and larger. This option MUST be stipulated in his bid and thereafter no deviation will be acceptable. All grooved components shall be of one manufacturer and conform to local code approval and/or as listed by ANSI B-31.1, B-31.9, ASME, UL-FM, IAPMO or BOCA. Grooved end product manufacturer to be ISO-9001 certified.

Pipe to be grooved in accordance with Victaulic current listed standards conforming to ANSI/AWWA C-606.

Mechanical couplings shall be Victaulic Style 107H QuickVic™ "Installation Ready" stab-on coupling and Victaulic Style 07 Zero-Flex standard rigid coupling. Victaulic Style 177 QuickVic and Victaulic Style 77 or 75 standard coupling shall be used where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration and eliminate flexible connectors. Vic-Flange adapter Style 741 shall be used for connections to ANSI class 125/150 flanged components. Gasket shall be Grade EHP EPDM compound with a temperature operating range -30°F to +250°F and Grade E EPDM compound with a temperature operating range -30°F to +230°F.

AGS mechanical couplings 14” through 60” shall be Victaulic Style W07 rigid and Style W77 flexible. Couplings shall consist of two ductile iron housings cast with a wide key profile and flat bolt pads for metal-to-metal contact. Gaskets shall be wide-width Grade E EPDM compound of a FlushSeal® design and temperature operating range -30°F to +230°F. Vic-Flange adapter Style W741 shall be used for connections to ANSI Class 125/150 flanged components.

Fittings shall be cast ductile iron conforming to ASTM A 536, forged steel conforming to ASTM A 234, or fabricated from carbon steel pipe conforming to ASTM A 53 with factory grooved ends designed to accept Victaulic stab-on, standard, and AGS “W” series couplings.

Bolted branch outlet - branch reductions on 2” through 8” header piping shall be made with Victaulic Style 920/920N Mechanical-T outlet.

Butterfly valves are not permitted.

Ball valves 1½ inches to 6 inches in size shall be Victaulic Series 721 or Series 726 standard port valve. Ductile iron body, TFE coated seats, 800 PSI.

Miscellaneous Components - Checks, strainers and other components as recommended by the manufacturer for a minimum rating of 300 PSI for the intended service.

H. Use dielectric fittings when connecting dissimilar metals.

2.02 INTERIOR HANGERS AND SUPPORTS

A. General

1. All interior hangers and supports shall be specially manufactured for that purpose and shall be the pattern, design and capacity required for the location of use.
2. Piping specified shall not be supported from piping of other trades.
3. Hangers on hot water and drain piping shall be sized for the piping only (not including insulation). Hangers on refrigerant piping, cold water piping and where specifically indicated on drawings, shall be sized to include the insulation and include thermal hanger shields (insulated pipe supports).

Hangers for piping 2½ inches and larger shall be steel, adjustable clevis type; plain for steel pipe and copper plated for copper tubing. Carpenter & Paterson, Inc., Fig. 100 (Fig. 100 CT copper plated) or approved equal.

Hangers for piping 2 inches and smaller shall be steel, band type; plain for steel pipe and copper plated for copper tubing. Carpenter & Paterson, Inc., Fig. 1A (Fig. 1A CT copper plated) or approved equal.

Hangers and mounting devices for PEX tubing shall be a product of the tubing manufacturer.

4. Thermal hanger shields shall be Carpenter & Paterson, Inc., Fig. 265P or approved equal.
5. Exposed vertical risers ¾ inch and smaller shall be supported at the mid-point between floor and ceiling with split ring type hangers; copper plated for copper tubing. Carpenter & Paterson, Inc., Fig. 81 (Fig. 81 CT copper plated) or approved equal.
6. Attachments to wide flange steel members shall be adjustable beam clamp, Carpenter & Paterson, Inc., Fig. 82 or approved equal.
7. Piping suspended from walls, trench walls and partitions shall be supported by steel support bracket. Carpenter & Paterson, Inc., Fig. 69 or approved equal.

B. Hanger Rods

1. Hanger rods shall be galvanized all thread rod. Rod size shall be as follows:

<u>Pipe Size</u>	<u>Rod Size</u>
½" to 2"	3/8"
2½" to 3½"	1/2"

2. Provide toggle bolts for fastening to concrete blocks and compound anchor shields for bolts for fastening to poured concrete.
3. Provide lag points with rod couplings or side beam connectors with drive screws for fastening to wood.
4. All nuts for hanger rod to be stainless steel.

C. Supports

Provide and install angle iron supports for pipe hangers as required. Angle iron supports shall be adequate size for span and piping or equipment load.

2.05 VALVES

A. General

1. Valves shall be provided as shown and as required to make the installation and its apparatus complete in operation, locate to permit easy operation, replacement and repair. All pressures specified are steam working pressure.
2. All valves must be so constructed that they may be repacked under pressure while open.
3. Ball valves shall be installed where shut-off and isolation is required.
4. Globe valves shall be installed in all lines where regulation is required.

5. Check valves shall be installed in all lines where flow may reverse from intended direction.
6. Except for above or as otherwise noted on drawings, ball valves shall be installed in all water supply and return lines and on all drain lines.
7. All valves to comply with federal specifications and be so listed.
8. Butterfly valves shall not be used.

B. Types and Manufacturers

All valves shall be of one manufacturer and by one of the manufacturers listed. The following list is provided as a means of identifying the quality and type required.

1. Globe Valves 2 inches in size and smaller shall have bronze bodies, union bonnet, renewable composition disc for service intended, rated for 150# WSP, 300# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1590-T	590-T
Stockham	B-24-T	B-22-T
NIBCO	S-235-Y	T-235-Y
Hammond	IB423	IB413T

2. Globe Valves 2½ inches in size and larger shall have iron bodies, union trim, OS&Y, bolted bonnet, solid disc, gland packed, flanged ends. Rated for 125# WSP, 200# WOG:

	<u>Flanged Ends</u>
Milwaukee	F-2981
Stockham	G-512
NIBCO	F-718-B
Hammond	IR116

4. Ball valves 1¼ inches in size and smaller shall have bronze bodies, brass stems and chrome plated brass balls, reinforced Teflon seats and seals, blow-out proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Ports shall be "full port". Rated for 400# WOG and 350°F:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	BA-350	BA-300
Apollo	82-200	82-100
Watts	B-6081	B-6080
NIBCO	-----	-----
Hammond	8614	8604

5. Ball valves 1½ and 2 inches in size shall have bronze bodies, two piece, standard port, brass stems and chrome plated brass balls, reinforced Teflon seats and seals, blow-out proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Rated for 400# Bar non-shock cold working pressure.

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Apollo	70-200	70-300
Watts	B-6000	B-6001
NIBCO	S-580-70-66	T-580-70-66
Hammond	8513	8503

6. Ball valves 2½ inches in size and larger shall have carbon steel bodies, Type 316 stainless steel stems, Type 351 stainless steel balls (vented), glass filled Teflon seats and seals and blow-out proof stems. Shall be equipped with suitable packing for service intended. Rated for 150# WOG and 350°F:

	<u>Flanged Ends</u>
Apollo	88-140
NIBCO	F-510-CS-R-66-FS

7. Plug type Globe valves 2 inches in size and smaller shall have bronze bodies, union bonnet, stainless steel plug type disc and seat. Rated for 150# WSP, 300# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	591-A	
NIBCO	T-256-AP	

8. Check Valves 2 inches in size and smaller shall be horizontal swing type with bronze body, Teflon disc. Rated for 125# WSP, 200# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1509-T	509-T
Stockham	B-310-T	B-320-T
NIBCO	S-413-Y	T-413-Y
Hammond	IB945	IB904

9. Check valves 2½ inches in size and larger shall be horizontal swing type with iron body, bronze trim and flanged ends. Rated for 125# WSP, 200# WOG:

	<u>Flanged Ends</u>
Milwaukee	F-2974
Stockham	G-931
NIBCO	F-918-B
Hammond	IR1124

2.06 PIPE SLEEVES AND ESCUTCHEONS

A. Interior Sleeves

1. Mechanical Contractor shall set sleeves for all piping penetrating interior concrete and masonry walls and floors. Sleeves shall be schedule 40 steel pipe, two sizes larger than the carrying pipe. Pipes passing through walls and floors of frame construction need not be provided with sleeves.
2. Sleeves set in floors shall finish flush with the underside, but extend a minimum of 1 inch above the finish floor. Sleeves set in walls shall finish flush with each side. General Contractor shall grout between sleeves and surrounding masonry.
3. Spaces between sleeves and pipes shall be sealed fire and smoke tight by the General Contractor. Spaces between pipes and floors and between pipes and fire rated walls in frame construction shall also be sealed fire and smoke tight by this section. Sealant material shall be 3M brand fire barrier caulk CP25 or putty 303, Ciba-Geigy CS240 Firestop Sealant, or approved equal and shall be U.L. listed.

B. Exterior Sleeves

Where piping passes through exterior walls, provide and install a complete pipe sleeve/hydrostatic wall closure system as shown on drawings.

1. Wall sleeve shall be schedule 40 steel pipe, two pipe sizes larger than carrier pipe. Sleeve shall be the same length as the thickness of the wall served.
2. The hydrostatic closure device shall consist of identical interlocking links of solid synthetic rubber compounded to resist ozone, water, chemicals and extreme temperature variations. Each link shall be connected by corrosion resistant bolts and nuts to form a belt which is to fit snugly around the pipe. Under each bolt and nut there shall be a metal pressure plate so that when each nut is tightened the rubber links will expand between the pipe and sleeve to form a continuous, air tight and water tight seal.
3. Units to be Link-Seal system Model LS wall seal by Thunderline Corp. or approved equal.

C. Escutcheons

Where uninsulated piping passes through finish walls, floors, ceilings and partitions, provide and set two piece nickel plated steel floor and ceiling plates. Provide deep type floor plates as required for projecting sleeves. Piping through walls with insulation shall not require escutcheons.

2.07 ANCHORS

Anchors shall be provided and installed as detailed and shown on the drawings, or as required to control expansion.

2.08 PAINTING

Painting shall be provided for all equipment supports within mechanical room, exposed flanges and fittings within mechanical rooms, and where specified elsewhere within this section. Temperature control devices *shall not* be field painted.

Painting shall consist of no less than two (2) coats of rust inhibiting paint, Rust'O'leum or approved equal. Paint shall be capable of withstanding temperatures of up to 250°F.

Color shall be flat black.

2.09 POLYETHYLENE HEATING HOT WATER PIPING

A. General

Furnish and install complete system of pre-manufactured piping as shown on plans for heating hot water run-outs to individual zones and snow melt systems. Piping systems shall consist of flexible crosslinked polyethylene tubing known in the trade as PEX. Tubing shall meet ASTM F876 and F877 standards and shall be capable of service temperatures up to 200°F. & 80 psi (180°F. & 100 psi). See part 4, "ALTERNATES" for snow melt system.

B. Construction and Components

The carrier pipe shall be PEX flexible crosslinked tubing, internal diameter as indicated on drawings. Connections to copper piping shall be sweat connectors and connections to steel piping shall be threaded connectors, all provided by the tubing manufacturer and installed in strict accordance with manufacturer's instructions.

Insert fittings shall be copper or brass, ASTM F 1807

Crimp rings shall be copper (black for PEX systems), ASTM F 1807

C. PEX tubing must be labeled (on the tubing) as follows:

1. The manufacturer's name or trademark
2. The standard to which it conforms (ASTM F876, F877, or both)
3. Tube size and CTS
4. Material designation code (PEX0006)
5. Pressure/temperature rating(s)
6. SDR9

The marking interval shall be not more than five feet.

2.10 REFRIGERANT SPECIALTIES

- A. Sight glass and moisture indicator shall be provided in the liquid line at the outdoor compressor-condenser unit if not provided by the equipment manufacturer.

- B. Externally equalized expansion valve shall be installed on each liquid connection to the evaporator coil(s) if not provided by the evaporator manufacturer. Valve size shall be as verified with unit manufacturer based on actual length of piping, quantity of fittings and difference of elevation. Valve shall be manufactured by ALCO or Sporlan and installed in accordance with manufacturer's instructions.
- C. A complete charge of R-410A shall be provided for the system.
- D. The liquid line shall be provided with removable core type filter-dryer and refrigerant valves as shown on the drawings. Units to be provided with ¼ inch male pipe plug in flange plate for installation of charging valve. Units to be Sporlan for refrigerant R-401A or approved equal.
- E. Suction and liquid refrigerant piping shall be provided and installed. The refrigerant piping shall be run in an approved manner providing traps where necessary to maintain the proper gas velocities and to keep the system free of oil.

2.11 HOT WATER SPECIALTIES

A. Automatic (Preset) Balancing Valves

- 1. All finned radiation, convectors, cabinet unit heaters, unit heaters, coils and elsewhere as indicated, shall be provided on the return line from each unit with a balancing type valve equipped with readout taps to facilitate the connecting of a differential pressure meter. Valve body shall include a ball valve, flow control cartridge assembly, two (2) pressure/temperature plugs and inlet union. Valve bodies shall be line size.
- 2. Design
 - a. The GPM for the automatic flow control valves shall be factory set and shall automatically limit the rate of flow to within 5% of the specified amount.
 - b. For ½ inch to 2 inch sizes the flow cartridge shall be removable from the Y body housing without the use of special tools to provide access for regulator changeout, inspection and cleaning without breaking the main piping (Access shall be similar to that provided for removal of a Y-strainer screen).
 - c. True operating ranges of 2 - 32 psid or 5 - 60 psid are required. The design flow should be achieved at the minimum psi differential. A 50% safety factor applied to the lower operating range is not acceptable.
 - d. Each valve shall have two PIT ports.
 - e. All automatic flow control devices shall be supplied by a single source and certified flow tests, witnessed by a professional engineer, shall be available.
 - f. Provide factory product warranty of not less than five (5) years and free first year cartridge exchange.

3. Construction
 - a. Internal wear surfaces of the valve cartridge shall be electroless nickel or stainless steel.
 - b. Internal flow cartridge body shall have machined threads so the spring free height may be compensated for without the use of fixed shims. A crimped sheet metal design is not acceptable.
 - c. Internal flow cartridge shall be permanently marked with the GPM and spring range.
 - d. All valves shall be factory leak tested at 100 psi air under water.
4. Minimum ratings
 - a. ½ inch through 2 inch pipe size: 400 PSIG at 250DF
 - b. 2½ inch through 14 inch pipe size: 600 P516 at 250°F
5. Flow Verification
 - a. Where indicated on the plans, the differential pressure across the Automatic Flow Control Valve shall be measured for flow verification and to determine the amount of system over heading or under pumping.
 - b. Flow shall be verified by measuring the differential pressure across the coil served or the wide open temperature control valve and calculating the flow using the coil or valve Cv.
6. Test Kit

A differential pressure test kit shall be supplied to verify flow and measure overheating. The kit shall consist of a 4½ inch diaphragm gauge equipped with ten foot hoses and P/T adapters all housed in a vinyl case. Calibration shall be 0-35 PSID for 2-32 PSI spring range or 0 - 65 PSID for 5-60 PSI range.
7. Installation
 - a. Install automatic flow control valves on the return lines of coils as indicated on the plans. Balancing valve on supply side is not acceptable.
 - b. The standard ports and handles shall clear 1 inch thick insulation. Handle and port extensions are required for over 1 inch thick insulation.
8. Units shall be Flow Design “AutoFlow” or approved equal.
 - a. Model ACM for ¾ inch sizes.
 - b. Model AC for 1 inch to 2 inch sizes.
 - c. Model WS for 2½ inch pipe sizes and larger. Ductile iron body suitable for mounting wafer style between standard 150# or 300# flanges. The long flange bolts and nuts shall be provided with each control valve.

B. Strainers

1. All finned radiation, convectors, cabinet unit heaters, unit heaters, coils and elsewhere as indicated, shall be provided on the supply line to each unit with a strainer equipped with ports to facilitate the connecting of a pressure gauge or thermometer and a hose end drain. Body shall include a ball valve and shall be line size.
2. Construction
 - a. 20 mesh stainless steel strainer, removable without breaking the main piping.
 - b. Ball valve shall have Teflon packing, brass packing nut, blowout-proof stem, large diameter plated ball and a handle with vinyl grip.
 - c. An integral union shall be provided on the discharge end of the strainer and shall incorporate an EPDM O-ring and tailpiece. Unions shall be available in both male & female threaded and sweat configurations.
 - d. Units shall be rated for 400 psig at 250°F.
3. Strainers shall be mounted upstream of ATC control valves (see typical piping diagrams on drawings).
4. Units shall be by Flow Design or approved equal.
 - a. Model YCM for ½ inch and ¾ inch sizes.
 - b. Model YC for 1 inch to 2 inch sizes.

C. Strainers (Mains)

Provide and install line size "Y" type strainers on heating mains where shown on drawings.

Units 2 inches and smaller to be bronze construction with SS 304 screen, 250 psig at 400°F. Spirax Sarco model BT for threaded pipe and model TBT for sweat connections or approved equal.

Units 2½ inches to 8 inches in size to be cast iron construction with SS 304 screen, 125 psig at 450°F. Spirax Sarco model CI-125 for flanged pipe connections or approved equal.

D. Drains

Each downfeed radiator, convector, cabinet unit heater, unit heater and coil shall be provided with a drain valve between the shut-off valves and heating equipment at the lowest point in the piping. All low points in piping mains shall be provided with drain valves. Drain valves shall be ball valves as specified under VALVES with hose connections and metal caps.

E. Radiator Valves

All radiation shall be provided with ball valve for 125 psig at 250°F. as specified under valves.

F. Air Vents

1. Air vents shall be installed at the equipment, all high points in the piping as indicated on the plans or as may be required.
2. Automatic air vents shall be Taco 409 brass vent with ¾ inch I.D. flexible tube drain. Units by Anderson, Armstrong (No. 1-AV) or Sarco will also be considered. Pet cocks shall be installed with each unit and the drains from the vents shall be run as indicated on the plans. An air chamber shall be installed at each air vent on piping 2 inches and larger piping. Do not use on glycol systems, use manual vents only.
3. Manual air vents shall consist of air chamber with a Dole No. 14A Coin Valve with copper tube extension. Install valve in accessible location.
4. By-pass type vents shall be installed where shown and as detailed on the drawings. By-pass valves shall be plug-type globe as specified under VALVES.

G. Expansion Tanks

Furnish and install vertical pressurized replaceable bladder type water expansion tanks charged to pressures shown on the drawing M12. Tanks shall be constructed of steel for 125 psi working pressure in accordance with ASME Code, and have the necessary tappings for water connections and charging valve. Tanks shall be furnished with ASME stamp and certification papers. A copy of ASME certification shall be provided with equipment submittal.

1. Tank for heating system shall be installed with a manual shut-off valve between the tank and the system and a union between the tank and the valve.
2. Tank for heating system shall be Taco CBX series.
3. Tank for snow melt system shall be HTX Series by Flexcon Industries. See part 4, "ALTERNATES".
4. Units by Bell & Gossett or Wood will be considered. Capacities shall be as shown on drawings.

H. Backflow Preventer

Backflow preventer shall be furnished under division 15400, "PLUMBING".

I. Water Pressure Reducing Valve

Furnish and install a pressure reducing valve with brass body construction and built-in strainer in the cold water piping connected to hot water heating system as shown on the drawings. The valve shall be adjustable and be No. 335, as manufactured by Taco. Units by Bell & Gossett and Watts will be considered. Provide pressure relief valve with operating pressure 100% over system pressure, but not exceeding 100 psi.

J. Sight Flow Monitor

1. Furnish and install straight pattern sight flow monitors where shown on drawings. Units shall provide a visual indication of GPM flow.
2. Units shall be constructed of brass with a pressure rating of 3500 psi for liquid applications and a temperature rating of 240°F.
3. Materials shall include:
 - a. Brass casing, end ports and tapered shaft.
 - b. Buna-N seals
 - c. PTFE coated Alnico magnet
 - d. Type 304 stainless steel floating orifice disk
 - e. Type 316 stainless steel spring
 - f. Type 304 stainless steel pilot disk
 - g. Type 316 stainless steel retainer ring
 - h. Clear lexan window tube
4. Features shall include:
 - a. Unrestricted mounting (horizontal, vertical or inverted)
 - b. Measuring accuracy of plus/minus 2.5% of full scale in the center third of the measuring range and a plus/minus 4.0% of full scale accuracy over the entire flow measuring range.
 - c. 1 to 15 GPM flow range
 - d. Five year warranty.
5. Units shall be line size.
6. Model EFI Inflow Flow Rate Monitors, Basic Style B by Ernst Flow Industries or approved equal.

K. Flow Measuring Station

1. Provide and install flow measuring stations where show on drawings.
2. Units shall be welded, flanged or grooved into the main piping.
3. Units shall be ASTM A-120 carbon steel and shall include test ports for attachment of a flow measuring device. Maximum working pressure shall be 400 psig at a maximum temperature of 250°F. for welded or grooved application and 240 psig at a maximum temperature of 250°F. for flanged application.

4. Units shall be line size (2 inches minimum).
5. Units shall be FlowSet model VW, VG or VF by Flow Design, Inc. or approved equal.

L. Flow Control Valve

Furnish and install flow control valve with line size cast iron body and threaded ends on the discharge of pumps P4, P5 and P8. Working parts shall be easily removable for inspection and cleaning without removing valve body from the pipeline. Taco Model "Flo-Chek" or approved equal by Bell & Gossett.

M. Air Scoop

Furnish and install in-line air scoop on the inlet side of pump P8 as shown on drawings. Taco product No. 432, Bell & Gossett Model IAS or approved equal.

N. Pressure Gauges

Furnish and install pressure gauges with gauge cocks on piping where shown on drawings. Tubing to pressure gauges shall be of sufficient length to extend beyond pipe insulation and still leave enough space to easily operate the gauge cock. The dial range shall be such that the normal pressure shall be approximately midway of the dial. Gauges shall be Weiss Series 4CTS with 4½ inch dial size, stainless steel or cast aluminum case, with brass "T" handle cocks. Provide steam siphons on steam pressure gauges and bronze pressure snubbers on water pressure gauges. Units by Ashcroft, Nurnburg & Trerice will be considered.

Pressure range: Water Systems 0-60 psi

O. Thermometers

Furnish and install where indicated on the drawings and in Part 3 - EXECUTION, analog dial type thermometers with stainless steel case, 4½ or 5 inch dial size, bimetal, universal angle type. No other style will be accepted. Thermometers shall be Weiss 5VBM series. Units by Ashcroft, Nurnburg & Trerice will be considered. Provide and install thermometer wells on supply and return branch piping to duct reheat coils (when present) and two thermometers in boxes for the Owner's use.

Temperature Range: Heating System... 30°F. - 240°F.

2.12 GLYCOL AND ACCESSORIES (SEE PART 4, "ALTERNATES")

Glycol: Inhibited, nonflammable propylene glycol, low toxicity with density 8.65 lbs. per gallon and reserve alkalinity of 11 - 12. Provide a 50% (by volume) concentration of glycol in the snow melt system. Glycol shall be Proco 1000 by Chute Chemical Co. of Bangor, Maine, Safe-T-Therm by Houghton Chemical Corp. of Allston, Ma. (<http://www.houghton.com>) or approved equal. The approximate system volume is 24 gallons.

2.13 DOMESTIC HOT WATER STORAGE TANK AND HEATER

A. Storage Water Heaters

Furnish and install hot water storage tank and heater complete with all accessories as shown on drawings.

B. Tanks

Tank shall have size and capacity indicated on drawings, installed in a vertical position and constructed of 316L stainless steel in accordance with the ASME Code for Unfired Pressure Vessels to withstand a working pressure of 150 psi. Tanks shall be provided with a heating element, aquastat control tapping, cold water inlet and drain, hot water outlet and T&P relief valve connection. The heating element in the tank shall consist of a 90/10 cupronickel coil. Storage tank shall be covered with a 2 inch thick closed cell foam insulation. Outer covering shall be heavy duty rigid plastic. The entire unit shall carry a manufacturer's lifetime warranty. All connections shall be standard I.P.S. threads. The tanks shall be the dimension as shown on drawings.

C. Relief Valve

ASME temperature and pressure relief valves shall be provided and installed on the domestic hot water outlet by section 15400, "PLUMBING"

D. Units to be Super-Stor Model SS or approved equal.

2.14 CIRCULATING PUMPS P1, P2, P3, P4, P6, P7 & P8 (SEE PART 4, "ALTERNATES")

A. Furnish and install hot water circulating pumps of the type, size and capacity shown on drawings. Pumps shall employ ECM technology and capable of being dead-headed with no adverse effects. Wilo Stratos or approved equal.

B. Pumps shall be Wet rotor, glandless inline circulating pumps and shall include electronic variable speed control to operate at constant/variable differential pressure control without external sensors. Pumps must be capable of being dead headed with no damage to the pump or motor.

C. Materials and Construction

1. Circulating pumps shall be constructed with Cast-Iron bodies with factory applied Cathaphoresic coating.
2. Shafts shall be constructed of high quality stainless steel. Motor bearings shall be metal impregnated carbon sleeve bearing type. Impellers will be constructed of a high strength, glass filled polypropylene engineered composite.

D. Pumps shall include the following features:

1. Integrated synchronous motors using ECM technology with permanent magnetic rotors, sensorless control electronics and single phase electronic converters.
2. Infra-red (IR) interface for wireless communication and an infra-red monitor.
3. Integrated overload motor protection.

4. Fault contact “FC” terminals shall be included in the terminal box and are to be potentially free, normally closed contacts that open on the event of a failure.
 5. Interface (IF) modules shall be included, installed in the terminal box (Pumps P6 and P7 only). Modules shall permit dual pump communication and pump operation status.
 6. Internal programming to regulate pump on/off operation based on outdoor temperature.
 7. Internal programming to regulate pump speed in response to changes in system pressure.
 8. Internal programming to provide lead/lag operation for pumps P6 and P7. Provide interface wiring between pumps.
- E. Pumps shall have a terminal box with NPT electrical connections and a secure, gasketed cover, Class 2 protection level. Include on the face of the terminal box cover a single adjustment button, front readable graphical pump display, field adjustable for horizontal or vertical positioning of the terminal box. The display shall indicate:
1. Operation status
 2. Control mode
 3. Differential pressure or speed/setpoint
 4. Fault and warning signals
- F. Pumps shall have a coded terminal strip indicating common/neutral/ground within the terminal box for field connections for single phase 230 volt, 60 Hz power.
- G. Electrical
1. Motor shall be a minimum of class H winding insulation as defined by UL 778.
 2. Voltage variances shall be less than +/- 10% from rated voltage with pump under load conditions. Maximum amperage not to be exceeded is indicated on the pump nameplate. Electrical power to the pump is confirmed when the face of the graphic display is lit.
- H. Startup and adjustment
- Manufacturer shall provide a factory authorized mechanic to provide startup services for the pumps. Startup shall include (but not be limited to):
1. Adjustment of required pressure settings.
 2. Verification that the ATC system is able to communicate with the pumps for start/stop and alarming features as required by the ATC system.
 3. Verification that pumps P6 and P7 are communicating with each other and that the lead-lag sequencing is operating properly.
- 2.15 CIRCULATING PUMP P5 (SEE PART 4, “ALTERNATES”)
- A. Furnish and install a hot water circulating pump of the type, size and capacity shown on drawings. Pump shall employ ECM technology and capable of being dead-headed with no adverse effects. Wilo Stratos ECO or approved equal.

- B. Pump shall be Wet rotor, glandless inline circulating pump and shall include an electronic module capable of maintaining the pump generated differential pressure variable at a preset value of between 1 and 16 feet. Pump must be capable of being dead headed with no damage to the pump or motor.
- C. Pump shall be a maintenance free, self venting, system lubricated type specifically designed for quiet operation with a horizontal motor mounted directly to the pump volute.
- D. Pump volute shall be constructed of cast iron, rated at 145 PSI working pressure. Temperature range for shall be from 60° to 230°F, based on maximum ambient temperatures of 104°F.
- E. Impeller shall be constructed of engineered composite polypropylene. Shaft shall be made of hardened stainless steel and sleeve bearings made of metal impregnated carbon. Rotor can and rotor cladding shall be constructed of high quality stainless steel. Water lubricated sleeve bearings to be constricted of metal impregnated carbon. Pump shall not incorporate the use of couplings or mechanical seals of any kind.
- F. The integral motor shall be non-overloading at any point of the curve, include thermal overload protection and rated for continuous duty operating on 120 volt, 1 phase, 60 hertz alternating current.
- G. Pumps shall be a manually selectable, two speed design regardless of voltage.
- H. Pumps shall be UL and ULC approved.

2.16 HEAT EXCHANGER (SEE PART 4, "ALTERNATES")

- A. Furnish and install where shown on the drawings a brazed water to water heat exchanger. Size and capacity shall be as indicated on the drawings. Unit shall have carbon steel heads, 316L stainless steel plates, copper braze material, male pipe thread connections and cross flow pattern. Unit shall be tested at not less than 450 psig at a maximum operating temperature of 350°F. All steel portions of the unit shall be epoxy painted by the manufacturer.
- B. Unit shall be ASME certified.
- C. Warranty shall be 18 months from date of manufacture or one year from date of installation, whichever is longer.
- D. Unit shall be Model TFP by Taco or approved equal.

2.17 BOILERS

- A. Furnish and install, where shown on the drawings, wall mounted natural gas fired condensing boilers of capacity scheduled on sheet M14. Units shall be completely assembled, modulating, sealed combustion, high efficiency with a stainless steel, fire tube heat exchanger.

B. General

1. Installation shall be according to manufacturer's installation instructions and all work shall be completed in a neat and workmanship like manner.
2. Boilers shall operate at a minimum Annual Fuel Utilization Efficiency of 95% and shall comply with the energy efficiency requirements of ASHRAE 90.1, latest edition and the minimum efficiency requirements of ASHRAE 103, latest edition.
3. AFUE efficiency shall be verified through a third party testing agency under the guidance of the Hydronics Institute Division of AHRI and listed in the AHRI Certification Directory.
4. Boilers shall be capable of full modulation, with a turn down of 4 to 1
5. Boilers shall be manufactured by an ISO 9001 registered company and shall bear the ASME "H" stamp according to Section IV of the ASME Boiler and Pressure Vessel Code. The stainless steel heat exchanger shall be hydrostatically pressure tested at the factory in accordance with ASME requirements. The maximum allowable working pressure shall be 30 psig water as listed on the rating plate. The heat exchanger shall be registered with the National Board and contain a registry number on the rating plate.
6. Boilers shall be ITS / ETL certified and listed to ANSI Z21.13/CSA 4.9 test standards for US and Canada.
7. Boilers shall meet or exceed the SCAQMD (South Coast Air Quality Management District of California) Low NO_x emission requirement for 14 NG/J.
8. Boilers shall meet Department of Energy guidelines for Energy Star energy efficiency.

C. Construction

1. 439 stainless steel, fire tube heat exchanger of welded construction and shall not contain any banding materials, bolts, gaskets or O-rings in the construction.
2. Combustion chamber shall be sealed and located at the top of the heat exchanger which should be of a counterflow design and vertical to assure that sediment and any potential lime that may form will fall to the bottom away from the tube sheet.
3. Flue ways shall be of a vertical design that allows condensate to "wash down" the flue surface preventing potential combustion residue from adhering to the flue ways.
4. Boiler shall be supplied with a gas valve designed with negative pressure regulation.
5. The gas valve on the boiler shall operate with an inlet gas pressure of a minimum 5" w.c to a maximum of 13" w.c and shall be independent of the type of gas (natural or propane). If the inlet gas pressure exceeds the maximum allowable 13" w.c. a 100% lock-up type gas pressure regulator,

properly sized, must be installed in the gas supply piping and adjust as to prevent an inlet gas pressure in excess of 13" w.c.

6. The burner shall be a premix combustion type system, made with a burner head constructed of stainless material and able to provide a wide range of modulating firing rates.
7. Boiler shall be equipped with a variable speed blower system to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency.
8. Boilers shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides.
9. Boiler controls shall have an electronic display for boiler set-up, boiler status and boiler diagnostics.

D. Controls and Trim

All electrical components shall be of the highest quality manufacture and bear a UL or UL recognized label. Supply voltage shall be 120 volt / 60 hertz / single phase. ATC Contractor shall be responsible to install external control devices and wiring and adjust control sequences as specified. Boiler manufacturer shall provide qualified personnel to assist the ATC Contractor and Commissioning Agent and verify interlocks between boiler controls and building controls are installed and functioning properly and control sequences are properly adjusted.

Boiler shall be furnished with controls and boiler trim that provides:

1. High limit temperature control for a maximum of 200°F
2. Operating temperature limit of 60°F to 194°F
3. Pressure gauge dial that is clearly marked and easy to read.
4. ASME certified pressure relief valve, set to relieve at 40 psig.
5. Flue gas, outlet water temperature and return water temperature sensors
6. Low water protection
7. Built-in freeze protection
8. Outdoor sensor to provide Outdoor Reset Control
9. Domestic priority with ability to reset the boiler operating temperature
10. Allows a 0-10 VDC input signal to allow external BMS control
11. Venting and Combustion Air

Manufacturer shall provide factory authorized personnel to program and commission the boilers. Programmer shall work closely with the ATC contractor and Commissioning agent to ensure all interlocks with pumps and other external devices are in place and functioning as required.

Boiler programming shall include reset water sequences. See par. 2.35, "AUTOMATIC TEMPERATURE CONTROL (ATC)" for additional information.

Program boilers with a lead/lag sequence, switching each from lead boiler to lag boiler every 24 hours. Lead boiler shall cycle to maintain discharge temperature as required by the reset water schedule. When boiler capacity reaches 70% the lag boiler shall be

activated to share the load equally with the lead boiler. As the load increases both boilers shall modulate together to meet the demand. When the load falls below 35% of each boiler's capacity the lag boiler shall be deactivated and the lead boiler shall modulate alone to meet demand.

Installer shall be required to provide not less than one (1) hour of training to the Owner in the functions and controls of the boilers. This shall be separate from ATC system training.

E. Warranty

1. The boiler heat exchanger shall carry a ten (10) year limited warranty.
2. The parts used in the assembly of the boiler shall carry a one (1) year warranty.

F. Unit shall be a Triangle Tube Prestige SOLO series, Rinnai or approved equal.

2.18 GAS VENT SYSTEM

- A. Furnish and install as indicated on drawings, a schedule 40 PVC gas vent system complete with all required supports, braces, stiffeners, hangers and roof flashing devices on the outside.
- B. Vent system shall be installed in strict accordance with the boiler manufacturer's venting instructions and must comply with all applicable NFPA 54, ANSI Z223.1 and local codes and ordinances.

2.19 FINNED RADIATION

- A. Provide and install finned pipe radiation as indicated. Radiation shall consist of $\frac{3}{4}$ inch copper pipe with $2\frac{3}{4}$ inch x $2\frac{1}{2}$ inch x 0.011 inch aluminum fins, 55 per foot. Each radiator shall have the finned length, number of tiers (or rows) and heating surface indicated on the drawings.
- B. Covers shall be 18 gauge steel with dampered top outlet, supported by a full 22 gauge (min) factory painted back plate screwed into wall studs (2 screws per stud). Elements shall be supported by approved slide cradle hangers and universal brackets spaced a maximum of 48 inches on center. Provide return line hangers where shown on drawings. Covers shall have baked enamel finish in standard factory color.
- C. Unless shown differently on the drawings, the covers shall be a minimum of 18 inches longer than the finned length. End covers or wall sleeve and wall sleeve supports shall be provided for each end of the cover.
- D. All ratings shown on the drawings are based on 150°F. average water temperature with a 20°F. temperature drop and 1.0 GPM (500#/hr) flow.
- E. Sterling Senior. Equivalent units by Rittling and Vulcan will be considered.

2.20 CONVECTORS

- A. Convectors of the size and types listed on the drawings shall be provided and installed. They shall have removable front panels. Backs and end enclosures of the cabinets shall be constructed of not less than 20 gauge steel. Fronts and tops shall be of not less than 18 gauge steel, if less than 48 inches long and 16 gauge if 48 inches or longer. Elements shall consist of round seamless copper tubes, non-ferrous fins securely fastened to the tubing, taps at each end for venting on up-feed units and drains on down-feed units, with ratings as shown on the drawings. Cabinets shall have baked enamel finish in color to be selected by Engineer. Provide not less than two (2) color chip cards with submittals (photocopies not acceptable). Ratings shown on the drawings are based on 150°F. average water temperature with a 20°F. temperature drop and inlet grilles (where present).
- B. The following types are based on Sterling to establish a standard:
1. Fully recessed with front outlet and inlet grilles, four side overlapping front cover; Type FWG-A.
 2. All units shall be firmly fastened to the walls.
- C. Equivalent units by Rittling and Vulcan will be considered.

2.21 RADIANT SNOW MELT SYSTEM (SEE PART 4, "ALTERNATES")

- A. General
1. Provide and install a radiant snow melt system where shown. System shall consist of flexible hydronic radiant tubing anchored to wire mesh and embedded in a sand sub-base for brick pavers and a surface mounted manifold assembly. Entire system shall be a product of one manufacturer and shall be installed by the manufacturer of the system or an installer authorized by the manufacturer.
 2. The scope of work covered by these specifications includes the furnishing of labor, materials, equipment, testing, startup and owner walk through and instruction to make the heating systems indicated complete.
 3. Contractor shall have a minimum of three years experience in radiant heating systems installation.
 4. System design and layout shall be as shown on drawings. The radiant snow melt system shall be installed using tubing tied to wire mesh. Staples or any other means of anchoring the tubing is prohibited. Mechanical contractor must coordinate work with Site Contractor to provide wire mesh for tube installation. Should the radiant heat supplier and/or installer request any deviation from the design and layout shown on the drawings, the shop drawings must include detailed layout drawings generated by the supplier and/or installer.

5. Specification and plans are based on Wirsbo Systems to establish a standard of quality. Approved equals by Rahau Hydronic Systems, Stadler Corporation & Watts Radiant will be considered. Others must provide samples, references and qualifications with submittals for review.
6. System shall be complete and shall include system design, PEX tubing, wire ties, tubing 90° bend supports, manifolds, manifold support bracket assembly, manifold angle valves assembly, hePEX connection fittings, thermometers, air elimination devices, loop balancing valves and all other necessary valves, fittings, piping, and additional components required to complete the system installation.

B. Products

1. Loop Tubing

Radiant tubing shall be as outlined in par. 2.09, "POLYETHYLENE HEATING HOT WATER PIPING".

2. Manifolds

Manifolds shall be brass only, made up of Wirsbo 4 loop dezincification resistant manifolds to supply the number of loops required. The manifold assemblies shall include special compression couplings for Wirsbo PEX tubing, Blank end caps for supply manifolds and end caps with purge valve for return manifolds, and brass angle valve assembly for supply and return connections.

Each zone shall have a balancing valve mounted on the return manifold. Valves shall be a product of the snow melt system manufacturer.

Each zone shall have a shut off valve mounted on the supply manifold. Valves shall be a product of the snow melt system manufacturer.

Each manifold shall include a thermometer.

3. Thermometers

Hydronic Radiant Heating System Thermometers shall be Letro SL-2DW dial-faced with 2 inch brass sweat-wells. Letro thermometers to be installed adjacent to each other in a horizontal position in the supply and return lines on the secondary side of the mixing valve, allowing full inspection.

C. Installation

1. HePEX tubing to be installed as per manufacturers recommendations as outlined in the Wirsbo Installation Guide for snow melt systems, and in accordance with the layout and floor section detail on plan. Note hePEX tubing to be stored shielded from direct sunlight. Tubing must not be taped with adhesive tapes. Each loop shall be joint-free except where they connect to the manifolds.

2. The manifolds are to be assembled as outlined in the manufacturer's installation guide, with mounting brackets and end caps provided. Loop risers are to be made in a neat manner in a straight line and close packed to protect from damage. Loop numbers are to be clearly marked on manifolds with magic marker.
3. A pressure test shall be made on all concealed tubing and manifolds of distribution systems with 60psi air pressure prior to and during placement of the cement, and pressure shall be maintained for inspection by tradespersons as construction is completed.
4. Notification of all trades is to be coordinated with general contractor that a radiant floor system is installed and no nailing or drilling of floor shall be allowed without verification of tubing locations.
5. Tubing splices shall not be allowed except to repair puncture made during or after installation. If made, repair splice location must be carefully marked on layout and made a permanent record of installation provided to owner.
6. Clear access must be available to inspect all above ground piping.

D. Record Keeping and Notification of Changes

1. Installed layouts must be photographed before concealment. Photographs shall be properly identified as to their location, date photograph was taken and provided to the owner as a permanent record of installation.
2. A schedule of loop lengths actually installed shall be returned to the system supplier on coil cutting schedule provided.
3. Deviations from design layout. Installer shall notify designer if changes in construction, wall location, or loop layout result in loop lengths shorter than designed by 10% or more. Any changes from design shall be drawn on CAD to indicate actual loop layout and an "as installed" copy provided to supplier and for owners manual. CAD base drawings for such purposes may be available from the Architect or Engineer via disk or e-mail. Please specify CAD format. See par. 1.12, "ELECTRONIC DRAWINGS AND FILE SHARING" for additional information.
4. Deviations in sidewalk construction or materials other than those planned for shall be reported immediately to designer, as these may effect heating capacity or control plan.

E. Instructions

1. On completion of the project, instruct the owner in the floor heat system operation.
2. Provide two copies of the Owner's Operating and Maintenance Manual, bound in a three ring binder, including all component information sheets, clean copies of installation diagrams and layouts with as installed markings, and pictures of each floor area prior to enclosure.

2.22 DUCT REHEAT COIL

A. General

Furnish and install where indicated a duct mounted water heating coil, size and capacity as indicated on drawings. Coil shall be header type, 1 row, ¼ serpentine with same end piping connections.

B. Tube and Fins

Tubes shall be round, seamless copper tubing brazed into intruder header tube holes using copper brazing alloys, tested at 315 lbs and guaranteed for 250 psig working pressure. Tubes shall be staggered in the direction of air flow. Fins shall be rippled aluminum with full drawn collars to provide a continuous surface cover over the entire tube. The use of internal restrictive devices to obtain turbulent flow will not be allowed since they prevent complete drainage of the coil.

C. Mounting

Coil shall incorporate a slip flange casing for mounting in ductwork.

D. Coil shall be Trane Type ST. Units by Carrier, McQuay, USA Coil or York will be considered.

2.23 CABINET UNIT HEATERS 1 AND 2

A. Cabinet unit heaters shall be provided and installed where shown and fastened securely. The units shall be mounted as indicated on the drawings.

B. Units shall be cabinet style fan convectors with heavy gauge zinc coated painted steel cabinets, direct driven centrifugal fans and front mounted controls. Bearings shall be ball bearing type. Units shall include a low temperature aquastat on the supply pipe to the coil set at 90°F. Myson Hi-Line RC or approved equal.

C. Shut-off valves, strainer, control valve, balancing valve and drain with metal cap shall be provided for each unit.

2.24 CABINET UNIT HEATERS 3 AND 4

A. Cabinet unit heaters shall be provided and installed where shown and fastened securely. The units shall be mounted as indicated on the drawings and shall include multi-blade centrifugal fans with quiet operating three (3) speed high efficiency direct drive motor, insulated casing, coils of copper tubes with aluminum fins, tamper proof access door to motor control switch. Capacities indicated on drawings to be based on 180°F. inlet water with a 20°F. drop.

B. All units shall be provided with 3 speed fan switch and unit mounted disconnect switch with thermal overload protection, all factory installed and wired.

C. Cabinets shall be 18-gauge steel with exposed corners and edges rounded, easily removed

access panels. Finish shall be factory applied baked enamel in color as selected by Architect on visible surfaces of enclosure or cabinet. Provide two (2) color chip cards with submittals (photocopies not acceptable).

- D. Cabinet insulation shall be 2 inch thick dual density bonded glass fiber. Exposed side shall be high density erosion proof material suitable for use in airstreams up to 4500 FPM.
- E. Coils shall be evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 200 psi and 220 degrees F.
- F. Provide two (2) sets of 1 inch *pleated media* throwaway type filters for each unit as specified under paragraph 2.31, "FILTERS". One set to be provided WITH each unit from the manufacturer to be used during construction and the other set installed when project is completed.
- G. Units shall be vertical surface mounted, Trane Cabinet Unit Heater Type FFMB inverted air flow. Remote thermostat and strap-on aquastat provided by ATC Contractor. Approved equals by American Air Filter, McQuay or Sterling will be considered.
- H. Control valve, shut-off valve, balancing valve, drain valve with metal cap and air vent shall be provided on each unit.

2.25 HORIZONTAL UNIT HEATERS

- A. Furnish and install hot water type horizontal propeller unit heaters as shown. Motors shall be totally enclosed and provided with overload protection and factory wired service disconnect switch.
- B. Units shall have coils with copper tubes and aluminum fins. Supply connections shall be in at the rear bottom and return out the rear top.
- C. Provide double directional louvers on each. Remote heavy duty line voltage electric thermostat and strap-on aquastat provided by ATC Contractor.
- D. Control valve, shut -off valve, balancing valve and drain with metal cap shall be provided with each unit.
- E. Units shall be manufactured by Trane. Units by American Air Filter, McQuay or Sterling will be considered.

2.26 CENTRAL DEHUMIDIFICATION SYSTEMS

- A. Provide and install variable refrigerant flow, split system, central dehumidification systems where indicated on drawings. All components and controls must be of the same manufacturer and intended to function together as a unified system. Capacities shall be as scheduled on sheet M14. The installing contractor must be certified by the equipment manufacturer to properly install the system as specified and be able to provide evidence of certification if requested.

- B. The system (outdoor unit and air handling units) and equipment described herein are based on a Mitsubishi City-Multi system consisting of PKFY series indoor (air handling) units, PUHY outdoor (Compressor/Condenser) unit and M-NET DDC (Direct Digital Controls).

The outdoor Compressor/Condenser unit shall be a vertical discharge, 208/230 volt, three phase. Equivalent equipment meeting the features and performance requirements of this equipment will be considered.

- C. Units shall be listed by Electrical Laboratories (ETL) and bear the ETL label. All wiring shall be in accordance with the National Electrical Code (N.E.C.). Units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

Provide a full diagrammatic drawing of the dehumidification system showing all components (including equipment tags), refrigerant piping (including lengths and sizes) and control wiring with the shop drawings.

- D. Outdoor (Compressor/Condenser) Unit

1. The outdoor unit shall be intended specifically for use with other system components. It shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Unit shall be run tested at the factory.
2. The PUHY outdoor unit shall consist of one unit, factory piped to a single field piping connection and factory wired to a single point field power connection. It shall be equipped with multiple circuit boards that interface to the Mitsubishi M-NET control system and shall perform all functions necessary for operation.
3. Unit electrical power shall be 208/230 volts, 3-phase, 60 hertz and shall be capable of satisfactory operation within voltage limits of 187-228 volts.

- E. Air Handling Units

1. Units shall be models PKFY-P_NBMU-E, PKFY-P_NHMU-E and PKFY-P_NKMU-E, high-performance indoor fan coil for wall mounting and shall have a modulating linear expansion device. The PKFY shall support individual control using M-NET DDC controllers.
2. Units shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. Units shall have a self-diagnostic function and an auto restart function. Air handling units and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

3. Coil

- a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
- b. The tubing shall have inner grooves for high efficiency heat exchange.
- c. All tube joints shall be brazed with phos-copper or silver alloy.
- d. The coils shall be pressure tested at the factory.
- e. A condensate pan and drain shall be provided under the coil.
- f. Each unit shall include a condensate lift mechanism that will be able to raise drain water not less than 12 inches above the condensate pan.
- g. Both refrigerant lines to the PKFY indoor units shall be insulated.

4. Electrical

- a. Unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
- b. System shall be capable of satisfactory operation within voltage limits of 187-228.

5. Controls:

- a. Air handling units shall cycle in response to their own electronic wall mounted thermostats. Controls shall be a product of this manufacturer and installed by the ATC Contractor.
- b. In the dehumidification mode the air handler fans shall cycle on demand for cooling and signal the outdoor unit to activate. There shall be no heating associated with this system.

F. Warranty

All units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation. In addition the compressors shall have a manufacturer's limited warranty for a period of six (6) years from date of installation.

If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty shall not include labor.

2.27 HEAT RECOVERY UNIT

- A. Provide and install a rooftop, curb mounted air to air heat recovery unit as shown on drawings. Capacities shall be as scheduled on drawings.
- B. Unit shall be listed per ANSI/UL 1995, Heating and Cooling Equipment. Energy transfer ratings of the energy recovery wheel shall be ARI Certified. Unit shall bear the AMCA Certified Rating Seals for Air Performance. Performance shall be as scheduled on plans. Exhaust discharge and outside air intake shall not be located on the same side of unit casing.
- C. Standard casing panels shall be 20 gauge galvanized steel, lined with not less than 1 inch thick fiberglass insulation with Foil-Scrim-Kraft facing. Housings shall be supported by a formed structural base forming a pan to ensure weather tight construction. Lifting holes

shall be provided at the unit base. Units shall have a weatherproof sheet metal roof. The outdoor air intake opening shall be protected by a galvanized steel sheet metal weather hood, moisture eliminators, and include an automatic shutoff damper with electric operator and time delay relay to give the damper an opportunity to open prior to the fan starting. The exhaust air discharge shall be covered with a gravity back draft damper and weather hood. The exterior of the unit shall be coated with an epoxy primer and a polyurethane enamel painting system for added protection. Painting system shall be rated to meet a 1500-hour salt spray test.

- D. Access to components shall be provided through a large, tightly sealed and easily removable access panel. Access panels shall be constructed of the same materials as the unit casing. The wheel cassette shall be easily removable from the unit. The roof of the unit shall also be removable for access.
- E. The supply air and exhaust air from the building shall be oriented for a vertical inlet and discharge.
- F. Fans shall be double width double inlet design with forward curve type wheels. The blades shall be designed for maximum efficiency and quiet operation. Impellers shall be statically and dynamically balanced.

For belt driven fans V-belt drives shall be sized for a minimum 150% of driven horsepower. Sheaves shall be adjustable on fans with motors less than 10 HP to allow independent balancing of exhaust and supply airflows. Pulleys shall be of the fully machined cast type, keyed and securely attached to the fan wheel and motor shafts. Optional speed controllers on direct-drive fans shall allow independent balancing of exhaust and supply airflows.

Ground and polished steel fan shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds.

Motors shall be standard NEMA frame, energy efficient, complying with EPACT standards, for single speed ODP enclosures. Motors shall be permanently lubricated, heavy-duty type, matched to the fan load and furnished at the specified voltage and phase with thermal overload protection. Where 3-phase is indicated motors shall be VFD rated.

Fans and motors shall be mounted to a unit base with neoprene isolators as standard. Belt drive motors shall be factory mounted to an adjustable motor plate having two heavy-duty adjusting bolts for alignment and belt tension.

- G. The rotor (energy wheel) shall be made of either a light weight polymer media in a stainless steel rotor or an aluminum media, coated to prohibit corrosion in a galvanized steel rotor. All surfaces shall be permanently bonded with a desiccant for both sensible and latent recovery and be designed to insure a laminar flow. Wheels with sprayed on desiccant coatings are not acceptable. The energy recovery wheel shall transfer moisture entirely in the vapor phase. Efficiencies shall match performance as scheduled, transfer ratings must be ARI certified to standard 1060 and bear the ARI certification symbol for ARI Air-to-Air Energy Recovery Equipment Certification Program based on ARI 1060. Ratings "in accordance with 1060" without certification are not acceptable. The media shall be cleanable with low temperature steam, hot water or light detergent, without

degrading the latent recovery. Wheel media shall be independently tested and shown to conform to the requirements of NFPA-90A, documenting a flame spread of less than 25 and a smoke generation rating of less than 50.

- H. The rotor cassette shall be easily removable from the unit to facilitate rigging (if necessary) and ease of service. The wheel cassette design shall use pillow block bearings for long life. For rotors thicker than 3" an adjustable purge sector shall be included in the cassette.
- I. Filters shall be not less than 1 inch thick permanent aluminum washable type mounted in the outside air hood and in the return air plenum. The filters shall be listed by Underwriters' Laboratories as Class 2.
- J. Unit shall be equipped with a rotation sensor and controller such that should the energy recovery wheel not rotate during a signaled run period, the controller shall send a 24 volt AC signal suitable for operating a relay to be used as an alarm contact. In addition, this controller shall be equipped with an outdoor air temperature and discharge temperature sensors such that the energy recovery wheel can be modulated via a (VFD) during moderate temperature periods if desired.
- K. Unit shall require a single point 60-cycle power connection. See equipment schedule on sheet M14 for voltage and phase requirements. The electrical panel shall consist of individual motor contactors, short circuit and overload protection, disconnect switch (for pre-heaters) and control power transformer. The NEMA 3R electrical panel shall be mounted on the unit exterior for ease of access or be a factory integral panel to the unit. A factory installed and wired 120 volt convenience outlet shall be provided inside the panel. Unit shall be ETL listed and labeled.
- L. Manufacturer shall provide variable frequency drives (VFD's) for each fan. Division 16 shall mount each in the ceiling space below the unit and wire from unit controls to fans. Drives shall be for balancing purposes only.
- M. Manufacturer shall warrant to Owner that for a period of not less than eighteen (18) months from the date of shipment the goods to be delivered to Owner will in all material respects be free from defects in material and workmanship when used in a proper and normal manner. Should any failure to conform to the above appear within eighteen months after the date of shipment, manufacturer agrees upon prompt notification thereof during the Warranty Period and confirmation to manufacturer's satisfaction that the goods have been stored, installed, operated and maintained properly and in accordance with standard industry practice, to correct the non-conformity at manufacturer's option either by repairing any defective part or parts or by making available at manufacturer's plant a repaired or replacement part.

Manufacturer shall warrant to the Owner for a period of not less than 60 months that the wheel contained in the energy recovery unit in all material respects to be free from defects in material and workmanship when used in a proper and normal manner. For warranty purposes the wheel includes, media, desiccant coating, wheel hub, wheel rim and spokes.

- N. Provide a remote control panel for unit. Panel shall be located in Mechanical 08 adjacent to the ATC panel. Panel shall contain:
 - 1. A contactor to permit start/stop operation with a signal from the building ATC system
 - 2. Rotation detection
 - 3. On-Off-Auto switch
 - 4. Wheel Frost Protection
- O. Provide factory authorized start-up and Owner training by a factory authorized representative.
- P. Submittals must include performance data which incorporates total unit energy consumption (fan power, wheel operation, energy recovery, etc.) vs. energy savings.
- Q. Unit shall be provided with factory insulated curb not less than 14 inches high. Contractor shall fill the curb with fiberglass batt insulation for added thermal and sound protection.
- R. Unit shall be Semco FV series for vertical ducting. Equivalent units meeting the requirements of this specification will be considered but request for consideration must be made prior to bidding.

2.28 FANS

- A. General
 - 1. Fans with capacity and types shown on the drawings shall be provided and installed. In order to establish a standard, fan model numbers indicated below are based on Cook (unless noted otherwise) Equivalent units by Acme, Greenheck and Ilg ONLY will be considered.
 - 2. Fan selection shall be based on sloping portion of curve with spare capacity of 20% of total CFM and static pressure without increasing motor size. **Provide full fan curves with submittals that shown the entire operating range of the fan - not just the operating point. Fans that are submitted without this data will not be accepted.**
 - 3. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance and shall be listed by the Canadian Standards Association Testing Laboratory (CSA). Sones indicated on drawings are AMCA ratings and are the maximum allowable. HVI sound ratings are not acceptable. All three phase motors shall be quiet operating and high efficiency.
 - 4. All fans shown with vibration isolators on drawings shall be provided with rubber-in-shear type unless otherwise indicated.
 - 5. Motor operated dampers shall be furnished by ATC Contractor.

B. Types

1. EF-1 shall be Model XMWH series belt driven propeller fan.

Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. Motor shall be mounted on a heavy duty steel base. The propeller shall be of steel construction, statically and dynamically balanced. Wall panel and steel venturi shall be minimum 14 gauge with continuously welded corners. Unit shall bear an engraved aluminum nameplate and shall be shipped in ISTA certified transit tested packaging.

Bearings shall be regreasable, in a cast housing rated at 200,000 hours average life. Drives shall be adjustable pitch.

Motor shall be 208/3/60, premium efficiency.

Accessories shall include:

- a. Motor side guard consisting of a 14 ga. steel frame, ½ inch x 1 inch x 16 ga. expanded metal screen with removable rear panel fastened with sheet metal screws at 6 inch centers around perimeter.
- b. Epoxy powder finish throughout, including guard.

2. EF-2 and EF-3 shall be ceiling mounted, direct driven, centrifugal exhaust fan, GC Series. EF-2 shall be mounted in the ceiling and EF-3 shall be mounted below the ceiling.

Fans shall be manufactured at an ISO 9001 certified facility. Fans shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

Housing shall be minimum 20 gauge galvanized steel and acoustically insulated. Blower and motor assembly shall be mounted to a minimum 14 gauge reinforcing channel and shall be easily removable from the housing. Motor shall be mounted on rubber-in-shear vibration isolators. Unit shall be supplied with integral wiring box and receptacle. Discharge position shall be convertible from right angle to straight through by moving interchangeable panels. The outlet duct collar shall include a reinforced aluminum damper with continuous aluminum hinge rod and brass bushings. To accommodate different ceiling thickness, an adjustable prepunched mounting bracket shall be provided. Units shall be shipped in ISTA certified transit tested packaging.

Wheel shall be centrifugal forward curved type, constructed of galvanized steel. Wheel shall be balanced in accordance with AMCA Standard 204-96, *Balance Quality and Vibration Levels for Fans*.

Motors shall be open drip proof type with permanently lubricated sealed bearings, built-in thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage and phase.

Accessories shall include:

- a. Powder painted white steel grille
 - b. Fan speed controller, prewired, internally mounted.
3. SF-1 shall be in-line mounted, direct driven, centrifugal fan, GN Series. Unit shall be mounted below the ceiling.

Fans shall be manufactured at an ISO 9001 certified facility. Fans shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

Housing shall be minimum 20 gauge galvanized steel and acoustically insulated. Blower and motor assembly shall be mounted to a minimum 14 gauge reinforcing channel and shall be easily removable from the housing. Motor shall be mounted on rubber-in-shear vibration isolators. Unit shall be supplied with integral wiring box and receptacle. Discharge position shall be convertible from right angle to straight through by moving interchangeable panels. The outlet duct collar shall include a reinforced aluminum damper with continuous aluminum hinge rod and brass bushings. To accommodate different ceiling thickness, an adjustable prepunched mounting bracket shall be provided. Units shall be shipped in ISTA certified transit tested packaging.

Wheel shall be centrifugal forward curved type, constructed of galvanized steel. Wheel shall be balanced in accordance with AMCA Standard 204-96, *Balance Quality and Vibration Levels for Fans*.

Motors shall be open drip proof type with permanently lubricated sealed bearings, built-in thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage and phase.

Accessories shall include:

- a. In-line adapter plate
- b. Fan speed controller, prewired, internally mounted.

2.29 RANGE HOODS (RH)

Apartment kitchen range hoods shall be designed for under cabinet mounting, ducted operation. Hoods shall be provided from the factory with triple 4 pin PL 26 watt fluorescent lamps, 3 speed fan switch and separate light switch. Should the factory not provide lamps, they must be provided and installed by the Mechanical Contractor. Units to be 30 inches wide, 23 gauge cold rolled steel with baked-on white finish and washable aluminum mesh grease filter.

- B. Units shall be Air King ESDQ Series or approved equal. Units shall be Energy Star compliant.

2.30 SHEETMETAL

A. General

The work under this section includes all the required sheetmetal and duct work, extensions for grilles, manual dampers, automatic counterbalanced (backdraft) dampers, deflectors, setting of control dampers, grilles, registers, diffusers, flexible connections, fire dampers, brick vents and louvers, as shown on the drawings or required to make the installation complete in accordance with the intent of the drawings and specifications.

B. Ducts

1. The size of ducts marked on the drawings will be adhered to as closely as possible. The right is reserved to vary duct sizes to accommodate structural conditions during the progress of the work without additional cost to the Owners. The duct layout is schematic to indicate size and general arrangement only. All ducts shall be arranged to adjust to "field conditions". The Sheet Metal Contractor shall coordinate his work with Division 16 and other trades.
2. Ducts shall be constructed of galvanized steel in accordance with the following table of duct sizes OR the latest SMACNA HVAC Duct Construction Standards for Metal and Flexible Duct unless otherwise shown on drawings.

<u>Dimensions of Longest Side</u> (inches)	<u>Minimum Sheet</u> <u>Metal Gauge</u>
Up thru 12	26
13 --> 30	24
31 --> 42	22
43 --> 60	20
61 --> inf.	18

Dryer exhaust: 0.050 inch Aluminum

3. Methods of fabrication and installation shall be in strict accordance with guidelines set forth in the latest SMACNA Guide and Data Book for Low and Medium Pressure Duct Construction unless otherwise shown on drawings. Cross break all ducts with largest dimension being 18 inches and larger. Beaded ducts are not acceptable except for ductwork less than 18 inches in either direction.
4. All dampers and deflectors shall be a minimum of #22 gauge and stiffened as required. Splitter dampers shall not be acceptable.
5. All joints in ducts shall be made air tight, and all branches and turns shall be made with long radius elbows and fittings. Long radius elbows are defined as having a centerline radius of 12 times the width of the duct. If long radius elbows are not used, elbows 18 inches wide and larger shall be provided with fixed double wall airfoil turning vanes designed to reduce the resistance of the elbow to the equivalent of a long radius elbow with a throat radius of not less than duct width. Square elbows less than 18 inches wide shall be provided with single wall turning vanes. Square elbows with outside corners cut at 45° or

rounded are not acceptable.

6. All ducts shall be installed with necessary offsets, changes in cross sections, risers, and drops which may be required. They shall be constructed with approved joints and be supported in an approved manner.
7. Round ductwork shall be constructed in accordance with the latest SMACNA HVAC Duct Construction Standards for round and oval duct construction. Ductwork larger than 8 inches in diameter shall employ spiral seams. All turns shall be made with smooth (not segmented), long radius elbows and fittings. All seams shall be type RL-5, grooved seam pipe lock or better. *Lap seams are not permissible*. Gauge thicknesses shall be as outlined in SMACNA for galvanized steel round duct gauge selections for maximum 2 inches w.g. static pressure. Ductwork shall be supported with full wrap-around band and single hanger strap as indicated in Figure 4-4 of the 1985 edition of the SMACNA HVAC Duct Construction Standards handbook.
8. Furnish and install flexible connections on exhaust fans (where indicated), horizontal unit ventilators, horizontal cabinet unit heaters and all Mechanical units. Connections shall be made from Ventglas neoprene coated glass fabric as furnished by Ventfabrics, Inc., or approved equal.
9. Every precaution shall be taken to keep interior of duct system free from dirt and rubbish and to protect all ducts and equipment during construction. At completion, this Mechanical Contractor shall thoroughly clean all equipment to the satisfaction of the Architect.
10. Spaces between ducts and wall or floor construction shall be caulked to make smoke and water tight by this section. Sealant material shall be 3M brand fire barrier caulk CP25 or putty 303, Ciba-Geigy CS240 Firestop Sealant or approved equal.
11. Testing, Balancing and Leak Testing... See Part 3, EXECUTION
12. Requirements set forth in applicable codes (see part one) shall supercede SMACNA standards.

C. Grilles and Registers

Grilles and/or registers shall be installed at all air supply, relief, return and exhaust openings as shown. All units to be aluminum, except as noted, and provided with baked enamel finish to match color of grille or register and countersunk screw holes. Mounting screws shall be oval head type with head painted to match finish. Unless stated otherwise, the following list is based on model numbers of Anemostat to establish a standard of quality (if substituting, certified sound criteria shall be included with submittals indicating CFM and NC levels of each register and grille). Krueger, Metalaire, Titus and Price only will also be considered for review.

1. Supply Registers: Double deflection; X2HO with opposed blade damper and ¾ inch front blade spacing; front blades set horizontal.

2. Supply Grilles: Double deflection; X2H, ¾ inch blade spacing; front blades set horizontal.
3. Exhaust and Return Registers: X3HOD with opposed blade damper and ¾ inch, 45° front blade spacing, front blades set horizontal.
4. Exhaust and Return Grilles: X3HD with ¾ inch, 45° front blade spacing, front blades set horizontal.

D. Louvers

1. All exterior louvers shall be extruded aluminum construction with interior bird screens and anodized finish in color to be selected by Architect. Provide not less than 2 *original* color chip cards with submittals for review (photocopies and e-mail copies are not acceptable). Frames and blades shall have not less than 55% minimum free area and no less than 0.081 inches thick. All louvers shall comply with Section 08400 of this specification. The following list is based on model numbers of Ruskin to establish a standard of quality; approved equal units by American Air Warming and Arrow are acceptable.
2. All louvers shall be stationary blade type. Units to be 6 inches deep with certified rating of zero water penetration at free area velocity of 900 FPM based on tests in accordance with AMCA Standard 500. Units 48 inches and less in width shall be Model ELF6375X. Units greater than 48 inches in width shall have drainable blades, Model ELF6375DX.
3. Frames of all louvers to be box type for mounting in masonry. Provide factory mounting flanges on head and side jambs with extended sill for units mounted in frame walls.
4. Louvers in doors shall be provided as a part of the door by the General Contractor.

E. Brick Vents

1. All brick vents to be extruded aluminum construction with inside bird screens and anodized finish in color to be selected by the Architect. Provide not less than 2 *original* color chip cards with submittals for review (photocopies and e-mail copies are not acceptable).
2. All units shall be 8 inches deep and modular in dimension to fit 4 inch standard brick sizes. Units shall be minimum 0.125 inch thick with integral water stop, weep holes and continuous drip edge. Units shall be structurally designed to eliminate need of wall lintels with ¼ inch ribs and full depth headers at 16 inch centers (minimum).
3. Units shall be BVC100 as manufactured by Ruskin or approved equal. Provide sample if substituting.

F. Wall caps shall be provided where indicated and shall include weather hoods extending

to the bottom of the outlet. Units shall be 26 gauge (min) steel, primed for field painting and include a 0.020 inch damper with magnetic closure strips. Turn wall caps over to the General Contractor for finish painting prior to installation. All units for exhaust fans and range hoods shall be identical in appearance and shall be provided by Aldes Ventilation Corp. (<http://www.americanaldes.com>) 2000 Series or Artis Metals Company (<http://www.artiscaps.com/exhaust.html>). Wall caps provided with fans are not permissible unless they meet these design and construction standards.

G. Roof Vents

1. Furnish and install an aluminum roof curb mounted air vent hood where shown on drawings. Hood throat area shall be equal to size shown, and hood inlet shall be twice area of throat. Unit to be provided with aluminum birdscreen.
2. Unit shall include a 16 inch high insulated, self flashing curb.
3. Unit to be Skymaster Trimline Ventilator as manufactured by ACME Engineering and Manufacturing Company or approved equal.

H. Duct Sleeves

Provide aluminum duct sleeves through outside wall at all locations as shown on drawings.

I. Sealing of Ducts

All interior ductwork (except prefabricated grease ducts, welded duct and clothes dryer ducts) shall be sealed with low VOC water based duct mastic, either "MP" (Multi-Purpose), Hardcast "Iron-grip 601", Polymer Adhesive "Airseal #11", or United Duct Seal (United McGill Corp.) water base, latex or acrylic type sealant. All transverse joints to be continuously sealed. Note that, except as noted, oil or solvent based sealants are specifically prohibited for use on this project. Duct tape is prohibited except on clothes dryer ducts only, use Venture model 3520CW duct tape or approved equal. Ensure duct exterior is thoroughly cleaned prior to installing the tape. Use pop rivets in lieu of screws to fasten dryer duct fittings together.

For exterior applications, "Uni-Weather" (United McGill Corp.) neoprene based sealant shall be used. No other sealants may be used.

All seams and joints in shop and field fabricated ductwork shall be sealed by applying one layer of sealant, then immediately spanning the joint with a single layer of 3" wide open weave fiberglass tape. Sufficient additional sealant shall then be applied to completely imbed the cloth. All sealants shall be UL rated at no more than flame spread of 5 and smoke developed of 0. At contractor's option Hardcast 1602 sealant tape may be used in lap joints and flat seams.

J. Duct Access Doors

Hinged insulated access doors with seals shall be provided in ducts where indicated on drawings, or as required. Units shall be provided at each manual damper, motor operated damper, duct coil (both sides), duct mounted temperature control device and fire damper unless accessible through grilles and as shown on drawings. Units to be Ruskin Model ADH-22 for rectangular duct and Model ADR for round duct or approved equal by Elmdor.

K. Motor Operated Dampers

Motor operated control dampers mounted in ductwork shall be provided by ATC Contractor, but installed by this Contractor. Contractor shall seal dampers to ductwork to provide a completely waterproof and airtight seal between damper frames and ductwork.

L. Manual Dampers

1. See Part 3, EXECUTION for installation notes.
2. Manual dampers with smallest dimension 5 inches or less shall be shop fabricated, single 22 gauge blade, 3/8 inch rod, provided with position indicator and locking quadrant.
3. Manual dampers with smallest dimension larger than 5 inches but smaller than 11 inches shall be single blade steel, 16 gauge construction, provided with position indicator and locking quadrant. Unit shall be Ruskin Type MD35 or approved equal.
4. Manual dampers with smallest dimension larger than 11 inches shall be opposed blade steel, 16 gauge construction, linkage concealed in frame, provided with position indicator and locking quadrant. Unit shall be Ruskin Type MD35 or approved equal.
5. Dampers to be installed in aluminum ductwork shall be fabricated of aluminum or isolated from ductwork with rubber grommets between the damper and the duct to prevent oxidation between dissimilar metals.
6. Provide hand quadrants for all manual dampers, Ventline Model 560 or approved equal.

M. Fire Dampers

1. Fire dampers shall be installed to comply with NFPA Code No. 90A and shall bear a U.L. label. Provide fire rated access door at each fire damper not accessible through grille. All dampers shall comply with UL requirements for static testing and positive closure under air flow.
2. All fire dampers to be provided by damper manufacturer with integral sleeves and mounting angles. Sleeves shall be one piece, continuous with the dampers fitted inside to avoid openings which allow for air leakage. Sleeves provided "in-field" are not acceptable. Models indicated are by NCA to establish a standard:

- a. Wall and floor types for rectangular ductwork, Model FD-A-S; Type “A” for ducts greater than 12 inches in height and Model FD-B-S; Type “B” for ducts 12 inches in height and less.
 - b. Wall and floor type for round ductwork, Model FD-C-S.
 - c. Wall and Ceiling type behind registers and grilles; Model FD-A-SL
3. Provide factory mounted fusible links designed to melt at 165°F. and close the damper.
 4. Installation shall be in accordance with damper manufacturer's instructions.
- N. Dryer Box

Provide and install, at each clothes dryer, a fully recessed dryer vent box. Units to be upflow configuration, 3½ inches in depth and have a 3.1/8 inch by 4.7/8 oval top duct connection. A 4 inch diameter flexible dryer hose shall connect to interior port of the box and the box shall provide a place for the dryer hose to be stored when the dryer is pushed back to the wall.

In-O-Vate Technologies (<http://www.dryerbox.com>) Model 350 or approved equal.

2.31 FILTERS

Cabinet unit heaters with filter racks shall be provided with a minimum of three (3) sets of filters with pleated media. One set to be used during construction (and replaced by the Mechanical Contractor during construction if required as determined by the Clerk of the Works and/or the Mechanical Engineer). Second set to be installed a minimum of one (1) day and a maximum of three (3) days prior to testing and balancing and/or final inspection. The third set shall be turned over to the Owner in their original unopened shipping boxes for their future use.

Filters shall be Farr 30/30, Air Guard DP-40 or approved equal; 1 inch thick.

2.32 WALL AND CEILING ACCESS DOORS

Provide and install access doors in walls and ceilings where indicated to facilitate access to dampers, valves, duct access doors, etc. where indicated. Provide unit pricing with the bid for access panels.

2.33 EQUIPMENT IDENTIFICATION

Tag each boiler, fan, circulating pump, air handler, outdoor unit, heat recovery unit, unit heater, cabinet unit heater and switch with rectangular engraved nameplates with white letters on black, Brady Corp., Seton Name Plate Corp. or approved equals. Nameplates shall be mechanically fastened to equipment (adhesives are not acceptable). Embossed labels are not acceptable.

On Boilers, Heat Recovery Unit and Outdoor Unit nameplates shall be 4 inches by 1½ inches, Setonply Style No. M1774. On all other units nameplates shall be 2½ inches by ¾ inch, Setonply Style No. M1771. Install nameplates inside control access covers for air handlers and cabinet unit heaters.

Identify all heating hot water supply and return, snow melt supply and return, refrigerant liquid, refrigerant suction and drain piping with "Set Mark" full snap-around pipe markers by Seton Name Plate Corporation or approved equal by Brady Corp. Markers shall include both identification and direction of flow. Use yellow background with black letters for hot water supply & return, green background with black letters for refrigerant liquid & suction and green background with white letters for drain piping. Markers shall be no less than 10 feet apart except in mechanical room where they shall be not less than 20 feet apart. Identification shall read "Heating Water Supply", "Heating Water Return", "Snow Melt Supply", "Snow Melt Return", "Refrigerant Suction" and "Refrigerant Liquid" as applicable. Domestic hot and cold water piping shall be labeled differently from heating water piping.

Tag all valves (if not tagged by valve manufacturer) with 1½ inch round brass tags and #6 bead chains, Seton #M4506. Tag shall be consecutively numbered. Provide valve charts identifying valve number, valve identification and service. Mount charts in Mechanical Room in 8½ inch x 10 inch and 8½ inch x 11 inch document frames with either glass or plastic windows. Identify ducts and fire dampers with ventmark HVAC markers.

2.34 INSULATION AND CONDENSATE PROTECTION

A. General

1. Insulation shall be provided for all hot water supply and return piping, refrigerant piping, outside air intakes, exhaust and relief ducts and other insulation where shown on drawings.
2. All insulation products shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less per ASTM E 84, UL 723 and NFPA 255.

B. Hot Water Supply & Return Piping

1. All metallic hot water supply and return piping shall be insulated with heavy density fiberglass pipe insulation with 850°F. temperature rating and factory applied self sealing ASJ jacket. Cut insulation to include pipe hangers. Maximum "k" factor of 0.23 at 75°F. mean temperature difference per ASTM C 518. Owens Corning SSL II, Johns Manville Micro-Lok HP or approved equal.

Insulation thickness for hot water shall be as follows:

<u>Pipe Size</u>	<u>Insulation Thickness</u>
½" – 1½ "	1½"
2" - 8"	2"

Insulation thickness for hot water run-outs in partitions shall be as follows:

<u>Pipe Size</u>	<u>Insulation Thickness</u>
½" - 1"	½"

2. All fittings shall be wrapped with fiberglass insulation and covered with a one piece PVC insulated fitting cover secured with flare type stainless steel staples.
3. The ends of insulation on exposed pipes at valves, flanges, unions, etc., shall be finished with covering to match jacket and secured with mastic.
4. All valves 2½ inches and larger shall be wrapped with fiberglass insulation, covered and finished neat with covering material to match ASJ jacket on pipe insulation and secured with mastic.
5. Valves less than 2½ inches in size, flanges and unions shall not be insulated. Exception: All valves for cold water application shall be insulated.

C. PEX Tubing and Refrigerant Piping

1. PEX Tubing (not buried) and all refrigerant piping (not pre-insulated by equipment manufacturer) shall be insulated with flexible, closed cell elastomeric thermal insulation. Material shall be 25/50 rated (flame spread rating of 25 or less and smoke developed rating of 50 or less) when tested in accordance with ASTM E84, latest revision. Thickness shall be 2 inches on refrigerant piping and ½ inch on PEX tubing.
2. Piping and fittings exposed to the elements shall have the insulation covered with ultraviolet resistant vinyl outdoor PVC jacket, JohnsManville Zeston 300 or approved equal.
3. Materials shall have a maximum thermal conductivity of 0.27 Btu-in./h-ft²-°F at a 75°F mean temperature when tested in accordance with ASTM C177 or ASTM C 518, latest revisions.
4. Materials shall have a maximum water vapor transmission of 0.08 perm inches when tested in accordance with ASTM E 96, Procedure A, latest revision.
5. Adhesive shall be the insulation manufacturer's recommended contact adhesive: Armaflex 520, Armaflex 520 BLV.
6. Accessories such as adhesives, mastics and cements shall have the same properties as listed above and shall not detract from any of the system ratings as specified above.

D. Duct and Equipment Insulation

1. Interior duct insulation shall be a ¾ pound density, all-service fiberglass duct wrap with factory applied foil faced FRK vapor barrier facing meeting the requirements of ASTM C 1136, Type II. Insulation material shall meet the requirements of NFPA 90A, NFPA 90B, ASTM C 1290 and ASTM C 553. Operating temperature range shall be from 40°F. to 250°F. Maximum “k” factor of 0.30 at 75°F. mean temperature difference. Owens Corning Type 75, Johns Manville Microlite XG or approved equal.

2. Insulate the following ducts with 3 inches installed thickness fiberglass duct wrap:
 - a. Rooftop heat recovery unit supply and exhaust air ducts starting at the point of entry into the building (at the roof deck) to the motorized dampers.
 - b. All kitchen range hood ducts from the exterior wall to 10 feet into the building.
3. Insulation materials to carry U. L. label. All laps to be sealed and held in place with adhesive and flare staples. All lap joints to be folded under before stapling so no raw insulation will be showing. On the bottom of ducts 24 inches or wider, mechanical fasteners shall be provided approximately 12 inches O.C.

E. Condensate Protection

Solder or weld bottom and sides of ducts connected to outdoors to prevent water leaks from rain and snow. Seal duct wrap and liner to minimize condensation.

F. Installation

All insulation work shall be executed by skilled insulation workmen regularly employed in the trade.

2.35 AUTOMATIC TEMPERATURE CONTROL (ATC)

A. General

1. Furnish and install a complete system of electric/electronic temperature controls.
2. The control systems shall be provided and installed by trained control mechanics regularly employed in installation and calibration of ATC equipment by the manufacturer or manufacturer's franchised dealer of temperature control equipment.

NOTE: Control installation is not acceptable by wholesalers, contractors or by any firm whose principal business is not directly involved with the manufacture and installation of ATC systems.

Approved manufacturers and vendors are as follows (no other vendor will be accepted):

- a. T.A.C.
Maine Controls
400 Presumpscot Street
Portland, Maine 04103
(207) 774-0220
- b. Honeywell, Inc.
501 County Road
Westbrook, Maine 04092
(207) 775-3501

- c. Johnson Controls
39 Salem Street
P.O. Box 840
Lynnfield, MA 01940
1-800-288-1028, ext. 4478
 - d. Siemens Building Technologies
66 Mussey Rd.
Scarborough, Me. 04074
(207) 885-4110
- 3. Shop drawings of entire control system shall be submitted for approval before work is started. ATC Contractor is required coordinate work with the Mechanical Contractor and Commissioning Agent along with a preliminary copy of the ATC shop drawings for the purpose of coordination.
 - 4. Provide ATC technician to test the complete ATC systems sequences for specified cycles of operation with the Testing and Balancing Contractor.
 - 5. ATC Contractor must, at the end of the warranty period, furnish the Owner with all access codes and passwords assigned to the ATC control systems. ATC Contractor shall also instruct the Owner in the use and operation of the entire control system, including any software all control software that may be utilized (including a backup copy of the final software package to the Owner on CD if applicable), see paragraph F, "Instruction and Adjustment".
 - 6. See Part 4 -- ALTERNATES for additional/alternative work.

B. Scope

Control system shall consist of all area thermostats, air stream thermostats, valves, dampers, damper operators, relays, transformers, labor, program clocks and other accessory equipment, and a complete system of wiring to fulfill intent of ATC specification. Control shall be provided for, but not limited to the following:

- 1. Direct radiation
- 2. Fans operated by automatic temperature control system
- 3. Cabinet and horizontal unit heaters
- 4. Control of circulating Pumps
- 5. Control of domestic hot water
- 6. Control of heat recovery ventilation system
- 7. Control of snow melt system (see Part 4, "ALTERNATES")

C. Incidental Work by Others

- 1. The following incidental work shall be furnished by the designated contractor under the supervision of the Control Contractor.
 - a. Mechanical Contractor shall:
 - (1) Install automatic valves and separable wells that are specified to be supplied by the Control Contractor.

- (2) Furnish and install all necessary valved pressure taps, water, drain and overflow connections and piping.

b. Sheet Metal Contractor shall:

- (1) Install all automatic dampers.
- (2) Provide necessary blank-off plates required to install dampers that are smaller than duct size.
- (3) Assemble multiple section dampers with required interconnecting linkages and extend required number of shafts through duct for external mounting of damper motors.
- (4) Provide access doors or other approved means of access through ducts for service to control equipment.

c. The General Contractor shall:

- (1) Provide all necessary cutting, patching and painting.
- (2) Provide access doors or other approved means of access through ceilings and walls for service to control equipment.

d. Division 16 shall:

- (1) Provide wiring as described in Fan Schedule on sheet M14.
- (2) Wire power to all motor operated dampers.
- (3) Provide wiring from smoke detectors outside elevator doors at each floor to the motorized damper in the vent at the top of the elevator shaft. Damper shall be normally closed unless activated by the smoke detectors.

D. Electric Wiring

1. All low voltage and data wiring for installation of temperature controls shall be by ATC Contractor, except as noted. Power wiring for equipment shall be by Division 16, "ELECTRICAL".
2. ATC Contractor shall be responsible for coordinating installation of his wiring conduits with Division 16, "ELECTRICAL".

E. Submittal Brochure

The following shall be submitted for approval:

1. Control drawings with detailed wiring diagrams, including bill of material and description of operation for all systems.
2. Panel layouts and name plate lists for all local and central panels.
3. Valve and damper schedules showing size, configuration, capacity and location of all equipment.
4. Product data for all control system components.

F. Instruction and Adjustment

Upon completion of the project, the ATC Contractor shall:

1. Adjust for use by Owner, all thermostats, controllers, valves, damper operators, and relays provided under this section.
2. Furnish two (2) instruction manuals covering function and operation of control systems for use of the Owner's operating personnel. A competent technician shall be provided for instruction purposes.
3. Provide training in the setting, use and care of the ATC systems. Training shall commence after the Owner has taken possession of the building and shall not exceed two (2) hours. Cost of additional training shall be negotiated between the Owner and ATC Contractor.

G. Guarantee

Control system shall be guaranteed to be free from original defects in both material and workmanship for a period of not less than one (1) year of normal use and service. This guarantee shall become effective starting the date Architect agrees Owner has begun to receive beneficial use of the system.

H. Hazardous Materials

Mercury, asbestos or any other material deemed environmentally hazardous by the Federal Environmental Protection Agency or the State of Maine Department of Environmental Protection, shall not be used in any components of the ATC system.

I. Control Panel

Provide and install surface mounted control panel with dust tight gasketed, hinged door with enamel finish in Mechanical Room 08 where indicated on the drawings. All switches, relays and equipment necessary for system operation shall be provided in control panel including separate thermometers indicating outdoor air and re-set water temperature (on face of panel). Additionally, provide a readout indicating the discharge air temperature downstream of the duct heating coil associated with the HUR on the face of the panel.

All electric wiring within the panel shall be factory wired to terminal strips.

J. Thermostats

1. General

All thermostats shall be mounted according to current ADA requirements but not higher than 48 inches above finish floor to center.

2. All apartments, common areas and offices.
 - a. Direct Radiation: Thermostats shall be low voltage, digital, single temperature, with large backlit L.E.D. temperature display. Devices shall incorporate an internal heating temperature setpoint limit of 74°F. for use with senior housing. When user adjusts the setpoint, the display shall not be permitted to exceed the programmed maximum.
 - b. Devices shall have a battery backup for the display only.
 - c. Thermostats shall not contain mercury or any other toxic material.
 - d. Chicago Controls Model HC7445.
 - e. Provide clear, tamperproof covers in corridors and common areas.
3. Fans controlled by thermostats
Heavy duty, line voltage, all metal type. Reverse acting (cooling) for EF-2, EF-3 and SF-1.
4. Unit heaters
Thermostats shall be line voltage, single temperature.
5. Cabinet unit heaters
 - a. These thermostats shall be of the single temperature type intended for use in visible areas.
 - b. Devices may be either line voltage or low voltage.
 - c. Heavy duty with concealed adjustment and heavy duty clear plastic tamper proof covers.
6. Dehumidification system
Dehumidification systems shall be controlled by factory supplied thermostats and controllers, installed by factory authorized personnel. There shall be no interface between these devices and the heating system.

K. Automatic Control Valves

1. All control valves shall be suitable for the pressure conditions and shall close against the differential pressure involved. Valve operators shall be low voltage. Body pressure rating and connection type (screwed or sweat) shall conform to pipe schedule in this specification.
2. Direct radiation, unit heaters and cabinet unit heaters.
Valves shall be line size, two position and quiet in operation. Valves shall be guaranteed to meet the heating loads as specified.

3. Coils and snow melt system (see part 4, "ALTERNATES").

Valves shall be modulating and quiet in operation. Valves shall be sized by the ATC contractor to provide optimal performance and guaranteed to meet the heating loads as specified.

L. Miscellaneous Devices

Provide all the necessary relays, transformers, valves, positioners, switches, etc. to make a complete and operable system.

M. Motorized Dampers

1. Motorized dampers shall have 16 gauge galvanized frames not less than 2 inches in width with airfoil blades not less than 14 gauge galvanized steel, and shall be adequately braced to form a rigid assembly. No dampers shall have blades more than 6 inches wide. Dampers shall be painted with one coat of lacquer. Dampers shall be two position or proportioning as required by specific application, opposed blade type with linkage concealed within the frame. Oilite bronze bearings shall be provided at the ends of damper blades. ALL DAMPERS SHALL BE MOUNTED WITH BLADES ORIENTED HORIZONTALLY.
2. Damper operators shall be provided with bracket arrangement for location outside of air stream wherever possible. All damper motors shall be sufficient size to operate dampers, including slow opening and fast closing.
3. Dampers shall be provided with flexible metal edge and jamb seals and neoprene blade edge seals for tight closure. Leakage shall be certified to be no more than 2.0 CFM per square foot at 1 inch w.g. on units 24 inches wide and larger, 3.0 CFM per square foot at 1 inch w.g. on units less than 24 inches wide.
4. Control dampers furnished by the ATC Contractor shall include motor operated dampers installed in supply fan 1, heat recovery units and elevator shaft venting ducts. Damper operators shall be normally closed.
5. Dampers shall be Ruskin Model CD60 or approved equal by Air Balance, Arrow or Greenheck.

N. Description of Operation

1. System shall be hot water with water supplied from the boilers at a maximum of 160°F, with 20°F drop through the heating system.
2. Occupied-unoccupied Control

There shall be no automatic occupied to unoccupied control sequencing.

3. A control sequence and hardware to maintain the water temperature to the system by modulating (resetting) boiler output temperature shall be provided within each boiler's internal controls. ATC Contractor shall adjust the reset schedule to provide 160°F water @ 20°F outdoors to 90°F water @ 65°F outdoors (and higher). As the outside temperature falls, the supply water temperature shall be increased. On a rise in outdoor air temperature, the temperature of the water shall be decreased.

Supply water temperature to the heating system shall be maintained by modulating each boiler output via reset water schedules programmed at the boilers. Additional control shall be provided (at each boiler) to give priority to domestic hot water. Whenever pump P4 activates, the reset water controller shall increase boiler output temperature to 180°F water for as long as required.

Coordinate with boiler manufacturer's literature for required control components and sequences not provided with boilers.

4. Boiler Controls

- a. A true run time lead-lag control shall be supplied with the boiler controls.
- b. ATC Contractor shall provide interlock wiring between boiler controls and pump P4 for domestic hot water override control.
- c. Coordinate with boiler manufacturer for required control components (if any) and sequences not provided with boilers.
- d. Boiler manufacturer shall be required to provide qualified personnel to install boiler related controls and wiring requiring field installation. Boiler installer shall also adjust boiler controls. Installer is required to work closely with the ATC Contractor and Commissioning Agent to be sure interlocks between boiler controls and building controls are installed and functioning properly. See par. 2.17, "BOILERS".
- e. Boilers shall go cold when there is no call for heat.

5. Control of Circulating pumps

- a. Boiler Pumps P1 and P2: Each pump shall be interlocked with its respective boiler. When boiler is activated the associated pump shall operate.
- b. Primary Circulation Pump P3: Pump shall operate continuously whenever either boiler is in operation.
- c. Domestic Water Heater Pump P4: Provide and install an immersion aquastat for the domestic water storage heater. On call for heat P4 shall activate and the boiler controls shall be signaled go into the internal domestic hot water over-ride sequence. Pump control shall have a high limit (off) of 140°F. and a low limit (on) of 120°F.
- d. Heat Exchanger Pump P5 (see part 4, "ALTERNATES"): Pump P5 supplies boiler water to the heat exchanger associated with the snow melt system. Whenever pump P8 is activated pump P5 shall run. When pump P8 is deactivated pump P5 shall stop.
- e. Heating Pumps P6 and P7: Pumps shall be provided with internal outdoor air control and lead/lag control. ATC Contractor shall provide

and install interface wiring between pumps. Program pumps for lead/lag operation and pump on/off operation based on outdoor air temperature. Lead pump shall run continuously when outdoor temperature is below 62°F. and off above 65°F. (adjustable). Pressure sensors internal to the pump controls shall modulate pump speed in response to system pressure. As zone valves in the system close, the pumps shall reduce speed.

- f. Snow Melt System Pump P8 (see part 4, "ALTERNATES"): Pump P8 supplies water from the heat exchanger to the snow melt tubing under the sidewalk in front of the building. Locate a switch in the building Office on the first floor. When the switch is activate a timing sequence shall start and operate the snow melt system for one hour. When activated, pumps P5 and P8 shall start and run continuously for the duration of the timing cycle. A three way valve shall regulate water temperature to the snow melt tubing as scheduled on sheet M14.

6. Direct radiation

All direct radiation shall be controlled by single temperature thermostats and two position zone valves. When a thermostat calls for heat the zone valve opens.

7. Cabinet Unit Heaters and Unit Heaters

Units to be supplied with remote thermostats, two position zone valves on the hot water supply and aquastats on the hot water supply to each unit furnished and installed by ATC Contractor. When the thermostat calls for heat the zone valve shall open and once supply water temperature of not less than 110°F. is proven the fan shall start.

8. Heat Recovery Unit

- a. Heat recovery unit shall be provided with a factory control panel be mounted in the Mechanical Room 08 adjacent to the ATC panel. Label each panel to identify its purpose. ATC contractor shall be responsible to mount panel and provide ATC wiring.
- b. Provide duct mounted motor operated dampers in the exhaust and outdoor air intake ducts between the unit and the roof. Dampers shall be closed when unit is not operating.
- c. The energy recovery wheel shall be provided with a variable frequency drive at the factory. The ATC Contractor shall control the wheel as follows:

Provide an enthalpy sensor in the main return air duct, and enthalpy sensor in the outdoor air intake at the unit and a dry bulb discharge sensor in the supply air ductwork downstream of the duct heating coil. Provide an enthalpy controller with a setpoint switch. The condensation control setpoint shall be automatically calculated and set by the controller. If the outdoor enthalpy is less than the return enthalpy, the wheel shall modulate to maintain the supply temperature setpoint. If the outdoor enthalpy is greater than the return enthalpy, the wheel rotates at full speed (20 RPM) in summer cooling mode. If the outdoor enthalpy is

less than the return enthalpy but the outdoor temperature is greater than the supply setpoint, the wheel will rotate at minimum speed (about 0.2 RPM) in economizer mode. The controller shall automatically calculate an exhaust temperature condensation control setpoint based on the space humidity. If the exhaust temperature drops below the condensation control setpoint, the wheel will modulate slower to maintain the exhaust setpoint. The wheel receives the minimum signal from the supply temperature and condensation control loops.

9. Duct Heating Coil

- a. The duct heating coil located in the supply air (discharge) ductwork from the heat recovery unit shall be controlled from a discharge sensor in the ductwork. Provide set points mounted adjacent to the heat recovery unit controls in Mechanical 08. In addition, provide a discharge temperature read out on the face of the ATC panel in Mechanical 08.
- b. Provide a modulating control valve on the hot water supply to the coil. Initially set discharge temperature at 72°F. Valve shall modulate to maintain setpoint.
- c. Provide a freeze protection sensing element across the entire face of each coil. Should the coil discharge temperature fall below 42°F. the fans in the heat recovery unit shall be stopped and the motorized dampers in the ducts shall close.
- d. When outdoor air temperature is below 40°F. the coil valve shall be opened 1/3 to permit constant flow of hot water.

10. Fans shall operate as indicated on "FAN SCHEDULE" on sheet M14. Provide 120 volt motor operated dampers to open when fans cycle (where indicated); power wiring by Division 16 unless noted otherwise.

Exhaust Fan 1 shall operate from a smoke detector and carbon monoxide detector wired in parallel and centrally located at the ceiling of the parking area. Detectors shall be provided, installed and wired by ATC.

Exhaust Fan 2, Exhaust Fan 3 & Supply Fan 1 shall operate from heavy duty, 120 volt reverse acting cooling thermostats. When fans operate associated motorized dampers shall open.

O. Low Temperature/Flow and Boiler Failure Alarms

1. Provide an immersion aquastat (normally open) with separable well in the heating hot water supply from the boilers. Also, provide a flow switch in the hot primary water supply line served by pump P3. The aquastat shall close an alarm circuit should the water temperature from the boilers drop below its temperature setpoint (110° F. - adjustable). The flow switch will also close this alarm circuit should the circulating pumps fail. This sequence shall be disabled when outdoor temperature is above 65°F.
2. Alarm circuit shall activate a warning light in the building Office labeled as heating system failure.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all work is complete to the point where this installation may properly commence.
2. Verify that Mechanical systems may be installed in strict accordance with all pertinent codes and regulations and the approved shop drawings.

B. Discrepancies

1. In the event of discrepancy, immediately notify Architect.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 INSTALLATION OF PIPING AND EQUIPMENT

A. General

1. All piping shall be installed within building insulation.
2. Size and general arrangements as well as methods of connecting all piping, valves, and equipment shall be as indicated, or to meet requirements for complete installation.
3. All piping shall be erected to provide for easy and noiseless passage of water and refrigerant under all working conditions. Inverted eccentric reducing fittings shall be used whenever water pipes reduce in size in the direction of flow. Tee fittings with reduction in the main direction of flow (run) are not acceptable.
4. All water mains shall be run level or pitch slightly upward so that no air pockets are formed in piping. Mains shall be set at elevations so runouts feeding heating equipment shall have no pockets where air can collect or automatic vents shall be provided.
5. Where balancing valves are used, it is critical that there not be two valves installed in series anywhere throughout the piping system.
6. Provide drains with hose threads and metal caps at all low points in the water piping system.
7. In erection of piping, care must be taken to make allowance for expansion and contraction; piping shall be anchored as necessary to control expansion.
8. Runouts to hot water radiation shall be size indicated on plans and shall come off the main downward (downfeed units) or off the side (upfeed units).

9. Install approved fittings at all points of dissimilar piping connections.
10. Install a sufficient number of unions or flanges to facilitate assembly and disassembly of piping and removal of equipment.
11. Install all piping promptly, capping or plugging all open ends and making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
12. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions; promptly remove all defective materials from the job site.
13. Install pipes to clear all beams and obstructions; do not cut into or reduce the size of load carrying members without the approval of the Architect.
14. All risers and offsets shall be substantially supported.
15. Make all changes in pipe size with approved reducing fittings.
16. All low points in water piping shall be provided with an accessible plug tee or drain valve.
17. All high points in water piping shall be provided with an accessible automatic vent.
18. Maximum spacing of hangers for steel piping shall be as follows:

<u>Pipe Size</u>	<u>Spacing</u>
½", ¾" & 1"	6'-0"
1¼" & 1½"	8'-0"
2" & 3"	10'-0"

19. Maximum spacing of hangers for copper piping shall be as follows:

<u>Pipe Size</u>	<u>Spacing</u>
½", ¾" & 1"	6'-0"
1¼" & 1½"	6'-0"
2" & 3"	10'-0"

20. Maximum horizontal spacing for pipe supports for PEX shall be 18 inches.
21. Whenever possible valves shall be installed with the operating stems in the upright position, however when conditions dictate it is acceptable to position valves 90° to either side of vertical. Valves shall not be installed with the stems in the downward position.
22. Do not substitute one style of valve indicated on drawings for another unless authorized by the Architect. Example: If a gate valve is shown use ONLY a gate valve or if a ball valve is shown use ONLY a ball valve.

B. Joints and Connections

1. Smoothly ream all cut pipe; cut all threads straight and true; apply best quality Teflon tape to all male pipe threads but not to inside of fittings; use graphite on all plugs.
2. Make all joints in copper tube (water and drains) with 95-5 tin-antimony solder applied in strict accordance with the manufacturer's recommendations.
3. All joints in refrigerant tubing shall be brazed.

C. Fire Safety

Fire extinguishing equipment shall be kept within 25 feet of welding areas at all times. Contractor shall take additional measures when welding close to wood structures to protect the wood from igniting.

D. Thermometers

Install thermometers where indicated on drawings and thermometer wells on supply and return branch piping at all duct hot water heating coils and two (2) thermometers with storage cases for the Owner's use.

E. PEX tubing

1. Install PEX tubing where indicated on drawings.
2. Tubing shall be supported from building structure only, not from other piping or equipment.
3. Do not support other piping or equipment from PEX tubing.
4. PEX tubing may be threaded through structure with the structure acting as support so long as support is not provided in lengths greater than 32 inches on center. Use protective sleeves or bushings where tubing passes through metal studs. Tubing shall not have sags or low points that would prevent thorough drainage of the system.
5. Support devices shall be a product of the PEX manufacturer. Support devices shall be screwed, not nailed, into wood. Do not attach to the underside of floor decks. It is acceptable to support PEX tubing to the side of steel bar joists with "zip" strip draw bands at 16 inch centers (maximum). Leave adequate provision for pipe insulation (where used).

3.03 PIPING TEST AND ADJUST

- A. During the installation, all hot water supply and return piping shall be tested with water to a pressure of not more than 125 psi and held for a period of not less than four (4) hours. Isolate boilers and any other piping or devices not designed for this pressure. Do not use compressed air on PEX tubing systems. Any leaks shall be repaired and another test applied to the piping. All piping shall be tested before it is insulated or otherwise concealed. Contractor shall be required to certify in writing that piping has been tested and conforms to these requirements.
- B. Before operating the water systems, all piping shall be flushed out to remove oil and foreign materials. This shall be accomplished by circulating a solution of heavy duty detergent by use of Mechanical Contractor supplied pump.
- C. After the installation is complete and ready for operation, the system shall be tested under normal operating conditions in the presence of the Architect and demonstrated that the system functions as designed.
- D. It shall be demonstrated that all parts of heating systems have a free and noiseless circulation of water and that all parts are tight. It shall also be demonstrated that all units are functioning properly and that control system operates correctly.
- E. Should any defects in operation develop during the test periods, the Mechanical Contractor will proceed to correct defects immediately. Additional tests will be conducted after correction.

3.04 INSTALLATION OF DUCTWORK AND EQUIPMENT

- A. General
 - 1. Size and general arrangements as well as methods of connecting all registers, grilles, duct coils and equipment shall be as indicated, or to meet requirements for complete installation.
 - 2. Construction standards and sheet metal gauges shall be as outlined in the latest edition of the SMACNA HVAC Duct Construction Standards handbook for metal and flexible ducts unless specifically indicated otherwise.
 - 3. Do not use segmented elbows or screws to connect fittings on clothes dryer ducts. Use smooth, long radius elbows and pop rivets instead.
 - 4. Manual Dampers
 - a. Manual dampers may be shop-fabricated on units 5 inches in height and less. All dampers larger than 5 inches MUST be pre-fabricated as previously outlined in this specification.
 - b. All manual dampers located within 10 feet of a fan outlet shall have the blades oriented perpendicular to the fan shaft.
 - c. Provide duct access door as large as possible up to 12 inches x 12 inches at each manual damper larger than 5 inches.

B. Protection and Cleaning

1. All open ends of ductwork which is to be unattended for 4 hours or more shall be temporarily protected with plastic sheeting and duct tape (or similar method) to reduce the collection of construction dust and debris.
2. Prior to testing and balancing and at the end of the construction, clean the interiors of all supply and return air ductwork before changing filters in air handling equipment. Careful coordination must be maintained between the time of testing and balancing and final delivery to avoid re-accumulation of dust and debris within the duct systems which will require additional cleaning by the Mechanical Contractor.

3.05 TESTING, ADJUSTING AND BALANCING (TAB)

A. General

1. TAB contractor shall be a subcontractor to the Mechanical Contractor.
2. TAB contractor shall perform functional performance test of all Division 15 equipment and entire ATC system for specified operation and control sequences.
3. The mechanical contractor shall startup all Division 15 equipment as required by the equipment specifications. Mechanical contractor shall verify that systems are complete and operable before TAB commencing work. Ensure the following conditions:
 - a. Systems are started and operating in a safe and normal condition.
 - b. Temperature control systems are installed complete and operable.
 - c. Proper thermal overload protection is in place for electrical equipment.
 - d. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - e. Duct systems are clean of debris.
 - f. Fans are rotating correctly.
 - g. Fire and volume dampers are in place and open.
 - h. Air coil fins are cleaned and combed.
 - i. Access doors are closed and duct end caps are in place.
 - j. Air outlets are installed and connected.
 - k. Duct system leakage is minimized.
 - l. Hydronic systems are flushed, filled, and vented.
 - m. Pumps are rotating correctly.
 - n. Proper strainer baskets are clean and in place. Service and balance valves are open.
4. TAB Contractor shall submit field reports to Mechanical Contractor who shall, in turn, submit them to the General Contractor. Report defects and deficiencies noted during performance of services which prevent system testing and balance.
5. TAB contractor shall submit all verification and functional performance checklists/results, signed by indicated personnel, organized by system and sub-system.

6. TAB contractor shall submit other reports described below.

B. Work Included

1. Test, adjust and balance all air and water systems, including components to conform to air and water flow rates shown on drawings.
2. Test complete automatic temperature control sequences for specified operations described under par. 2.35, "AUTOMATIC TEMPERATURE CONTROLS".
3. Complete and submit balance report. Report shall be submitted with information noted on one side of sheet only (i.e., backside of sheet shall be blank.).
4. Testing of air and water systems will be done by the same agency.
5. Mechanical Contractor SHALL PROVIDE copies of shop drawings indicating coil gpm's, air handling unit air volumes, etc. to the Testing and Balancing contractor at no cost to the contractor.
6. Careful coordination must be maintained between the time of testing and balancing and final delivery to avoid re-accumulation of dust and debris within the duct systems which will require additional cleaning by the Mechanical Contractor.

C. Quality of Compliance

1. Qualification: TAB Contractor must be independent test and balancing agency.
2. AABC Compliance: Comply with AABC Manual MN-1 "AABC National Standards" as applicable to mechanical and hydronic distribution systems and/or Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).
3. Industry Standards: Comply with ASHRAE recommendations for measurements, instruments and testing and balancing.
4. Coordination: Work together with Automatic Temperature Control Contractor to adjust set points of various devices to balance system(s) and test ATC sequences of operation. Temperature Control Contractor shall be responsible for balancing return air, exhaust (relief) air and outdoor air dampers on Air Handling Units in order to achieve proper mixed air temperatures.
5. ASHRAE Guideline 1-1996, "The HVAC Commissioning Process".

D. Execution of TAB Work

1. TAB Contractor shall visit job site and determine that control devices, test devices and valves are correctly installed and ready for balancing.

2. Examine each air and hydronic distribution system to see that it is free from obstructions. Determine that all dampers, registers and valves are in a set or full open position; that moving equipment is lubricated, and that required filters are clean and functioning. Request that Installing Contractor perform any adjustments necessary for proper functioning of the system.
3. TAB Contractor shall use test instruments that have been calibrated within a time period recommended by the manufacturer, and have been checked for accuracy prior to start of testing, adjusting and balancing activity.
4. Verify that all equipment performs as specified. Adjust variable type drives, volume dampers, control dampers, balancing valves and control valves as required by TAB work.
5. Test pressure profile of systems by traverse as required.
6. Adjust each register and damper to handle and properly distribute design airflow within 5% of specified quantities. Mark all setpoints.
7. Adjust front and rear discharge louvers on each supply register to distribute air in an even pattern or as indicated on plans.
8. Take readings of all preset balancing valves to ensure they are providing the specified flow and record the results.
9. Document results of all testing on approved TAB report formats and submit 3 copies for approval and record within 15 days of completion of TAB work. Include a warranty period of 90 days, during which time the Architect/Engineer may request a re-check or re-adjustment of any part of the work.
10. Reports shall be compiled on a spreadsheet such as Excel, Quattro-Pro, Lotus, etc. and shall clearly indicate the following *minimum* information:
 - a. Air (Rated and Actual)
 - 1) System/unit name
 - 2) HP, BHP, voltage, amperage and fan rpm
 - 3) Static pressures; suction, discharge and total
 - 4) Total system flow rate
 - 5) Individual terminal flow rates (Terminal readings must show location, make, model and size of register, grille or diffuser).
 - 6) Provide a static pressure profile of heat recovery unit components.
 - 7) Filter status report

b. Water

- 1) Pump full flow and no-flow suction and discharge pressures.
- 2) Rated and actual amperage, voltage and total discharge head (TDH).
- 3) Calibrated balancing device readings will indicate location, size, setting, differential pressure and rated and actual gpm.

Reports to have a minimum of color or must be compatible with monochrome printers. Reports must be submitted to the Architect electronically in addition to hard copies.

E. Duct Testing

1. Ductwork mains on 4th floor shall be tested for leakage prior to installation of insulation and concealment.
2. Leakage test procedures shall follow the outlines and classifications in the latest edition of the SMACNA HVAC Duct Leakage Test manual. See Section 4 of the SMACNA leakage test manual for normal duct classifications.
3. Leakage amount shall not exceed the allotted amount for the pressure class or the allotted amount for that portion of the system, whichever is applicable.
4. Any ductwork which fails to meet the allotted leakage level shall be modified to bring it into compliance and shall retest it until acceptable leakage is demonstrated.
5. At completion of construction, Contractor shall provide written certification, on his company letterhead, indicating that all ductwork has been tested according to specified requirements. Document shall include date of test, test pressures used, leakage class and construction class of each section of ductwork tested.

F. Drawings

Drawings in CAD format may be made available to the TAB Contractor after the contract for this work is awarded. Contact the Engineer via telephone or at mechsyst@maine.rr.com and request the drawings, indicating CAD format required and a return e-mail address. See par. 1.12, "ELECTRONIC DRAWINGS AND FILE SHARING" for additional information.

G. Acceptable TAB Contractors (listed alphabetically)

1. Central Air Balance
2. Maine Air Balance
3. Tab-Tech International
4. Tekon-Technical Consultants
5. Yankee Balancing

3.06 CLOSING IN UNINSPECTED WORK

A. General

Do not cover up or enclose work until it has been properly and completely inspected and approved.

B. Contractor is required to provide not less than 48 hours advance notice to the Architect of intent to cover non-inspected work to permit time for scheduling inspections.

C. Noncompliance

Should any work be covered up or enclosed prior to all required inspections and approvals, the Architect reserves the right to order the uninspected work to be uncovered for inspection at the Contractor's expense. After the work has been inspected completely and approved, make all repairs and replacements with materials necessary for approval by the Architect and at no additional cost to the Owner.

3.07 TEMPORARY HEATING

A. Mechanical Contractor shall install the new heating system and related equipment as soon as those portions of the building are ready and the work can be performed.

B. Mechanical Contractor will be required to permanently connect as many units as possible for temporary heat.

C. At the conclusion of the temporary heating period, the complete system shall be thoroughly cleaned.

D. General Contractor will be required to assume full responsibility for the care and operation of the new equipment during its temporary use and to return the equipment to the Mechanical Contractor in perfect order, normal wear and tear excepted.

E. Water, fuel and electric power required to operate the heating system for temporary heat shall be provided by the General Contractor.

3.08 CLEANING

Prior to acceptance of the buildings, thoroughly clean all exposed portions of the Heating, Ventilating and Dehumidification installation, including the removal all labels and all traces of foreign substance. Prior to testing and balancing vacuum and clean inside of all convectors, finned radiators (spackle droppings), unit ventilators, air handling units, VAV units, fans and cabinet unit heaters. Clean the interiors of ductwork as outlined in 3.04, "INSTALLATION OF DUCTWORK AND EQUIPMENT"; paragraph "B", "Protection and Cleaning".

3.09 INSTRUCTIONS

On completion of the job, the Mechanical Contractor shall provide a competent technician to thoroughly instruct the Owner's Representative in the care and operation of the system. The total period of instruction shall not exceed two (2) hours. (ATC system instruction and boiler training shall be in addition to this instruction period). The time of instruction shall be arranged with the Owner.

3.10 REFRIGERANT PIPING

Refrigerant piping shall be installed and tested in accordance to the conditions set forth herein and as required by the manufacturer of the refrigeration equipment by personnel with not less than 5 years experience in the installation of refrigerant piping.

The installation shall be inspected and certified by the manufacturer of the refrigeration equipment prior to charging with refrigerant.

Refrigerant piping shall be run in a approved manner, providing traps where necessary to maintain gas velocities to return oil to the compressor and to keep systems free of oil slugs at the compressor. Fittings shall be long radius and soldered with Sil-Fos or silver solder. The inside of all refrigerant piping shall be thoroughly cleaned using Virginia Solvent #10 or approved equal; followed by a wiping of compressor oil and then wiped dry with a clean, dry cloth. All refrigerant piping shall then be tested with nitrogen and all joints tapped with a rubber mallet to make sure they are tight. A soap solution shall then be applied to each joint. High side test shall be a minimum of 250 psi while the low side test shall be tested to a minimum of 100 psi. Any equipment that may be damaged by these pressures shall be removed. After pressure test, a freon test shall be applied using Halide torch. The interior of the piping system shall be thoroughly cleaned of all oil, dirt and foreign matter then evacuated and dehydrated. All copper tubing shall be supported by copper coated clevis type hangers, see Paragraph 2.03; "HANGERS AND SUPPORTS". The hangers on the suction piping shall be sized to include the insulation and metal shields 12 inches long shall be placed between hangers and insulation.

3.11 RECYCLING

Discarded materials, both new and removed, shall be recycled whenever practical through metal salvage dealers (ductwork, piping, etc.), paper salvage (cardboard shipping containers, etc.), wood & plastic products, etc. The Mechanical Contractor shall retain the salvage value of discarded materials and may use this value to offset his project bid price if so desired. Toxic materials such as adhesives, coolants, refrigerants, etc. SHALL be disposed of in a manner acceptable to the State of Maine Department of Environmental Protection.

3.12 HAZARDOUS MATERIALS

Mercury, asbestos or any other material deemed hazardous by the Federal Environmental Protection Agency or the State of Maine Department of Environmental Protection, shall not be used in any components of the mechanical systems or packaging.

PART 4 - ALTERNATES

4.01 GENERAL DESCRIPTION

- A. Alternate No. 1 is an add alternate to include a snow melt system as show on drawings.
- B. No other alternate applies to this section.
- C. Snow melt system shall include the following items specified under Part 2, "PRODUCTS":
 - 1. Pumps P5 and P8
 - 2. All piping, pipe insulation, manifolds and PEX tubing associated with pumps P5 and P8.
 - 3. Heat exchanger HE-1
 - 4. Glycol
 - 5. Snow melt system controls

END OF SECTION 15600

**SECTION 15710
FIRE SPRINKLERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

General Provisions of Contract, including General and Supplementary conditions and General Requirements (if any) apply to work specified in this Section.

1.02 DEFINITIONS

- A. Reviewed equal: Shall mean that the Engineer, not the contractor, shall make final determination whether materials are an equal to that which is specified.
- B. Equal: Shall mean essentially the same as that product specified, but a model of a different manufacturer.
- C. Concealed: Shall mean in walls, in chases, above ceilings, within enclosed cabinets, otherwise enclosed.
- D. Exposed: Shall mean in finished spaces, in closets, under counters, behind and/or under equipment and/or otherwise visible.
- E. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- F. Others: Shall mean provided by sections other than this section. If not purposely assumed by another section, shall be provided by the Contractor.
- G. Materials: Shall mean any product used in the construction, including but not limited to: fixtures, equipment, piping and supplies.
- H. Piping: Shall mean pipe, fittings, hangers and valves.
- I. Provide: Shall mean the furnishing and installing of materials.
- J. Substitution: Shall mean materials of significantly different physical, structural or electrical requirements, performance, dimensions, function, maintenance, quality or cost, than that specified.

1.03 ALTERNATES

There are NO alternates that apply to this section of the project.

1.04 DESCRIPTION OF WORK

A. Work Included

Provide all design services, construction documents, labor, transportation, equipment, permits, materials, tools, inspections, incidentals, tests and perform all operations in connection with the installation of a complete new Hydraulically Designed Wet Pipe Sprinkler System in all heated areas of the buildings, with a dry system in the Parking Garage and in misc. unheated spaces and overhangs. Comply with requirements of all Authorities Having Jurisdiction. Include aesthetic considerations into the design. Coordinate with interfacing trades. Submit equipment and components for review. Prepare Shop and Record Drawings and Owner's Manuals. Assure quality of workmanship. Provide guarantees and warranties.

1. Automatic Sprinkler System shall meet the standards of the most recent edition of the National Fire Protection Association's (NFPA) NFPA 13R Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height.
2. Attic Dry Automatic Sprinkler System shall meet the standards of the most recent edition of the National Fire Protection Association's (NFPA) NFPA 13 Standard for the Installation of Sprinkler Systems.
3. A Manual Wet Class 1 Standpipe system shall be provided in the stairwells of the building and shall meet the requirements of the National Fire Protection Association's (NFPA) NFPA 14 Standard for the Installation of Standpipe, Private Hydrant and Hose Systems.

1.05 SUBMITTALS

A. Shop Drawings:

1. Within 30 working days after the Contractor has received a fully executed contract, prepare and submit Plans / Shop Drawings in accordance with the requirements of NFPA and obtain the Engineer's approval and Owner's Insurance Underwriter approval before proceeding with the fabrication and work.
2. Drawings shall include, but not be limited to:
 - a. Name of Owner and Occupant
 - b. Name and address of Contractor.
 - c. Physical Location
 - d. Plan view of system
 - e. Full height cross section or schematic diagram including ceiling construction and spray obstructions.
 - f. Locations of all partitions, with fire partitions noted.
 - g. Occupancy class for each area and minimum density of water application.
 - h. Locations of concealed spaces
 - i. Plan showing location and size of city water main, where private main attaches, all valves, distance and elevation between main and riser.

- j. Recent hydrant test showing both static and residual pressures, and date and time taken. List any significant known daily or seasonal pressure fluctuations and the cause.
 - k. Make, model and nominal K factor of sprinkler heads.
 - l. Control valves, check valves, drain pipes and test connections.
 - m. Fire department connections
 - n. Details showing riser piping configurations.
 - o. Pipe sizes.
 - p. Switches and supervisory devices.
 - q. Interface with Fire Control Panel.
3. To obtain an electronic copy of the building plan and sections, contact the Engineer. Specify required CAD format when requesting the files.
4. Procedure
 - a. As soon as possible after award of Contract, before any material or equipment is purchased, this Contractor shall submit to the Engineer no less than six (6) copies for approval. Shop drawings shall be properly identified and shall describe in detail the material and equipment shall be provided, including all dimensional data, performance data, curves, computer selection print-outs, etc.
 - b. Corrections or comments made on the submittals do not relieve the contractor from compliance with requirements of the specification. Shop drawing review is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades and performing his work in a safe and satisfactory manner.
 - c. All related items shall be submitted as a package.
4. Submit data on the following items:
 - a. Piping, fittings and couplings.
 - b. Alarm check valves and trim.
 - c. Backflow preventer.
 - d. Valves and supervisory devices.
 - e. Sprinkler heads and escutcheon plates.
 - f. Supports, hangers and accessories.
 - g. Fire Department Connections.
 - h. Any other significant item valued over \$100.00
5. Submit to the Owner's Insurance Underwriter sufficient copies for approval to allow one copy to be incorporated into each Owner's Manual in addition to the required As-Built Plans

1.06 HYDRAULIC DESIGN DATA

- A. Building Occupancy: Apartments.
- B. Water Density and Square Foot Requirements: Provide per NFPA.
- C. Codes and Requirements:
 - 1. Comply with the standards of most recent edition of the National Fire Protection Association.
 - 2. Comply with the BOCA International Building Code, all Maine State laws as well as local codes and ordinances.
 - 3. Comply with the requirements of the State Fire Marshals Office, Local Fire Chief, Owners Insurance Underwriter, Local Water District and other Authorities Having Jurisdiction

1.07 GUARANTEE

This Contractor shall guarantee all materials and workmanship furnished by him or his sub-contractors to be free from all defects for a period of no less than one (1) year from date of final acceptance of completed system and shall make good, repair or replace any defective work which may develop within that time at his own expense and without expense to the Owner.

1.08 MAINTENANCE MANUAL

On completion of this portion of the work, and as a condition of its acceptance, submit for review two copies of a manual describing the system. Prepare manuals in durable 3-ring binders approximately 8.1/2" by 11" in size with at least the following:

- A. Project name on the spine and front cover, and identification on the front cover stating the project name, general nature of the manual, and name, address and telephone number of the General and Sprinkler Contractors.
- B. Neatly typewritten index.
- C. Complete instructions regarding operation and maintenance of all equipment involved.
- D. Complete nomenclature of all frequently replaceable parts and supplies, their part numbers, and name, address and telephone number of the vendor.
- E. Copy of all guarantees and warranties issued, and dates of expiration.
- F. Shop drawings and equipment/fixtures manufacturer's catalog pages.

PART 2 – PRODUCTS

All products shall be new and must be either Factory Mutual (FM) or Underwriters' Laboratory (U.L.) listed or both.

2.01 MANUFACTURERS

- A. Equipment: Grinnell, Standard, Viking, Central Sprinkler Corp., Reliable, or equal.
- B. Heads: Viking, or equal.
- C. Flow Switch and Supervisory Device: Potter Electric Signal Company or equal.
- D. Backflow preventer: Ames or equal.

2.02 MATERIALS

A. Piping:

- 1. Outside Building, Underground: Connect where the site piping ends. Match materials and methods until inside the building.
- 2. Inside building: Shall be schedule 40 black steel, standard weight welded, threaded or Victaulic fittings for sizes 2-1/2" and under. Install flanged fitting and flanges at valves and where required. Threadable light wall pipe (schedule 10) shall be permitted only for sizes 3" and over.
- 3. Where permitted by code, and based on the construction, the contractor may substitute CPVC sprinkler system piping in lieu of the above for the wet sprinkler system. Install according to manufacturer's requirements and restrictions. Piping and fittings shall be Harvel Blazemaster CPVC fire sprinkler piping. Piping shall be installed only by a factory trained and certified installer. Do not use where piping is exposed or where manufacturer's requirements cannot be met.

B. Sprinkler Heads:

- 1. Temperature Classification:
 - a. Finished area shall be ordinary temperature rating.
 - b. Boiler /mechanical room shall be Intermediate temperature rating 175° F to 225° .
- 2. All shall be Quick Response bulb type head.
- 3. Type:
 - a. Generally shall be white, concealed pendant.
 - b. Concealed spaces shall be the type best suited for the configuration of the individual space.
 - c. Any minor unheated spaces shall be dry type.

4. Provide and install a spare head case per NFPA requirements. The case shall contain not less than 12 heads total, no less than two of each style of heads and one wrench for each style of head. Locate case in the sprinkler room near the check valve assemblies.
- C. Hangers: Provide per NFPA. Provide seismic protection unless specifically exempt by the Authority Having Jurisdiction. Hang from building structure, not piping of other trades.
- D. Sleeves:
1. Pipes Through Floors: Form with Schedule 40 (galvanized) steel pipe and extend 1" above surrounding floor.
 2. Pipes Through Interior Fire-rated or Sound-rated Partitions: Form with steel pipe or 16 gauge galvanized steel.
 3. Pipes through Exterior Building Walls, Concrete Walls or Footing: Form with Schedule 40 (galvanized) steel pipe.
 4. Size: The minimum sleeve diameter shall be either 2 pipe sizes or 2" in diameter larger than the outside diameter of the pipe.
 5. Fire caulk all penetrations through floors and fire rated partitions.
- E. Valves:
1. Riser Control Valve: OS&Y cast iron construction.
 2. Sectionalizing Valves: OS&Y cast iron body.
 3. Drain and Test Valves: Bronze body, gate type or ball type, capable of being padlocked in either open or closed position.
- F. Provide all miscellaneous items required for a complete system, such as: paint, signs, valve tags, pipe markers, chains and locks, relief valves, and water additives.

2.03 COMPONENTS

- A. Fire Department Connection (Verify with local Fire Department). 4" Fire Department connection with, caps with chains and wall plate with "Auto Sprinkler". Thread Pattern shall match that of the local Fire Department equipment; also 4" UL listed check valve with automatic ball drip piped to drain. Bronze finish.
- B. Flow Switch for Wet Systems: Model # VSR-F vane type water flow alarm switch with an adjustable retard setting from 10 seconds to 90 seconds having two sets of DPDT contacts for reporting to the building fire alarm system.
- C. Electric Supervisory Switch: All valves shall have a Model # OSYSU-2 electric supervisory device with 2 sets of DPDT contacts to report to the building fire alarm system.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Backflow preventer: Double check, testable, replaceable seats.
- E. Provide all shut-off valves with tamper switches. Lock or chain open valves with break-away padlocks.
- F. Water pressure gauge: Provide one before the valve on each inspectors test connection. Range applicable to fire protection application.

PART 3 – EXECUTION

3.01 PREBID EXAMINATION AND INVESTIGATION

- A. Visit the site and become acquainted with the conditions.
- B. Study all Drawings and Specifications for all related and interfacing trades. No claim will be recognized for extra compensation due to failure to become familiarized with the conditions and extent of the proposed work as indicated within.
- C. Ascertain all Authorities Having Jurisdiction, and consult where needed.

3.02 OBTAINING DRAWINGS AND SPECIFICATIONS

- A. Obtain a FULL set of drawings and specifications as soon as is practical.

3.03 SPECIFIC INSTALLATION REQUIREMENTS

- A. **All SPRINKLER piping in finished areas shall be run concealed.**
- B. For aesthetic reasons, locate sprinkler heads neatly and symmetrically, relative to the walls, ceiling grid, diffusers and light fixtures. Center heads in tiles in suspended ceilings.
- C. All piping shall be run as high as practicable. Pitch piping slightly to allow the system to be drained.
- D. System drains shall be valved and piped to discharge. No valve shall be provided ahead of the electric alarm devices.
- E. All sprinkler work shall avoid proposed locations of, and installation clearances for, lighting, ducts, piping, framing and equipment.
- F. Paint all exposed sprinkler and standpipe piping, color as determined by Architect.

3.04 COORDINATION

- A. Coordinate work with that of other trades. Coordinate early for locations of mains. Ductwork, mechanical equipment, electrical panels and large gravity piping will be given priority over sprinkler piping, unless all effected parties agree otherwise. No compensation will be given for neglect to comply with the above and no claim will be recognized for sprinkler piping, heads and miscellaneous appurtenances which must be modified, removed and reinstalled or relocated, due to conflicts with other work which is or will be installed per the Contract Documents.
- B. Contact Electrical Contractor and assure that all requirements for power and fire alarm system have been met.

3.05 TESTS

- A. The entire installation shall be tested with water in accordance with all NFPA requirements, all requirements of the local Fire Department and local Water District; and the Owner's Insurance Underwriter; this includes the testing of all alarms.
- B. All tests shall be witnessed by the Owner's representative and local Fire Chief's representative. Submit copies of all test certificates, properly signed, to the Engineer.

END OF SECTION

SECTION 16010

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnish all materials, labor, tools, transportation, incidentals, and appurtenances to complete in every detail and leave in working order all items of work called for herein or shown on the accompanying drawings, including work related to:
 - 1. Electrical service entrance.
 - 2. Electrical distribution including new circuit breaker load centers, and associated feeders.
 - 3. Electrical branch circuits, including wiring and devices.
 - 4. Interior lighting including luminaires, lamps, wiring and controls.
 - 5. Exterior lighting including luminaires, lamps, wiring and controls.
 - 6. Fire alarm system including initiating/notification devices, bldg. control panels connection to municipal fire alarm system, and all associated wiring.
 - 7. Cable TV system, including service entrances, outlets and wiring.
 - 8. Telephone system including service entrances, outlets and wiring.
 - 9. Door entry communications system.

- B. Include any minor items of work necessary to provide a complete and fully operative electrical system.

- C. The Contractor for this work is referred to Bidding Requirements, General Conditions, Special Conditions, Temporary Services and other pertinent Sections of these Specifications. These sections describe work that is a part of this Contract as contained in Division 1. The following General Provisions amplify and supplement these Sections of Specifications. In cases of conflicting requirements, the stipulations set forth in Division 1 supersede and must be satisfied by the Contractor.

1.2 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. ANSI/NFPA 72 - National Fire Code.
- C. ANSI/NFPA 101 - Life Safety Code.
- D. OSHA 1910 - Occupational Safety and Health Act.
- E. ADA - Americans with Disabilities Act.

DANFORTH ON HIGH – PORTLAND, MAINE

1.3 GENERAL REQUIREMENTS

- A. Contractor shall read the entire specifications covering other branches of work. He is responsible for coordination of his work with work performed by other trades.
- B. Consult all Contract drawings which may affect the location of any equipment or apparatus furnished under this work and make minor adjustments in location as necessary to secure coordination.
- C. System layout is schematic and exact locations shall be determined by structural and other conditions. This shall not be construed to mean that the design of the system may be arbitrarily changed. The equipment layout is to fit into the building as constructed and to coordinate with equipment included under other Divisions of work.
- D. Contractor shall contact the Owner's Representative immediately if he notices any discrepancies or omissions in either the drawings or the specifications, or if there are any questions regarding the meaning or intent thereof.
- E. Submit all changes, other than minor adjustments, to the Architect for approval before proceeding with the work.

1.4 SUBMITTALS

- A. Submit under provisions of the following and Division 1.
- B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- C. Mark dimensions and values in units to match those specified.
- D. Contractor shall check all shop drawings for dimensional correctness, interferences and conformance to specifications and plans. Stamp drawings "approved" and indicate when stipulated check has been made before forwarding them. Identify submittal data by project name and equipment identification number.

1.5 REGULATORY REQUIREMENTS

- A. Complete installation shall conform with all applicable Federal, State and Local laws, Codes and Ordinances, included but not limited to latest approved editions of the following:
 - 1. State Building Codes.
 - 2. Specific Construction Safety Requirements, State Industrial Commission.
 - 3. National Electrical Code - NFPA 70.
 - 4. National Fire Code - NFPA 72.
 - 5. Life Safety Code - NFPA 101.
 - 6. Occupational Safety and Health Act (OSHA) of 1971 and all amendments thereto.
 - 7. ADA - Handicap Accessibility Requirements.
 - 8. State Elevator Code.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Nothing contained in the drawings and specifications shall be construed to conflict with these laws, codes, and ordinances and they are thereby included in these specifications. All work shall comply with the 2011 edition of NFPA 70, The National Electrical Code. It shall be the Contractor's responsibility to assure that electrical work is in full compliance with the *NEC*.
- C. Contractor shall visit the site to become familiar with all existing conditions affecting this work. No claim will be recognized for extra compensation due to failure of contractor to familiarize himself/herself with the conditions and extent of proposed work.
- D. Obtain and pay for all necessary permits. Request inspections from authority having jurisdiction.

1.6 ELECTRICAL MOTORS

- A. In general, motors will be furnished and installed under other Divisions of work as a factory-installed item. Unless they are factory installed on equipment units supplied under other Divisions, all safety switches and motor starters shall be furnished and installed by the Electrical Contractor. Coordinate prior to submission of bid.
- B. Electrical Contractor shall obtain all wiring diagrams necessary to connect and control equipment requiring electrical energy.

1.7 RECORD DRAWINGS

- A. Record any changes in location of concealed boxes, underground utility service runs, and similar construction on a set of prints and deliver them to the Owner's Representative upon completion of the work.
- B. Record location and depth of exterior work carefully for future reference.

1.8 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Instruct the Owner's representative in all matters pertaining to the proper operation and maintenance of electrical equipment furnished under this contract.
- B. Submit three (3) sets of instructions in hard-bound three-ring notebooks, including installation, maintenance and operating instructions, pamphlets or brochures and warranties obtained from each manufacturer of principal items of equipment.

1.9 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

1.10 FIRESTOPPING

DANFORTH ON HIGH – PORTLAND, MAINE

- A. Firestopping around electrical cable, conduit and/or boxes and firestopping within boxes shall be provided under Division 16 to maintain fire ratings at walls, floors and ceilings. The Contractor shall coordinate penetrations of rated surfaces with the architectural drawings and specifications to assure that the proper fire rating is achieved.

1.11 TEMPORARY POWER AND LIGHTING

- A. The Contractor shall be responsible for provision of temporary electrical power and lighting as required to facilitate construction work.
 - 1. Temporary electrical power shall be obtained from the serving utility company. The Contractor shall make all necessary arrangements for the connection of a temporary power service.
 - 2. The costs for monthly service charges from the serving utility company included in the General Contractor's bid.
 - 3. The Contractor shall provide temporary electrical power distribution as required to facilitate construction activities including:
 - a. Wire/conduit
 - b. Over-current protection
 - c. Receptacle outlets
 - d. Motor disconnect means
 - e. Grounding
 - 4. The Contractor shall provide temporary lighting as required to facilitate construction activities.
 - 5. All temporary electrical power and lighting shall be completely removed prior to substantial completion of the project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish new and undeteriorated materials and of a quality not less than what is specified.
- B. Contractor to furnish and install only those brands of equipment mentioned specifically or accepted by the Engineer as equivalent substitutes.

2.2 EQUIPMENT SELECTION AND APPROVAL

- A. The selection of materials and equipment to be furnished shall be governed by the following:
 - 1. Where single trade name, brand of manufacturer or material is listed in the specification, the exact equipment listed shall be used in the bid.
 - 2. Where more than one name is listed, Contractor may select any one of the several brands specified.
 - 3. Where trade name, brand of manufacturer of equipment or material is listed in the specification followed by the word "or approved equal," the Contractor may substitute product of equal quality from another manufacturer for consideration by the Engineer.

SPRING CROSSING

PART 3 - EXECUTION

3.1 PROTECTION AND CLEANING

- A. Protect all electrical work and products against damage during construction and pay the cost of repair or replacement of electrical products made necessary by failure to provide suitable safeguards or protection.
- B. After all work has been inspected and approved, thoroughly clean all equipment, provided under this work.
- C. Repair all dents and scratches in factory prime or finish coated on all electrical equipment.

3.2 CUTTING AND PATCHING

- A. Cut and patch as required to install new work. Patching shall match existing surfaces in kind and finish.
- B. Obtain prior approval from the Engineer before cutting any structural members.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16111

CONDUIT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Rigid metal conduit and fittings.
- B. Non-metallic conduit and fittings.
- C. Electrical metallic tubing and fittings.
- D. Flexible metal conduit and fittings.
- E. Liquid-tight flexible metal conduit and fittings.

1.2 RELATED WORK

- A. Section 16123 - Wiring and Cable

1.3 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.
- B. ANSI C80.3 – Electrical Metallic Tubing, Zinc-Coated.
- C. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- D. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
- E. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT AND FITTINGS

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; threaded type, material to match conduit.

2.2 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

- A. EMT: ANSI C80.3 galvanized tubing.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Fittings and Conduit Bodies: ANSI/NEMA FB1; steel compression or set-screw type.

2.3 FLEXIBLE METAL CONDUIT AND FITTINGS

- A. Conduit: Steel.
- B. Fittings and Conduit Bodies: ANI/NEMA FB 1.

2.4 LIQUID-TIGHT FLEXIBLE METAL CONDUIT AND FITTINGS

- A. Conduit: Flexible metal conduit with PVC jacket.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB1.

2.5 PLASTIC CONDUIT AND FITTINGS

- A. Conduit: NEMA TC 2; Schedule 40 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.6 CONDUIT SUPPORTS

- A. Conduit Clamps, Straps, and Supports: Steel or malleable iron.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size conduit for conductor type installed $\frac{3}{4}$ -inch minimum size.
- B. Arrange conduit to maintain headroom and present a neat appearance.
- C. Route conduit parallel and perpendicular to walls.
- D. Maintain minimum 6-inch clearance between conduit and heat sources such as flues, steam pipes and heating appliances.
- E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

DANFORTH ON HIGH – PORTLAND, MAINE

- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
- H. Support conduit at spacing not to exceed the spacing allowed per ANSI 70.

3.2 CONDUIT INSTALLATION

- A. Cut conduit square using a saw or a pipecutter; de-burr cut ends.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
- D. Install no more than the equivalent of three 90-degree bends between boxes.
- E. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 1-inch size.
- F. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- G. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- H. Provide No. 12 AWG insulated conductor or suitable nylon pull rope in empty conduit, except sleeves and nipples.
- I. Install expansion joints where conduit crosses building expansion joints.
- J. Where conduit penetrates fire-rated walls and floors, seal opening around conduit with UL listed foamed silicone elastomer compound.
- K. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum. Provide spacers for multiple runs of buried raceways.
- L. Where conduit(s) pass(es) from refrigerated or cooled atmosphere to warmer areas where condensation of water vapor may occur within raceways, conduit bodies sealed with "duct Seal" type compound shall be provided after conductors are installed.
- M. Flexible metal conduit shall not exceed three (3) feet in length.
- N. Where exposed ceiling structure exists in finished spaces, conduit shall be run on the ceiling deck parallel to ceiling joists, along the sides of primary framing members, or immediately adjacent to walls. Exposed conduit running from joist-to-joist attached to the bottom of joists will not be accepted.

DANFORTH ON HIGH – PORTLAND, MAINE

- O. Where conduit is installed to be attached to metal roof deck, maintain 1-1/2" clearance between the conduit and the roof deck.

3.3 UNDERGROUND CONDUIT INSTALLATION

- A. Install top of conduit minimum 30 inches below finished grade.
- B. Slope underground conduit away from building.
- C. Use rigid galvanized steel conduit long-sweeps for underground elbows in conduit sizes 2 inch and larger.

3.4 CONDUIT INSTALLATION OF SCHEDULE

- A. Underground Installations: Schedule 40 plastic conduit.
- B. Exposed Outdoor Locations: Rigid steel conduit.
- C. Exposed Interior Locations: Electrical metallic tubing.
- D. Connections to Motors (exterior locations): Liquid-tight flexible metal conduit.
- E. Connections to Motors (interior locations): Flexible metal conduit.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16123

BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Building wire and cable.
- B. Metal clad cable.
- C. Non-metallic sheathed cable.
- D. Wiring connectors and connections.

1.2 RELATED SECTIONS

- A. Section 16111 - Conduit.
- B. Section 16130 - Boxes.
- C. Section 16195 - Identification.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.5 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.
- C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

DANFORTH ON HIGH – PORTLAND, MAINE

1.6 COORDINATION

- A. Determine required separation between cable and other work.
- B. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

2.1 BUILDING WIRE AND CABLE

- A. The following specification for building wire and cable is based on the use of copper conductors. The substitution for aluminum conductors shall be permitted for conductor sizes #2 AWG and larger provided an ampacity rating equal to that of copper conductors is maintained.
- B. Manufacturers:
 - 1. *Southwire.*
 - 2. *General Cable.*
 - 3. *Rome.*
 - 4. Substitutions: Or Approved equal.
- C. Description: Single Conductor insulated wire.
- D. Conductor: Copper.
- E. Insulation Voltage Rating: 600 volts.
- F. Insulation Type: THHN or XHHW.
- G. Insulation Color: Color of all service, feeder, branch, motor control, and signaling circuit conductors shall be green for grounding conductors, and white for neutrals. The color of the ungrounded conductors in different voltage systems shall be as follows:
 - 1. 120/208 volt, 3-phase:
 - Phase A - black
 - Phase B - red
 - Phase C - blue
 - 2. 120/240 volt, 1-phase:
 - Phase A - black
 - Phase B - red

2.2 METAL CLAD CABLE

- A. Manufacturers:
 - 1. *General Cable.*
 - 2. *Phelps Dodge Cable.*
 - 3. *Triangle.*
 - 4. Substitutions: Or Approved equal.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Description: ANSI/NFPA 70, Type MC.
- C. Conductor: Copper only.
- D. Insulation Voltage Rating: 600 volts.
- E. Insulation Temperature Rating: 60 degrees C.
- F. Insulation Material: Thermoplastic.
- G. Armor material: Steel or aluminum.
- H. Armor Design: Interlocked metal tape.
- I. Jacket: None.

2.3 NONMETALLIC-SHEATHED CABLE

- A. Manufacturers:
 - 1. *Rome Cable*
 - 2. *General Cable*
 - 3. *Triangle*
 - 4. *Southwire*
 - 5. Substitutions: Or Approved Equal.
- B. Description: ANSI/NFPA 70, Type NMC.
- C. Conductor: Copper only.
- D. Insulation Voltage rating: 600 volts.

2.4 WIRING CONNECTORS

- A. Manufacturers:
 - 1. *3M.*
 - 2. *Ideal.*
 - 3. *Thomas and Betts.*
 - 4. Substitutions: Approved equal.
- B. Description: Compression set or twist-on type with integral molded insulation and internal metallic compression ring or spiral screw-on connecting device.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

- A. Concealed Interior Locations (wood studs): Non-metallic sheathed cable or Type MC cable.
- B. Concealed Interior Locations (metal studs): Type MC cable, or non-metallic sheathed cable with grommets provided in cable openings in studs.
- C. Exposed Exterior Locations (with prior approval by Architect): Building wire in conduit.
- D. Service Entrance: Building wire in conduit.
- E. Panelboard and Loadcenter Feeders: Type MC cable.
- F. Exterior Locations: Building wire in conduit.

3.4 INSTALLATIONS

- A. Install products in accordance with manufacturers' instructions.
- B. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- C. Use stranded conductors for control circuits.
- D. Use conductor not smaller than 12 AWG for interior power and lighting circuits. Use Conductor not smaller than 10 AWG for exterior lighting circuits.
- E. Use conductor not smaller than 16 AWG for control circuits.
- F. Use 10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.
- G. Pull all conductors into raceway at same time.
- H. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- I. Protect exposed cable from damage.
- J. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure. Do not rest cable on ceiling panels.
- K. Use suitable cable fittings and connectors.
- L. Neatly train and lace wiring inside boxes, equipment, and panelboards.

DANFORTH ON HIGH – PORTLAND, MAINE

- M. Clean connector surfaces before installing lugs and connectors.
- N. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- O. Use split bolt connectors for conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- P. Use solderless pressure connectors with insulating covers for conductor splices and taps, 8 AWG and smaller.
- Q. Use insulated spring wire connectors with plastic caps for conductor splices and taps, 10 AWG and smaller.
- R. Where cable is to be installed attached to metal roof deck, maintain a 1-1/2" clearance between the cable and the roof deck.

3.5 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire and cable under provision of Section 16195.

3.6 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- C. Verify continuity of each branch circuit conductor.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16130

BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

1.2 RELATED SECTIONS

- A. Section 16180 - Equipment Wiring Systems.
- B. Section 16141 - Wiring Devices.

1.3 REFERENCES

- A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. ANSI/NFPA 70 - National Electrical Code.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.4 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations and mounting heights of outlet, pull, and junction boxes.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.6 PROJECT CONDITIONS

- A. Verify field measurements are as shown on Drawings.
- B. Electrical boxes are shown in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

DANFORTH ON HIGH – PORTLAND, MAINE

PART 2 - PRODUCTS

2.1 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include ½ inch male fixture studs where required.
- B. Air-Seal Boxes
 - 1. Outlet Boxes in Exterior Walls: Provide air-vapor barrier boxes for all outlets in exterior walls. Boxes shall be as manufactured by Lessco, or approved equal.
 - 2. Boxes at Top Floor Ceiling: Provide air-vapor barrier boxes for all outlets in ceilings at the top floor. Boxes shall be as manufactured by Lessco, or approved equal.
- C. Cast Boxes: NEMA FB 1, Type FS, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- D. Non-Metallic Outlet Boxes: PVC Type FS, UL listed.

2.2 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS1, galvanized steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
- C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- E. Install boxes with suitable firestop material to preserve fire resistance rating of partitions and other elements.
- F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
- G. Use flush mounting outlet boxes in finished areas.

DANFORTH ON HIGH – PORTLAND, MAINE

- H. Do not install flush mounting boxes back-to-back or side-to-side in walls; provide minimum 24-inch separation. Where 24 inch separation is not physically possible, approval for closer spacing shall be obtained from the Architect prior to rough-in. In such cases, provide UL listed firestop pads for boxes.
 - I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
 - J. Use stamped steel bridges to fasten flush mounting outlet box between studs.
 - K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
 - L. Use adjustable steel channel fasteners for hung ceiling outlet box.
 - M. Use gang boxes where more than one device is mounted together. Do not use sectional box.
 - N. Use gang box with plaster ring for single device outlets.
 - O. Use cast outlet box in exterior locations exposed to the weather and wet locations.
 - P. Use either sheet metal or non-metallic outlet boxes with non-metallic sheathed cable. Use sheet metal outlet boxes with Type MC cable.
 - Q. Install air-seal boxes in full conformance with the manufacturer's recommendations. Flanges shall be sealed to drywall or vapor barrier with caulking cable penetrations at air-seal boxes shall also be sealed.
 - R. Provide UL-listed fire-stop material in boxes that are recessed into fire rated walls. Refer to Architectural Contract Drawing for identification of fire walls.
 - S. Where boxes are installed to be attached to metal roof deck, maintain a 1-1/2" clearance between the box and the roof deck.
- 3.2 INTERFACE WITH OTHER PRODUCTS
- A. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
 - B. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.
- 3.3 ADJUSTING
- A. Adjust flush-mounting outlets to make front flush with finished wall material.
 - B. Install knockout closure in unused box opening.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16141

WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Device plates.

1.2 RELATED SECTIONS

- A. Section 16130 - Boxes.

1.3 REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

- A. Manufacturers:
 - 1. *Hubbell.*
 - 2. *Leviton.*
 - 3. *Bryant.*
 - 4. *Pass & Seymour*
 - 5. Substitutions: Or Approved Equal.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Switch Types: *Pass & Seymour* model numbers are listed below to establish configuration and type of switch. Equal devices by other manufacturers will be accepted.
- C. SPST Switches:
 - 1. Description: NEMA WD 1, commercial, specification grade, AC only general-use snap switch, back and side wired.
 - 2. Device Body: Ivory plastic with toggle handle.
 - 3. Voltage Rating: 120-277 volts, AC.
 - 4. Current Rating: 20 amperes.
 - 5. Model Number: CS20AC1-I
- D. 3-Way Switches:
 - 1. Description: Identical to SPST switches except 3-way operation.
 - 2. Model Number: CS20AC3-I.
- E. Boiler Cut-Off Switches:
 - 1. Description: DPST switch with red handle.
 - 2. Voltage Rating: 120-277 volts AC.
 - 3. Current Rating: 20 Amperes.
 - 4. Faceplate: Red color, engraved "EMERGENCY."
 - 5. Model Number: PS20AC2-RED

2.2 RECEPTACLES

- A. Manufacturers:
 - 1. *Hubbell.*
 - 2. *Leviton.*
 - 3. *Bryant.*
 - 4. *Pass & Seymour*
 - 5. Substitutions: Or Approved equal.
- B. Receptacle Types: *Pass & Seymour* model numbers are listed below to establish configuration and type of receptacles. Equal devices by other listed manufacturers will be accepted.
- C. General Use:
 - 1. Description: NEMA WD 1; commercial, specification grade, 125-volt grounded duplex receptacle, back and side wired.
 - 2. Device Body: Ivory, nylon face.
 - 3. Configuration: NEMA 5-20.
 - 4. Model number: BR20-I.
- D. Tamper-Resistant:
 - 1. Description: NEMA WD 1; specification-grade, tamper-resistant, 125-volt grounded duplex receptacle, back and side wired.
 - 2. Device Body: Ivory, nylon face.
 - 3. Configuration: NEMA 5-20.
 - 4. Model number: TR63-I

DANFORTH ON HIGH – PORTLAND, MAINE

- E. Standard Ground Fault:
 - 1. Description: UL 498, 544, 943; specification-grade, 125-volt, ground-fault interrupt type duplex receptacle with TEST and RESET, side wired.
 - 2. Device Body: Ivory, Thermoplastic.
 - 3. Configuration: NEMA 5-15R.
 - 4. Model Number: 2095-I.

- F. Tamper-Resistant Ground Fault:
 - 1. Description: UL 498, 544, 943; specification-grade, tamper-resistant, 125-volt, ground-fault interrupt type duplex receptacle with TEST and RESET, side wired.
 - 2. Device Body: Ivory, Thermoplastic.
 - 3. Configuration: NEMA 5-15R.
 - 4. Model Number: 2095-TRI.

- G. Electric Range:
 - 1. Description: 125/250 volt, 50-ampere surface receptacle.
 - 2. Device Body: Black thermoplastic.
 - 3. Configuration: NEMA 14-50R.
 - 4. Model Number: 3854/3854-40.

2.3 WALL PLATES

- A. Manufacturers:
 - 1. *Hubbell.*
 - 2. *Leviton.*
 - 3. *Bryant.*
 - 4. *Pass & Seymour.*
 - 5. Substitutions: Or Approved Equal.

- B. Description: Smooth plastic, ivory.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify outlet boxes are installed at proper height.

- B. Verify wall openings are neatly cut and will be completely covered by wall plates.

- C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install devices plumb and level.
- C. Install switches with OFF position down.
- D. Install receptacles with grounding pole on top.
- E. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- F. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- H. For non-dwelling unit locations, provide standard GFIC-type receptacles at all receptacle locations within six (6) feet of a sink, whether indicated as such on the Drawings or not.
- I. For dwelling unit locations, provide tamper-resistant type receptacles at all
- J. Provide tamper-resistant GFIC-type receptacles in kitchens (except dishwasher and refrigerator receptacles which shall be standard tamper-resistant type receptacles). Also provide tamper-resistant GFIC-type receptacles in dwelling unit bathrooms.
- K. Install light switches 48 inches above finished floor. Install standard receptacle outlets 18 inches above finished floor. Install receptacle outlets above counters at heights as indicated on drawings.
- L. For dwelling unit locations, provide receptacle outlets such that no point measured horizontally along the floor line in any wall space is more than six feet from a receptacle outlet. Wall space shall be defined as any space two feet or more in width (including space measured around corners) and unbroken along the floor line by doorways, or similar openings. The Contractor shall confirm that this condition has been met prior to rough-in of receptacle outlets.
- M. For dwelling unit locations, provide wall countertop receptacle outlets such that no point along the countertop line is more than 24 inches measured horizontally from a receptacle outlet. At island countertops, provide receptacle outlets with at least one receptacle installed at each island with a long dimension of 24 inches or greater and a short dimension of 12 inches or greater. The Contractor shall confirm that this condition has been met prior to rough-in of receptacle outlets.
- N. Tamper-resistant receptacle outlets shall be replaced where plugs are not able to be inserted after installation.

DANFORTH ON HIGH – PORTLAND, MAINE

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on Drawings.
- B. Install wall switch 48 inches above finished floor.
- C. Install convenience receptacle 18 inches above floor, or as noted on the Drawings.
- D. Where multiple heating boilers exist, connect all boilers to a single multi-pole emergency disconnect switch to be installed at the boiler room entrance door.

3.5 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16180

EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical connections to equipment specified under other Sections, including connections to built-in residential appliances and mechanical HVAC equipment.

1.2 RELATED WORK

- A. Division 11 - Appliances.
- B. Division 13 - Sprinkler System
- C. Division 15 - Mechanical Equipment.
- D. Section 16111 - Conduit.
- E. Section 16120 - Wire and Cable.
- F. Section 16130 - Boxes.
- G. Section 16441 - Disconnect Switches.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

- A. Provide disconnect switches as specified under Section 16441.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

DANFORTH ON HIGH – PORTLAND, MAINE

3.2 PREPARATION

- A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

- A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.
- B. Make conduit connections to mechanical equipment using flexible cable or flexible conduit.
- C. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.
- D. Install all controllers, control stations, and control devices such as limit switches, speed switches, and temperature switches that are supplied with equipment items. Connect with conduit and wiring.
- E. Provide a local means of disconnect for all motor loads except where factory supplied controllers are provided which contain disconnecting means.
- F. Reference to specification Section where control connection and wiring provisions are specified.

3.4 MECHANICAL SYSTEMS EQUIPMENT CONNECTIONS

- A. Except where provided as an integral element by the equipment manufacturer, provide a combination type magnetic motor starter for all 208 and/or 240-volt fans and/or pumps. Mount starters locally at equipment item as shown on Drawings. Starters shall be as specified under Section 16481.
- B. Except where provided as an integral element by the equipment manufacturer, provide a SPST manual motor starter switch for all 120-volt motors that are part of mechanical systems equipment items. Mount manual switches locally at motors. Manual switches shall be as specified under Section 16481.
- C. Where noted on the Drawings that an equipment item is to be connected with a local speed switch, make all necessary connections to the speed switch (furnished under Division 15) and to the equipment motor.
- D. Provide an emergency cut-off boiler switch at all doors to the Boiler Room and interlock switches such that turning off any switch shall shut off all oil-fired boilers and other oil-fired equipment.

DANFORTH ON HIGH – PORTLAND, MAINE

- E. Provide connections to Toilet Room exhaust fans and fan time switches. Local room fan/control light switches will be furnished under Division 15 and installed under Division 16.
- F. Provide connections to Toilet Room electric baseboard heat that is furnished under Division 15.

3.5 ELEVATOR OPERATION COORDINATION

- A. Interlock alarm system heat detectors at the top and bottom of the elevator shaft, and in the Elevator Machine Room with the elevator power service shunt trips such that an alarm condition at any of these detectors shall automatically disable the associated elevator electrical service feeder. Provide an interlock between the fire alarm system smoke detectors at the Elevator Lobbies on each floor and the smoke detector in the Elevator Machine Room, such that:
 - 1. An alarm activation by detectors at the first or third floor level lobbies, or at the detector in the elevator machine room, shall automatically send the elevator to the Second Floor Lobby.
 - 2. An alarm condition activated by the second floor lobby smoke detector shall automatically send the elevator car to the first level lobby.
- B. Interlock fire alarm system with the relief vent at the top of the elevator shaft such that an alarm condition caused by any house initiating device shall automatically open the relief vent.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16190

SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Conduit, cable and equipment supports.
- B. Fastening hardware.

1.2 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Support Channel: Galvanized or painted steel.
- B. Hardware: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors and/or beam clamps.
- C. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Use expansion anchors.
 - 2. Steel Structural Elements: Use beam clamps.
 - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
 - 5. Solid Masonry Walls: Use expansion anchors.
 - 6. Sheet Metal: Use sheet metal screws.
 - 7. Wood Elements: Use wood screws.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- E. Do not use powder-actuated anchors.
- F. Do not drill structural steel members.
- G. Fabricate supports or trapeze hangers from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- H. Bridge studs to and bottom with horizontal members to support flush-mounted loadcenters in new stud walls.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and tape labels.
- B. Panelboard Directories.
- C. Underground marker tape.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Nameplates: Engraved three-layer laminated plastic, black letters on a white background.
- B. Underground Warning Tape: 6" wide plastic tape, colored red with suitable legend describing buried electrical lines: Model UT27737 as manufactured by *Emedco*, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates.
- B. Install nameplates parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.
- D. Install underground warning tapes at all buried lines 6" below finished grade.

3.2 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates to identify all electrical disconnect switches, transformers, motor starters, and panelboard. Letter Height: ¼ inch. Use designations indicated on Single Line Diagram included in the Contract Drawings.

DANFORTH ON HIGH – PORTLAND, MAINE

3.3 PANELBOARD AND LOAD CENTER DIRECTORIES

- A. Provide a typed directory of panel circuit load descriptions for all panelboards and load centers. Mount directory to inside of panel cover. Identify circuit loads by load type and room location of load served.
- B. Provide labels for all panelboards indicating the calculated short circuit current and arc-fault hazard rating.

END OF SECTION

DANFORTH ON HIGH CONDOMINIUMS- PORTLAND, MAINE

SECTION 16421

UTILITY SERVICE ENTRANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide new incoming electrical utility service entrances.
- B. Provide new incoming telephone utility service entrances.
- C. Provide new incoming cable television utility service entrances.
- D. Provide new incoming municipal fire alarm service.

1.2 RELATED SECTIONS

- A. Section 16111 - Conduit.
- B. Section 16123 - Wire and Cable.
- C. Section 16450 - Grounding.
- D. Section 16470 - Panelboards.
- E. Section 16721 – Fire Alarm System.
- F. Section 16742 - Telephone System.
- G. Section 16745 - Cable Television

1.3 ELECTRICAL SYSTEM DESCRIPTION

- A. Electrical Service Description: The existing overhead CMP electrical utility line at Danforth Street shall be modified, and a new underground electrical secondary service shall be provided as shown on the Contract Drawings. The contractor shall coordinate with the utility company all the work required to complete this project.
- B. Work associated with the new electrical services shall be coordinated with:
Central Maine Power Company
- C. Arrange with *CMP* to modify the existing overhead utility line on Danforth Street as required. Arrange with *CMP* to provide a new pole mounted service transformer. 208/120 volt, 3-phase secondary service shall be extended underground by the Contractor from the new pole mounted service transformer to a modular meter center on the outside of the

DANFORTH ON HIGH CONDOMINIUMS- PORTLAND, MAINE

building. Secondary service conductors shall be extended from the modular meter center to new single-phase load centers located in each living unit of the building.

- D. Work by *CMP*: The Contractor shall make all necessary arrangements with *CMP* to provide the following:
 - 1. Modifications to the existing overhead utility line in front of the building.
 - 2. New primary underground electrical system.
 - 3. Pole mounted service transformer.
- E. Work by Contractor: The Contractor shall provide the following:
 - 1. All conduit for secondary service conductors from the pole mounted service transformer to the meter center at the building.
 - 2. Service meter center at the building.
 - 3. Service grounding.
- F. Work by General Contractor:
 - 1. Excavation and backfill.

1.4 TELEPHONE SYSTEM DESCRIPTION

- A. Telephone Service Description: A new underground telephone service shall be provided as shown on the Contract Drawings. The contractor shall coordinate with the utility company all the work required to complete this project.
- B. Arrange with *FairPoint* to modify the existing overhead utility line in front of the building as required. Also, arrange with *FairPoint* to provide a new underground service from the service terminal pole at Danforth Street to the building. Telephone service cable shall be extended underground to new telephone service termination equipment in the electrical room in the building.
- C. Work associated with new telephone services shall be coordinated with: *FairPoint*
- D. Work by *FairPoint*: The Contractor shall make all necessary arrangements with *FairPoint* to provide the following:
 - 1. Modification of existing overhead telephone service line in front of the building as required.
 - 2. Provide new underground telephone service cables from the service terminal pole.
 - 3. Service entrance connections for individual living units, including wiring termination means, and service cables from exterior connection point on the building.
- E. Work by Contractor: The Contractor shall provide the following:
 - 1. Underground conduits between the service terminal pole and the service termination equipment at the electrical room in the building.

1.5 CABLE TELEVISION SYSTEM DESCRIPTION

- A. Cable Television Service Description: A new underground cable television service shall be provided as shown on the Contract Drawings. The contractor shall coordinate with the utility company all the work required to complete this project.

DANFORTH ON HIGH CONDOMINIUMS- PORTLAND, MAINE

- B. The Owner will arrange with *Time-Warner* to provide a new underground service from the service terminal pole at Danforth Street to the building. Cable TV service cable shall be extended underground to new cable service termination equipment in the electrical room in the building.
- C. Work associated with new telephone services shall be arranged by the Owner.
- D. Work by Contractor: The Contractor shall provide the following:
 - 1. Underground conduits between the service terminal pole and the service termination equipment at the electrical room in the building.

1.6 MUNICIPAL FIRE ALARM SERVICE

- A. Municipal fire Alarm Service Description: A new underground municipal fire alarm service shall be provided as shown on the Contract Drawings. The contractor shall coordinate with the *City of Portland Fire Department* all the work required to complete this project.
- B. Arrange with the *City of Portland Fire Department* to modify the existing overhead municipal fire alarm line in front of the building as required. Also, arrange with *City of Portland Fire Department* to provide a service connection at the existing utility pole at Danforth Street. Municipal fire alarm service cable shall be extended underground to a new fire alarm municipal master box in the electrical room in the building.
- C. Work by the *City of Portland Fire Department*: The Contractor shall make all necessary arrangements with *City of Portland Fire Department* to provide the following:
 - 1. Modification of existing overhead municipal fire alarm service line in front of the building as required.
 - 2. Service cable connections at the existing utility pole on Danforth Street.
- D. Work by Contractor: The Contractor shall provide the following:
 - 1. Underground conduits and fire alarm service cable between the service terminal pole and the fire alarm municipal master box at the electrical room in the building.
 - 2. Provision of the fire alarm municipal master box.

1.7 QUALITY ASSURANCE

- A. Conform to the requirements of ANSI/NFPA 70 - National Electrical Code.
- B. Conform to the requirements of:
 - 1. *Central Maine Power Company.*
 - 2. *FairPoint.*
 - 3. *Time Warner*
 - 4. *City of Portland Fire Department*

DANFORTH ON HIGH CONDOMINIUMS- PORTLAND, MAINE

1.8 UTILITY SERVICE CHARGE ALLOWANCE

- A. The Contractor shall include under Division 16 an allowance of \$25,000.00 to cover the cost of utility service charges. This allowance will be paid according to actual utility company invoices received.

PART 2 - PRODUCTS

2.1 UTILITY SERVICES MATERIALS

- A. Conduit shall be as specified in Section 16111.
- B. Electrical service conductors shall be as specified in Section 16123.
- C. Service grounding shall be as specified in Section 16450.

2.2 MODULAR METER CENTERS

- A. Manufacturers:
 - 1. *Square D*
 - 2. *Anchor*
 - 3. *Landis & Gyr*
 - 4. *Milbank*
 - 5. *Murray*
- B. UL listed, multi-gang meter center with ringless meter sockets and main circuit breaker service sections as detailed on the Drawings.
- C. Meter Centers shall be NEMA Type 3R construction, rated for use on a three-wire 240/120-volt system. Meter sockets shall have a fifth terminal in the 6 o'clock position, and shall include a simple handle lever operated by-pass. Meter sockets shall be rated as indicated on the Drawings. Main devices shall have 100K AIC ratings.
- D. All meters shall be supplied with an output branch circuit breaker, in sizes as indicated on the Drawings.
- E. Approval: Meter centers shall be approved by the *Central Maine Power Company*.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all service related work in conformance with the standards and requirements of the serving utility.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16441

ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Disconnect Switches.
- B. Fuses.

1.2 REFERENCES

- A. NEMA KS 1 - Enclosed Switches.
- B. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

- A. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

- A. Acceptable manufacturers:
 - 1. *Square D.*
 - 2. *General Electric.*
 - 3. *Cutler-Hammer.*
 - 4. *Siemens.*
 - 5. Substitutions: Or Approved Equal.
- B. Nonfusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front with switch in ON position. Handle lockable in OFF position.
- C. Fusible Switch Assemblies: NEMA KS 1, Type HD, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: designed to accommodate Class R fuses.
- D. Enclosures: NEMA KS 1; Type 1. For indoor locations; Type 3R for outdoor locations.

DANFORTH ON HIGH – PORTLAND, MAINE

2.2 FUSES

A. Acceptable manufacturers:

1. *Bussman*
2. *Shawmut-Gould*
3. Substitutions: Or Approved Equal.

B. Fuses 600 amperes and less: ANSI/UL 198E, Class RK5 dual element 250-volt.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches for all motor loads and where indicated on Drawings, except where equipment is factory supplied with an integral means of disconnect.
- B. Install disconnect switches within sight and within 25 feet of equipment item being served. Install switch handle no higher than 60 inches above the working surface.
- C. Provide unfused disconnect switches for general motors. Provide fused disconnect switches for elevator controller, feeder and for elevator cab branch circuit power.
- D. Provide a mechanical interlock contact on the elevator main power disconnect switch of use by elevator control wiring.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16450

SECONDARY GROUNDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Power system grounding.
- B. Electrical equipment and raceway grounding and bonding.

1.2 SYSTEM DESCRIPTION

- A. Provide a service ground at the service entrance.
- B. Connect load center feeder ground conductors to service ground at main service entrance.
- C. Connect branch circuit equipment wires to ground bus at load centers.
- D. Provide a dedicated ground for the telephone service.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Service Ground Conductor: Bare copper, stranded conductor.
- B. Load Center Feeder Ground Conductor: Copper conductor.
- C. Branch Circuit Ground Conductors: Insulated (green) copper conductor.
- D. Ground Rods: 5/8-inch diameter, by 8-feet long, copper clad steel rods with bronze ground clamps.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide service ground system in accordance with Article 250 of NFPA 70. Connect service-grounding equipment to made electrodes as well as to the cold water service entrance pipe.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Provide a separate grounding conductor in panelboard and load center feeders, and in all branch circuits provided under this contract. Terminate each end on a grounding lug, bus, or bushing.
- C. Provide grounding for service riser pole in accordance with all applicable *Central Maine Power Company* requirements.
- D. Provide grounding for the service transformer at the transformer pad in accordance with all applicable *Central Maine Power Company* requirements.
- E. Provide grounding for the telecommunications service termination board consisting of a separate ground conductor connected to the main service ground system.

3.2 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 10 ohms.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16470

PANELBOARDS AND LOAD CENTERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Residential Load Centers.
- B. Panelboards.

1.2 RELATED SECTIONS

- A. Section 16195 – Electrical Identification.

1.3 REFERENCES

- A. NECA (National Electrical Contractors Association) "Standard of Installation."
- B. NEMA AB 1 - Molded Case Circuit Breakers.
- C. NEMA PB 1 - Panelboards.
- D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards rated 600 Volts or Less.
- E. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment.
- F. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement and sizes.

1.5 SPARE PARTS

- A. Keys: Furnish three sets to Owner.

PART 2 - PRODUCTS

2.1 LOAD CENTERS

- A. Manufacturers:

DANFORTH ON HIGH – PORTLAND, MAINE

1. *Square D.*
 2. *General Electric.*
 3. *Siemens.*
 4. Substitutions: Or Approved Equal.
- B. Load Centers: NEMA PB 1; circuit breaker type. UL listed for service entrance duty.
- C. Enclosure: Recessed, NEMA PB 1; Type 1.
- D. Cabinet Size: 3¾ inches deep; 14¾ inches wide.
- E. Provide cabinet front with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.
- F. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.
- G. Minimum Integrated Short Circuit Rating: 10,000 amperes RMS symmetrical for 240-volt panelboards.
- H. Molded Case Circuit Breakers: NEMA AB 1; plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles.
- I. Arc-Fault Circuit Breakers: Provide arc-fault circuit breakers for all load center branch circuits supplying outlets in dining rooms, living rooms, bedrooms, hallways, and other similar rooms. Also provide arc-fault breakers for all spare circuit breakers to be included in each load center.

2.2 PANELBOARDS

- A. Acceptable Manufacturers.
1. *Square D.*
 2. *Cutler-Hammer.*
 3. *General Electric*
 4. *Siemens.*
 5. Substitutions: None Permitted.
- B. Circuit Breaker Panelboards
1. Panelboards: NEMA PB1; circuit breaker type.
 2. Enclosure: NEMA PB 1; Type 1.
 3. Branch Circuit Panelboard Cabinet Size: 5 ¾ inches deep; 20 inches wide.
 4. Distribution Panelboard Cabinet Size: 8¾ inches deep; 32 inches wide.
 5. Provide cabinet front with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel
 6. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.
 7. Minimum Integrated Short Circuit Rating:
 - a) 65,000 AIC for Panel DP1

DANFORTH ON HIGH – PORTLAND, MAINE

- b) 42,000 AIC for panels HP-1 and M3
- c) 22,000 AIC for all other panels.
- 8. Molded Case Circuit Breakers: NEMA AB 1; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles.
- 9. Provide circuit breaker accessory trip units and auxiliary contacts as indicated.
- 10. Main Circuit Breaker: Molded case thermal magnetic type with solid state tripping elements with instantaneous, long time delay, long time pickup, and short time delay settings.

2.3 ENCLOSED CIRCUIT BREAKERS

- A. Acceptable Manufacturers.
 - 1. *Square D.*
 - 2. *Cutler-Hammer.*
 - 3. *General Electric*
 - 4. *Siemens.*
 - 5. Substitutions: None Permitted.
- B. Molded Case Circuit Breakers:
 - 1. NEMA AB 1; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles.
 - 2. NEMA 1 surface enclosure.
 - 3. Minimum Integrated Short Circuit Rating: 65,000 AIC.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install load centers and panelboards plumb and flush with wall finishes, in conformance with NEMA PB 1.1. Install recessed, flush with wall finishes.
- B. Height: 4 feet to top circuit breaker in load centers in residential units; 6 feet to top of panelboards.
- C. Provide filler plates for unused spaces in load centers and panelboards per Specification Section 16195.
- D. Provide typed circuit directory for each branch circuit panelboard and load center per Specification Section 16195.

3.2 FIELD QUALITY CONTROL

- A. Measure state load currents at each new panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

VOLTS: 120/240		AMPS: 100		PANEL: TYPICAL LC					
MOUNT: RECESSED		MAIN: MLO		LOCATION: LIVING UNIT BEDROOM					
		WIRES: 3							
BREAKER	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD	CKT NO.	DESCRIPTION	BREAKER	
A	P							P	
20	1	LVG AREA/HALL RECEPTS 800	R	1	4800	2	RANGE	2	
20	1	LVG AREA/HALL RECEPTS 600	R	3		4	RANGE	50	
20	1	BEDROOM RECEPTS 1200	R	5	1335	6	RANGE HOOD	50	
20	1	DOOR INTERCOM STATION 500	O	7		8	KITCHEN RECEPTS	20	
20	1	LIGHTS AND DETECTORS 1000	R	9	1600	10	KITCHEN RECEPTS	20	
20	1	SPARE 500	S	11		12	REFRIGERATOR	20	
20	1	SPARE 500	S	13	900	14	BATHROOM RECEPT	20	
20	1	SPARE 500	S	15		16	SPARE	20	
				17		18		20	
				19		20			
		PHASE TOTALS		8635		8200		DEMAND	
		CONNECTED VOLT-AMPERES=		16835		CIRCUIT TYPE CODES		FACTOR	
		CONNECTED AMPERES=		70		L LIGHTS		1.0	
		DEMAND VOLT-AMPERES=		8418		M MOTORS		0.5	
		DEMAND AMPERES=		35		R RECEPTS		0.5	
						H HEAT		1.0	
						O OTHER		0.5	
						S SPARE		0.5	

ALL CBs EXCEPT FOR #9 AND #2,4 SHALL BE ARC-FAULT TYPE

PROJECT: DANFORTH ON HIGH
 PROJ. NO: 11-0058
 DATE: 06/04/12
 STATUS: 90% REVIEW

Bartlett Design
 LIGHTING & ELECTRICAL ENGINEERING
 942 WASHINGTON STREET BATH, MAINE 04530
 TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208
 MOUNT: SURFACE
 MAIN: MLO
 WIRES: 4
 AMPS 225
 PHASE: 3
 PANEL: E1
 LOCATION: ELECTRICAL 07

BREAKER	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD			CKT TYPE	CKT VA	DESCRIPTION	BREAKER	
					A	B	C				P	A
20 1	CUH1/CUH2/CUH5	240	H	1	1580			L	1340	COMMON AREA LIGHTS	1	20
20 1	CUH4	696	H	3		1496		R	800	COMMUNITY RM. RECEPTS.	1	20
20 1	BOILER B-1	600	H	5			1200	R	600	COMMUNITY RM. RECEPTS.	1	20
20 1	BOILER B-2	600	H	7	1296			H	696	CUH-3	1	20
20 2	PUMP P-1	334	M	9		1104		L	770	GARAGE LIGHTS	2	20
20 2	PUMP P-1	334	M	11			534	R	200	ELEV PIT RECEPT AND LT	1	20
15 2	PUMP P-2	334	M	13	396			M	62	PUMP P-4	1	15
15 2	PUMP P-2	334	M	15		611		M	277	FAN SF-1 AND EF-3	1	15
20 2	PUMP P-3	794	M	17			994	O	200	ATC CONTROL PANEL	1	20
20 2	PUMP P-3	794	M	19	994			R	200	ELEVATOR PIT	1	20
15 2	PUMP P-6	564	M	21		1260		M	696	SUMP PUMP	1	20
15 2	PUMP P-6	564	M	23			1064	O	500	DATA NETWORK EQUIP	1	20
15 2	PUMP P-7	564	M	25	1064			O	500	DOOR ENTRY PANEL	1	20
15 2	PUMP P-7	564	M	27		1064		O	500	TEL ENTRANCE EQUIP	1	20
20 1	FIRE ALARM BOOSTERS	500	O	29				O	500	GENERATOR BATTERY	1	20
20 1	FIRE ALARM PANEL	500	O	31	1000			H	500	GENERATOR HEATER	1	20
20 1	DOOR LOCK	500	O	33		1000		S	500	SPARE	1	20
20 1	SPARE	500	S	35			1000	S	500	SPARE	1	20
20 1	SPARE	500	S	37	1000			S	500	SPARE	1	20
20 1	SPARE	500	S	39		1000		S	500	SPARE	1	20
20 1	SPARE	500	S	41			1000	S	500	SPARE	1	20
PHASE TOTALS					7330	7535	6792					

CONNECTED VOLT-AMPERES= 21657
 CONNECTED AMPERES= 60
 DEMAND VOLT-AMPERES= 13550
 DEMAND AMPERES= 38

CIRCUIT TYPE CODES
 L LIGHTS
 M MOTORS
 R RECEPTACLES
 H HEAT
 O OTHER
 S SPARE
 DEMAND FACTOR
 1.0
 0.5
 0.5
 1.0
 0.5
 0.5

PROJECT: DANFORTH ON HIGH
 PROJ. NO: 11-0058
 DATE: 06/04/12
 STATUS: 90% REVIEW

Bartlett Design
 LIGHTING & ELECTRICAL ENGINEERING
 942 WASHINGTON STREET BATH, MAINE 04530
 TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208 **AMPS:** 100 **PANEL:** E2
MOUNT: SURFACE **PHASE:** 3 **MAIN:** MLO **LOCATION:** ELECTRICAL.07
WIRES: 4

BREAKER A P	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD			CKT TYPE	CKT NO.	CKT VA	DESCRIPTION	BREAKER	
					A	B	C					P	A
20 1	CORRIDOR NIGHT LIGHTS	1032	L	1	1532			S	2	500	SPARE	1	20
20 1	STAIR LIGHTS	972	L	3	1472			S	4	500	SPARE	1	20
20 1	SPARE	500	S	5		1000		S	6	500	SPARE	1	20
20 1	SPARE	500	S	7	995			L	8	495	GARAGE NIGHT LIGHTS	1	20
20 1	SPARE	500	S	9	1000			S	10	500	SPARE	1	20
20 1	SPARE	500	S	11	1000			S	12	500	SPARE	1	20

PHASE TOTALS 2527 2472 2000
 CONNECTED VOLT-AMPERES= 6999
 CONNECTED AMPERES= 19
 DEMAND VOLT-AMPERES= 4749
 DEMAND AMPERES= 13

CIRCUIT TYPE CODES	DEMAND
L LIGHTS	FACTOR
M MOTORS	1.0
R RECEPTACLES	0.5
H HEAT	0.5
O OTHER	1.0
S SPARE	0.5
	0.5

PROJECT: DANFORTH ON HIGH
PROJ. NO: 11-0058
DATE: 06/04/12
STATUS: 90% REVIEW

Bartlett Design
LIGHTING & ELECTRICAL ENGINEERING
 942 WASHINGTON STREET BATH, MAINE 04530
 TEL (207) 443-5447 FAX (207) 443-5560

VOLTS: 120/208
MOUNT: SURFACE
AMPS: 225
PHASE: 3
MAIN: MLO
WIRES: 4
PANEL: HPI
LOCATION: ELECTRICAL 07

BREAKER	DESCRIPTION	CKT VA	TYPE	CKT NO.	LOAD			CKT NO.	CKT TYPE	CKT VA	DESCRIPTION	BREAKER	
					A	B	C					P	A
20 1	WASHER/DRYER	1000	O	1	2000			2	O	1000	WASHER/DRYER	1	20
20 1	WASHER/DRYER	1000	O	3	2000			4	O	1000	WASHER/DRYER	1	20
20 1	EXTERIOR LIGHTS	184	L	5		984		6	R	800	LAUNDRY RM RECEPTS	1	20
20 1	2nd FL RECEPTS	1000	R	7	2200			8	R	1200	OFFICE RECEPTS	1	20
20 1	2nd FL RECEPTS	1000	R	9	1800			10	R	800	1st FL RECEPTS	1	20
20 1	3rd FL RECEPTS	1200	R	11		2200		12	R	1000	1st FL RECEPTS	1	20
20 1	3rd FL RECEPTS	1200	R	13	1700			14	O	500	LAUNDRY CARD READER	1	20
20 1	4th FL RECEPTS	1200	R	15		1365		16	L	165	LAUNDRY RM LIGHTS	1	20
20 1	4th FL RECEPTS	1200	R	17		1420		18	L	220	BASEMENT LIGHTS	1	20
20 2	AH1/AH2/AH3/AH4/AH5/AH6	175	M	19	1375			20	R	1200	BASEMENT RECEPTS	1	20
20 2	AH1/AH2/AH3/AH4/AH5/AH6	175	M	21		1175		22	R	1000	BASEMENT RECEPTS	1	20
30 3	OUTDOOR UNIT	2102	M	23		2702		24	R	600	BASEMENT RECEPTS	1	20
30 3	OUTDOOR UNIT	2102	M	25	2502			26	R	400	ROOFTOP RECEPTS	1	20
30 3	OUTDOOR UNIT	2102	M	27		2160		28	M	58	EF2	1	20
30 3	RHU-1	1878	M	29			2078	30	M	200	UH-1 AND UH-2	1	20
30 3	RHU-1	1878	M	31	3078			32	R	1200	MECH/ELEC RM RECEPTS	1	20
30 3	RHU-1	1878	M	33		2378		34	S	500	SPARE	1	20
15 3	EF-1	387	M	35			887	36	S	500	SPARE	1	20
15 3	EF-1	387	M	37	887			38	S	500	SPARE	1	20
15 3	EF-1	387	M	39		887		40	S	500	SPARE	1	20
15 1	PUMPS P-5 AND P-8	60	M	41			560	42	S	500	SPARE	1	20
PHASE TOTALS											13742	11765	10831

CONNECTED VOLT-AMPERES= 36337
CONNECTED AMPERES= 101
DEMAND VOLT-AMPERES= 18453
DEMAND AMPERES= 51

CIRCUIT TYPE CODES
L LIGHTS
M MOTORS
R RECEPTACLES
H HEAT
O OTHER
S SPARE

DEMAND FACTOR
1.0
0.5
0.5
1.0
0.5
0.5

PROJECT: DANFORTH ON HIGH
PROJ. NO: 11-0058
DATE: 06/04/12
STATUS: 90% REVIEW

Bartlett Design
LIGHTING & ELECTRICAL ENGINEERING
942 WASHINGTON STREET BATH, MAINE 04530
TEL (207) 443-5447 FAX (207) 443-5560

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16481

ENCLOSED MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Manual motor starters.
- B. Combination magnetic motor starters.

1.2 REFERENCES

- A. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- B. NEMA AB 1 - Molded Case Circuit Breakers.
- C. NEMA ICS 1 - Industrial Control Devices, Controllers, and Assemblies.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 1.
- B. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 1.
- B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

PART 2 - PRODUCTS

2.1 MOTOR STARTERS

- A. Acceptable Manufacturers (combination motor starters).
 - 1. *Cerus Industrial*
 - 2. Substitutions: Or approved equal.
- B. Acceptable Manufacturers (manual motor starters).
 - 1. *Square D*
 - 2. *General Electric*

DANFORTH ON HIGH – PORTLAND, MAINE

3. *Siemens*
 4. Substitutions: None permitted.
- C. Manual Motor Starters
1. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, 1 pole, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, and toggle operator.
 2. Enclosure: ANSI/NEMA ICS 6; Type 1 for interior locations, Type 4 for exterior locations.
- D. Magnetic Motor Starters
1. Motor Starter shall be enclosed in a Type 1 or Type 4 UL rated enclosure. Type 1 enclosure shall include pre-cut holes for conduits with removable plugs.
 2. Motor Starter shall be rated for NEMA class B motors for AC-3 switching and AC-4 switching. Starter shall be sized to equivalent NEMA rating for AC-3 switching.
 3. Controls and annunciation shall include Hand- OFF- Auto keypad with 20 mm snap dome actuation. Keypad shall be water tight and liquid tight. LED indication shall include Hand, Off, Auto, Run and Overload. Overload reset shall be available by holding Hand and Off for five seconds.
 4. Control inputs shall include: Auto Wet input, Auto Dry input, Permissive Auto input, Damper Status Input and Override Input. Automatic control inputs shall be capable of accepting a transistorized input without the need for interposing relays. Wet control inputs shall accept AC or DC inputs from 10 to 138VAC or DC.
 5. Damper control shall be built into the starter to provide 24VAC or 120VAC damper control and monitoring.
 6. Override input shall disable the starter from operating in either Hand or Auto mode.
 7. Protective Functions-
 - a. Electronic Overload shall provide phase failure and phase loss protection, stall, and class 1 - 30 selectable overload protection. Phase failure protection shall initiate when phase loss is greater than 70% for 3 seconds or phase unbalance is greater than 50% for more than 5 seconds.
 - b. Cycling fault protection shall be integral to the starter. Cycling fault shall be enabled whenever the starter is cycled more than 1000 times in a one hour period. This feature shall be selectable to be disabled. Cycling fault shall cause overload LED to blink rapidly.
 8. Motor Starters shall be equipped with an integral Motor Circuit that is UL listed 508. The breaker and shall carry a UL 508F rating (up to 100A frame size) which provides for coordinated short circuit rating for use with the motor contactor and provides an interrupting rating for the breaker and contactor combination.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install motor control equipment in accordance with manufacturer's instructions.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.
- C. Mount combination type motor starters locally to equipment being served, with top at 60 inches (maximum) above adjacent floor, with not less than 36 inches clearance in front of starter (floor to ceiling).

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16510

INTERIOR LUMINAIRES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior luminaires and accessories.
- B. Ballasts.
- C. Lamps.

1.2 RELATED SECTIONS

- A. Section 16130 – Boxes
- B. Section 16950 – Lighting Control System

1.3 REFERENCES

- A. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.
- B. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- B. Product data: Provide dimensions, ratings and performance data.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of each luminaire.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

DANFORTH ON HIGH – PORTLAND, MAINE

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Furnish products as specified in schedule attached to this Section.

2.2 BALLASTS

- A. Electronic T8 fluorescent ballasts
1. Non-dimming ballasts:
 - a) *Sylvania* QHE/UNV ISN-SC series
 - b) *Advance* IOP/SC series
 - c) *Universal* B/IUNVHE series
 2. Electronic Ballasts for T8 Lamps: Comply with ANSI C82.11; instant-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.
 - a) Starting Method: Instant Start
 - b) Ballast Factor: 0.88 (minimum)
 - c) Circuit Type: Parallel
 - d) Lamp Frequency: > 40 kHz
 - e) Lamp CCF: < 1.7
 - f) Starting Temperature: 0 F (-17.8 C)
 - g) Input Frequency: 60 Hz
 - h) Total Harmonic Distortion (THD): <10%
 - i) Power Factor: >98%
 - j) Voltage: Universal 120-277 volts
 - k) Maximum Input Wattage:
 - (1) Single Lamp, T8 (32-watt lamps): 28 Watts
 - (2) Two Lamp T8, (32-watt lamps): 55 Watts
- B. Ballasts For Compact Fluorescent Lamps:
1. Description: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
 - a) Starting Method: Programmed Rapid-Start (quad and triple-tube lamps); Instant Start (PL lamps)
 - b) Ballast Factor: 0.96 (minimum)
 - c) Circuit Type: Series (quad and triple-tube lamps); Parallel (PL lamps)
 - d) Lamp Frequency: > 40 kHz
 - e) Lamp CCF: < 1.7
 - f) Starting Temperature: 5 F (-20 C)
 - g) Input Frequency: 60 Hz
 - h) Total Harmonic Distortion (THD): <10%
 - i) Power Factor: >97%
 - j) Voltage: Universal 120-277 volts
 - k) Maximum Input Wattage:
 - (1) Single Quad-Tube Lamp T4, 13-Watt: 16 Watts

DANFORTH ON HIGH – PORTLAND, MAINE

- (2) Single Quad-Tube Lamp T4, 18-Watt: 20 Watts
- (3) Two Quad-Tube Lamp T4, 18-Watt: 38 Watts
- (4) Single Quad-Tube Lamp T4, 26-Watt: 28 Watts
- (5) Two Quad-Tube Lamp T4, 26-Watt: 57 Watts

2.3 FLUORESCENT AND COMPACT FLUORESCENT LAMPS

- A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- B. 32-Watt, T8 Fluorescent Lamps:
 - 1. Base: Medium Bi-Pin
 - 2. Initial Lumens: 3100 (minimum)
 - 3. Mean Lumens: 2945 (minimum)
 - 4. CCT: 3500K
 - 5. CRI: 82 (minimum)
 - 6. Life: 20000 hours (3 hours/start)
- C. 17-Watt, T8 Fluorescent Lamps:
 - 1. Base: Medium Bi-Pin
 - 2. Initial Lumens: 1375 (minimum)
 - 3. Mean Lumens: 1305 (minimum)
 - 4. CCT: 3500K
 - 5. CRI: 85 (minimum)
 - 6. Life: 24000 hours (3 hours/start)
- D. 13-Watt, T4 Quad Tube Lamps:
 - 1. Base: 4-pin, G24Q-1
 - 2. Initial Lumens: 900
 - 3. Mean Lumens: 774
 - 4. CCT: 3000K
 - 5. CRI: 82
 - 6. Life: 12000 hours (3 hours/start)
- E. 18-Watt, T4 Quad Tube Lamps:
 - 1. Base: 4-pin, G24Q-2
 - 2. Initial Lumens: 1200
 - 3. Mean Lumens: 1032
 - 4. CCT: 3000K
 - 5. CRI: 82
 - 6. Life: 12000 hours (3 hours/start)
- F. 26-Watt, T4 Quad Tube Lamps:
 - 1. Base: 4-pin, G24Q-3
 - 2. Initial Lumens: 1710
 - 3. Mean Lumens: 1548
 - 4. CCT: 3000K

DANFORTH ON HIGH – PORTLAND, MAINE

5. CRI: 82
6. Life: 12000 hours (3 hours/start)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate and supporting grids for luminaires.
- B. Examine each luminaire to determine suitability for lamps specified.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- C. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- D. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- E. Install recessed luminaires to permit removal from below.
- F. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- G. Install wall mounted luminaires at height as scheduled.
- H. Install accessories furnished with each luminaire.
- I. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- J. Bond products and metal accessories to branch circuit equipment grounding conductor.
- K. Install specified lamps in each luminaire.

3.3 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING

- A. Aim and adjust luminaires as directed.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Re-lamp luminaires that have failed lamps at Substantial Completion.

3.5 CLEANING

- A. Clean electrical parts to remove conductive and deleterious materials.
- B. Remove dirt and debris from enclosure.
- C. Clean photometric control surfaces as recommended by manufacturer.
- D. Clean finishes and touch up damage.

END OF SECTION

Project: DANFORTH ON HIGH
Location: Freeport, Maine
Date: March 31, 2011

Bartlett Design
942 Washington Street, Bath, ME
(T) 207-443-5447 (F) 207-443-5560

LIGHTING FIXTURE SCHEDULE

All fixtures are 120 volt, unless specifically noted otherwise.
All fixtures shall be *Energy Star* rated.



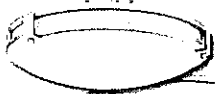
Dimensions: Height = 3" Diameter = 13 3/4"

Type: C1

Description: Surface mounted ceiling fixture with white acrylic diffuser. Fixture finish shall be white. Provide electronic ballast.

Lamps: (2) CF26DD/E/827

Manufacturers: *Brownlee Lighting # 2045-14-WH-226-ELB*



Dimensions: Height = 3 1/4" Diameter = 16"

Type: C2

Description: Surface ceiling mounted luminaire with white acrylic diffuser and decorative metal trim. Fixture finish shall be brushed nickel. Provide electronic ballast.

Lamps: (2) CF26DD/E/827

Manufacturers: *Lithonia # 11752 BN*



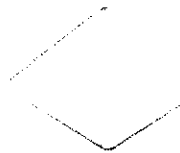
Dimensions: Overall Height = 8 5/8" Diameter = 16"

Type: C3

Description: Similar to Type C2 except semi-flush mounted.

Lamps: (2) CF26DD/E/827

Manufacturers: *Lithonia # 11752 BN*



Dimensions: Height = 2 1/4" Length/Width = 12"

Type: C4

Description: Surface ceiling mount square fixture with white finish and white acrylic diffuser. Provide electronic ballast.

Lamps: (2) CF18DD/E/827

Manufacturers: *Brownlee Lighting # 2035-12-WH-218-ES3*



Dimensions: Height = 2 1/4" Diameter = 16 1/2"

Type: C5

Description: Surface ceiling mount square fixture with brushed nickel finish and satin-etched glass diffuser. Provide electronic ballasts so that one lamp to runs continuously, and one lamp is controlled by a motion sensor.

Lamps: (2) CF18DD/E/827

Manufacturers: *Lithonia Lighting #11736 BN*



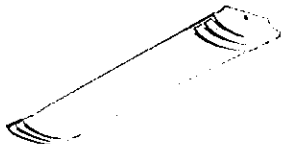
Dimensions: Height = 2 3/4" Length = 48" Width = 3 3/4"

Type: J1

Description: Surface ceiling mounted fluorescent strip. Provide electronic non-dimming ballast.

Lamps: (2) FO32/830/XP/ECO

Manufacturers: *Lithonia # C 2 32 120 GESB*



Dimensions: Height = 5 1/2" Length = 50 3/4" Width = 12 1/4"

Type: J2

Description: Surface ceiling mounted fluorescent luminaire with white acrylic diffuser and decorative brushed nickel metal trim. Provide electronic non-dimming ballast.

Lamps: (2) FO32/830/XP/ECO

Manufacturers: *Lithonia # 10813BN*



Dimensions: Height = 7 5/8" Width = 5 1/4" Projection = 4"

Type: L1

Description: Surface wall mounted luminaire with clear prismatic polycarbonate diffuser. Fixture finish shall be white. Mount in elevator pit 24" above pit floor. Provide electronic ballast.

Lamps: (1) CF13DD/E/827

Manufacturers: *American Scientific Lighting # WU/Q13/EB/ES*



Dimensions: Diameter= 13 3/4" Projection = 3 3/4"

Type: S2

Description: Exterior surface ceiling mounted luminaire with borosilicate glass diffuser. Luminaire finish shall be white. Luminaire shall be UL listed for wet locations.

Lamps: (1) CF42DT/E/IN/830/ECO

Manufacturers: *Lithonia* # VGR1-42TRT-GL-120-DWHG



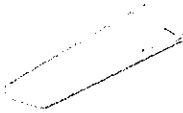
Dimensions: Height = 5 3/4" Length = 12 1/2" Projection = 7 1/2"

Type: S3

Description: Exterior surface wall mounted luminaire with full cutoff medium throw lighting distribution optics. Luminaire shall include clear flat bottom glass lens. Luminaire finish shall be dark bronze. Luminaire shall be UL listed for wet locations. Coordinate exact mounting height with Architect prior to rough-in.

Lamps: (1) CF42DT/E/IN/830/ECO

Manufacturers: *Lithonia* # WSTM-42TRT-MD-120



Dimensions: Height = 1 1/8" Length = 21 3/8" Width = 5"

Type: U1

Description: Under-cabinet fluorescent luminaire with white acrylic diffuser. Luminaire finish shall be white. Provide electronic non-dimming ballast.

Lamps: (1) F13T5/30U

Manufacturers: *Lithonia* # UC 21E 120



Dimensions: Height = 6" Length = 27" Projection = 4 1/4"

Type: W1

Description: Linear surface wall mounted fixture with white acrylic diffuser. Fixture finish shall be white. Provide electronic ballast. Install immediately above vanity mirror.

Lamps: (2) FO17/830/XP/ECO

Manufacturers: *Brownlee Lighting* # 5057-27-217-ES4



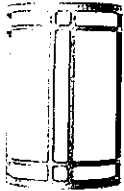
Dimensions: Height = 6 9/16" Length = 22 5/8" Projection = 3 1/4"

Type: W2

Description: Surface wall mounted fixture with curved etched-glass diffuser. Fixture finish shall be white. Provide electronic ballasts.

Lamps: (2) FO17/830/XP/ECO

Manufacturers: *Lithonia Lighting# 10842RET5 BNP*



Dimensions: Height = 10 7/8" Width = 7 1/8" Projection = 4"

Type: W3

Description: Surface wall mounted fixture with white acrylic diffuser and metallic casing. Provide electronic non-dimming ballast.

Lamps: (2) FO17/830/XP/ECO

Manufacturers: *Lithonia Lighting# 11956*



Dimensions: Length = 25" Height = 3 1/2" Projection = 3 7/8"

7/8"

Type: W4

Description: Surface wall mounted fixture with etched acrylic diffuser. Fixture to have die-cast aluminum ends with brushed nickel finish. Provide electronic non-dimming ballast.

Lamps: (2) FO17/830/XP/ECO

Manufacturers: *Lithonia Lighting# 11727RET5 BN*



Dimensions: Length = 11 3/4" Height = 7 5/8" Projection = 4 1/2"

Type: X1

Description: Wall mounted thermoplastic exit sign with red letters and white housing. Fixture shall include LED lamps. Provide directional arrows as indicated on the drawings.

Lamps: By Manufacturer

Manufacturer: *Lithonia # LQM-S-W-1-R-120/277*

EMERGENCY LIGHTING EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Emergency lighting units (Fixture Type E1).
- B. Exit signs (Fixture Type X1 and Type X2).

1.2 REFERENCES

- A. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
- B. NEMA WD1 - General Purpose Wiring Devices.

1.3 REGULATORY REQUIREMENTS

- A. Conform to NFPA 101 for installation requirements.

1.4 RELATED SECTIONS

- A. Section 16510 - Lighting Fixture Schedule

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 1 and Section 16010.
- B. Provide product data on emergency lighting units and exit signs.

1.6 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of each luminaire.

PART 2 - PRODUCTS

2.1 INCANDESCENT EMERGENCY LIGHTING UNITS

- A. Manufacturers: As specified in the Lighting Fixture Schedule in Section 16510.
- B. Emergency Lighting Unit: Self-contained unit with rechargeable storage batteries, charger, and lamps.

SANFORD MILL – SANFORD, MAINE

- C. Battery: 12 volt, nickel-cadmium type, with 1.5-hour capacity to supply the connected lamp load.
- D. Charger: Dual-rate charger, capable of maintaining the battery in a full-charge state during normal conditions, and capable of recharging discharged battery to fully charged within 12 hours.
- E. Lamps: 12-watt minimum, halogen sealed-beam type.
- F. Indicators: Provide lamps to indicate AC ON and RECHARGING.
- G. Provide switch to transfer unit from normal supply to battery supply.
- H. Unit Voltage: 120 volts, AC.

2.2 EXIT SIGNS

- A. Manufacturers: As specified in the Lighting Fixture Schedule in Section 16510.
- B. Exit Signs: AC-only exit sign with stencil face, white housing and red letters. Exit signs shall be equipped with LED lamps.
- C. Directional Arrows: Exit signs shall include universal, removable directional chevron inserts.
- D. Mounting: Exit Signs shall include universal top, end or back mounting provisions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install emergency units and exit signs plumb and level.
- B. Aim emergency unit directional lampheads as directed.
- C. Connect power to emergency lighting units to nearest lighting circuit ahead of all switches.

END OF SECTION

SECTION 16721

FIRE ALARM AND SMOKE DETECTION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section of the specification includes the furnishing, installation, and connection of a “house” fire alarm system consisting of a microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
- B. This section of the specification also includes furnishing, installation and connection of “local” fire alarm detection/notification means within individual living units. Local fire alarm means shall include, but not be limited to, alarm initiating devices, alarm notification appliances and wiring as shown on the Drawings and specified herein.
- C. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.
- D. This section also requires a connection to an off-site monitoring agency for reporting a “house” alarm condition.

1.2 RELATED SECTIONS

- A. Section 16180 – Equipment Wiring Systems.

1.3 “HOUSE” FIRE ALARM SCOPE

- A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.
- B. Basic Performance:
 - 1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on an NFPA Style 7 (Class A) Signaling Line Circuit (SLC).
 - 2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D).
 - 3. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z).
 - 4. Digitized electronic signals shall employ check digits or multiple polling.
- C. A single ground or open on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
- E. Interlock the “House” fire alarm system with the elevator operation as described in Section 16180.
- F. Interlock the “House” fire alarm system with the elevator shaft relief vent as described in Section 16180.

1.4 COORDINATION WITH CITY OF PORTLAND FIRE PREVENTION BUREAU

- A. Fire Alarm Permit
 - 1. The Contractor shall be responsible for obtaining a fire alarm permit from the City of Portland. A city fire alarm permit application and permit fee shall be submitted by the Contractor prior to purchase of any fire alarm equipment.
 - 2. The following will be provided by the Engineer in support of the fire alarm permit:
 - a. Electronic PDF files of floor plans showing fire alarm system components (11x17 and full-size copies).
 - b. Input/output matrix.
 - c. Designer qualifications.
 - 3. The following shall be provided by the Contractor in support of the fire alarm permit:
 - a. Wiring diagram from the system manufacturer.
 - b. Annunciator details from the system manufacturer.
 - c. Equipment data sheets from the system manufacturer.
 - d. Battery and voltage drop calculations.
- B. Fundamentals
 - 1. All fire alarm system components, wiring, and operation shall conform to all requirements contained in the City of Portland Standard for Signaling Systems for the Protection of Life and Property 2010 Edition.
 - 2. All control equipment must have transient protection devices to comply with UL864 requirements.
 - 3. Knox Box(s) – number, make, and model shall be provided as determined by the Fire Prevention Bureau, and shall be located as required by the Fire Department. All keys required to operate the life safety signaling system shall be placed within the box.
 - 4. Personnel Qualifications
 - a. System Installers and Service Personnel
 - (1) Life safety signaling system installers and service personnel shall be Maine licensed electricians.
 - (2) Life safety signaling system installers and service personnel shall have completed an approved training program in accordance with *NFPA 72*.
 - b. Certificate of Fitness
 - (1) Companies engaged in the installation or servicing of life safety signaling system shall have a Certificate of Fitness.
 - (2) Certificates of Fitness shall comply with *NFPA 1*.
 - 5. A fire alarm records cabinet shall be provided next to the Signal System Interface Panel. The cabinet shall be keyed alike, and labeled “FIRE ALARM DOCUMENTS”. With the exception of Section 14.6.3, it shall contain all records listed in Sections 10.18 and 14.6

DANFORTH ON HIGH – PORTLAND, MAINE

of *NFPA 72* for the life of the signaling system. In addition, a Record of System Installation (#14 of the Fire Alarm Emergency Communication System Record of Completion) shall be laminated and affixed to the inside of the cabinet.

C. Control Equipment

1. The signal system interface panel or a full-function annunciator panel shall be placed at the primary point of entry as defined by the Fire Prevention Bureau.
2. Programmable systems shall be capable of being programmed onsite.
3. All control features shall be placed within the signal system interface panel or annunciator panel only.
4. All signal system controls shall be secured by a key. Locked room doors shall not be acceptable. Allen keys shall not be acceptable.
5. Drill switches when activated shall be programmed to prevent transmission of an alarm signal, but shall initiate a supervisory signal at the panel and transmit a supervisory signal when connected to a central station. Activation of a drill switch alone shall not cause the evacuation signals to silence.
6. Any signal system interface panel which is placed within a space shall have the door leading to that space labeled with the words "Fire Alarm Control Panel".
7. Where two-way telephone communication service for fire department use is required by Chapter 10 of City Code and the fire department radio system is approved as an equivalent system, the Fire Prevention Bureau may require an approved fixed repeater system that shall meet the interface requirements of the City of Portland's 800 mhz radio system. All such equipment shall be properly installed and regularly maintained, and the cost thereof borne by the property owner and shall be available for inspection and use of the City of Portland 24/7.
8. Where fire department radio equipment fails to penetrate a building, the Fire Chief reserves the right to require a fixed repeater system complying with 1.4.B.8.

D. Initiating Devices

1. The tripping of a duct detector or tamper switch shall activate a supervisory signal only and shall not sound the evacuation signals.
2. Detection devices located within concealed spaces or spaces deemed inaccessible by the Fire Prevention Bureau shall have an indicator visual to the firefighter from an adjacent normally occupied space approved by the Fire Prevention Bureau.
3. Manual pull stations shall be reset with the same key as the fire alarm panel.
4. All automatic extinguishing systems shall be supervised by the life safety signal system.
5. All detection devices shall be protected against radio frequency activation.
6. Initiation devices shall be labeled with a unique identity number visible from the floor for tracking of maintenance.

E. Master Box Connections

1. Master Box Alarm Connections shall be approved by the Fire Chief.
2. All new master boxes shall be connected to the City of Portland Public Safety Answering Point (PSAP) via an approved wireless master box. Those facilities requiring or desiring signaling system monitoring other than the master box connection shall be by approved central station or means approved by the Fire Chief.
3. Master box alarm systems shall have a drill switch complying with 1.4.B.6.
4. Master box equipment shall be of the type approved by the Fire Chief.

DANFORTH ON HIGH – PORTLAND, MAINE

5. Installation shall be per manufacturer and City requirements.
6. Master box equipment shall be located next to the signal system interface panel and shall not be capable of operation apart from the building signal system.
7. Each master box alarm number shall not serve more than 100,000 square feet of building space, more than one building, more than one evacuation zone, or more than 6 stories.
8. All wiring on the municipal side of the signal system interface panel shall be rigid conduit.

F. Initiation Devices

1. Initiation devices shall be labeled with a unique identity number visible from the floor for tracking of maintenance. All such labeling shall be completed in the time frame established by *NFPA 72* for which each device of the given type must have been tested

1.5 "HOUSE" FIRE ALARM SYSTEM FUNCTIONAL OPERATION

- A. When a fire alarm condition is detected and reported by one of the system initiating devices located in common areas, the following functions shall immediately occur:
 1. The system alarm LED shall flash.
 2. A local piezo electric signal in the control panel shall sound.
 3. A backlit 80-character LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 4. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
 5. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed and the associated system outputs (alarm Notification appliances and/or relays) shall be activated.
 6. Audible and visual alarm notification appliances throughout the facility (including those in Living Units) shall activate.

1.6 "LOCAL" FIRE ALARM SCOPE

- A. Multiple-station, hard-wired unitary equipment conforming to *NFPA 72* shall be provided for all living units and shall be installed in accordance with the project specifications and Drawings.
- B. Basic Performance:
 1. Living Units : Actuation of any automatic fire alarm initiating device causes all local audible and visual alarms to activate within the given unit.

1.7 SUBMITTALS

- A. General:
 1. Submit shop drawings and product data under provisions of Division 1 and Section 16010.
 2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and

DANFORTH ON HIGH – PORTLAND, MAINE

quality. Equivalent equipment (compatible UL Listed) from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.
- B. Shop Drawings:
1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
 3. Show annunciator layout, configurations, and terminations.
- C. Manuals:
1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
 2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
 3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.
- D. Software Modifications:
1. Provide the services of a factory-trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
 2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.
- E. Certifications: Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.8 GUARANTY

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.9 POST CONTRACT MAINTENANCE

DANFORTH ON HIGH – PORTLAND, MAINE

- A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
- 1.10 POST CONTRACT EXPANSIONS
- A. The contractor shall provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- 1.11 APPLICABLE STANDARDS AND SPECIFICATIONS
- A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards.
1. National Fire Protection Association (NFPA) - USA:
 - a. No. 12 CO2 Extinguishing Systems.
 - b. No. 12A & 12B Halon Extinguishing Systems.
 - c. No. 15 Water Spray Systems.
 - d. No. 16 Foam/Water Deluge and Spray Systems.
 - e. No. 72-1993 National Fire Alarm Code.
 - f. No. 101 Life Safety Code.
 2. Underwriters Laboratories Inc. (UL) - USA:
 - a. No. 268 Smoke Detectors for Fire Protective Signaling Systems.
 - b. No. 864 Control Units for Fire Protective Signaling Systems.
 - c. No. 268A Smoke Detectors for Duct Applications.
 - d. No. 521 Heat Detectors for Fire Protective
 - e. No. 464 Audible Signaling Appliances.
 - f. No. 38 Manually Actuated Signaling Boxes.
 - g. No. 346 Waterflow Indicators for Fire Protective Signaling Systems.
 - h. No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems.
 - i. No. 1971 Visual Notification Appliances.
- B. Local and State Building Codes.
- C. All requirements of the City of Biddeford Fire Department.
- 1.12 APPROVALS
- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:
 1. UL Underwriters Laboratories Inc.
 2. FM Factory Mutual
- B. The fire alarm control panel shall meet UL Standard 864, (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems).
- C. The system shall be listed by the national agencies as suitable for extinguishing release applications.

DANFORTH ON HIGH – PORTLAND, MAINE

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.
- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2 CONDUIT AND WIRE

- A. Conduit:
 - 1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements, and shall be as specified in Section 16111.
 - 2. Where possible, all wiring shall be concealed within partitions or above ceilings. Where exposed wiring is necessary, it shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
 - 3. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.
 - 4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
 - 5. Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
 - 6. Conduit shall be 3/4-inch (19.1 mm) minimum.
- B. Wire:
 - 1. All fire alarm system wiring shall be new.
 - 2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.

DANFORTH ON HIGH – PORTLAND, MAINE

3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
 4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
 5. Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. The system shall support up to 1,000 ft. of untwisted, unshielded wire. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.
 6. All field wiring shall be completely supervised.
 7. The Fire Alarm Control panel shall be capable of T-Tapping Class B (NFPA Style 4) Signaling Line Circuits (SLC's). Systems that do not allow or have restrictions in, for example, the amount of T-Taps, length of T-Taps etc., are not acceptable.
- C. Terminal Boxes, Junction Boxes and Cabinets: All boxes and cabinets shall be UL listed for their use and purpose.
- D. Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.
- E. The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Main Power Distribution Panel as FIRE ALARM. Fire Alarm Control Panel Primary Power wiring shall be 12 AWG. The Control Panel Cabinet shall be grounded securely to either a cold water pipe or grounding rod.
- 2.3 "HOUSE" FIRE ALARM CONTROL PANEL:
- A. The FACP shall be a *Notifier* Model FireWarden-100-2(E), or APPROVED EQUAL and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, printer, annunciators, and other system controlled devices.
- B. System Capacity and General Operation:
1. The control panel shall provide, or be capable of expansion to 198 intelligent/addressable devices.
 2. The system shall include Form-C alarm and trouble relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include four Class B (NFPA Style Y) programmable Notification Appliance Circuits.
 3. The system shall support up to 99 programmable EIA-485 driven relays for an overall system capacity of 301 circuits.
 4. The Fire Alarm Control Panel shall include a full-featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color-coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
 5. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.
 6. The FACP shall provide the following features:

DANFORTH ON HIGH – PORTLAND, MAINE

- a. Drift Compensation to extend detector accuracy over life.
 - b. Sensitivity Test, meeting requirements of NFPA 72, Chapter 5.
 - c. Maintenance Alert to warn of excessive smoke detector dirt or dust accumulation.
 - d. System Status Reports to display or printer.
 - e. Alarm Verification, with verification counters.
 - f. PAS presignal, meeting NFPA 72 3-8.3 requirements.
 - g. Rapid manual station reporting (under 2 seconds).
 - h. Non-Alarm points for general (non-fire) control.
 - i. Periodic Detector Test, conducted automatically by software.
 - j. Pre-alarm for advanced fire warning.
 - k. Cross Zoning with the capability of: counting two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
 - l. March time and temporal coding options.
 - m. Walk Test, with check for two detectors set to same address.
 - n. UL 1076 Security Monitor Points.
 - o. Control-By-Time for non-fire operations, with holiday schedules.
 - p. Day/Night automatic adjustment of detector sensitivity.
 - q. Device Blink Control for sleeping areas.
7. The FACP shall be capable of coding Notification circuits in March Time (120 PPM), Temporal (NFPA 72 A.2.2.2.2), and California Code.
- C. Central Microprocessor:
1. The Microprocessor shall communicate with, monitor, and control all external interfaces with the control panel. It shall include EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
 2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory and shall not be lost even if system primary and secondary power failure occurs.
 3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.
- D. Display:
1. The display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
 2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
 3. The display shall provide an 80-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide 5 Light-Emitting-Diodes (LEDs), that will indicate the status of the following system parameters: AC POWER, FIRE ALARM, SYSTEM TROUBLE, ALARM SILENCED, SUPERVISORY, MAINTENANCE/PRE-SIGNAL, DISABLED, BATTERY FAULT, and GROUND FAULT.
 4. The Display shall provide a 16-key touch keypad with control capability to command all system functions, entry of alphabetic or numeric information, and field

DANFORTH ON HIGH – PORTLAND, MAINE

programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

5. The Display shall include the following operator functions: ALARM SILENCE, SYSTEM RESET, DRILL, and ACKNOWLEDGE/STEP.

E. Signaling Line Circuit (SLC):

1. The SLC interface shall provide power to and communicate with up to 99 intelligent detectors (Ionization, Photoelectric, or Thermal) and 99 intelligent modules (monitor or control) for a system capacity of 198 devices. This shall be accomplished over a single SLC loop and shall be capable of NFPA 72 Style 4, Style 6, or Style 7 wiring.
2. The loop interface shall receive analog information from all intelligent detectors that shall be processed to determine whether normal, alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
3. The detector software shall meet NFPA 72, chapter 7 requirements and be certified by UL as a calibrated sensitivity test instrument.
4. The detector software shall allow manual or automatic sensitivity adjustment.

F. Serial Interfaces:

1. An EIA-232 interface between the Fire Alarm Control Panel and UL Listed Electronic Data Processing (EDP) peripherals shall be provided.
2. The EIA-232 interface shall allow the use of printers, CRT monitors, and PC compatible computers.
3. The EIA-232 interface shall include special protocol methods that allow off-site monitoring of the FACP over standard dial-up phone lines. This ancillary capability shall allow remote readout of all status information, including analog values, and shall not interfere with or degrade FACP operations when used. It shall allow remote FACP Acknowledge, Reset, or Signal Silence in this mode. It shall also allow adjustment of detector sensitivity and readout of the history file.
4. An EIA-485 interface shall be available for the serial connection of remote annunciators and LCD displays.
5. The EIA-485 interface may be used for network connection to a Proprietary Receiving Unit.

G. Enclosures:

1. The control panel shall be housed in a UL listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.

H. All interfaces and associated equipment are to be protected so that voltage surges or line transients, consistent with UL standard 864, will not affect them.

I. Optional plug-in modules shall be provided for by NFPA 72, Chapter 4, Transmitters.

DANFORTH ON HIGH – PORTLAND, MAINE

- J. An optional module shall be available which provides 8 Form-C relays rated at 5.0. The relays shall track programmable software zones.
- K. Power Supply:
1. The Power Supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
 2. It shall provide 5.0 amps of usable Notification appliance power, using a switching 24 VDC regulator. A 3.0 amp Notification expansion power supply shall be available for the demanding requirements of UL 1971 and ADA devices, for a total system capacity of 8 amps.
 3. It shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge.
 4. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
 5. It shall be power-limited per 1995 UL864 standards.
 6. It shall provide optional meters to indicate battery voltage and charging current.
- L. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24-volt power supply or used to power Notification Appliances.
1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24-volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60-hour standby.
 2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
 3. The FCPS shall include a surface mount backbox.
 4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per 1993 NFPA requirements.
 5. The FCPS include power limited circuitry, per 1995 UL standards.
- M. Field Wiring Terminal Blocks: For ease of service all panel I/O wiring terminal blocks shall be a removable, plug-in type and have sufficient capacity for 18 to 12 AWG wire. Terminal blocks that are permanently fixed are not acceptable.
- N. Operator's Controls:
1. Acknowledge/Step Switch: Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and Trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
 - a. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
 2. Alarm Silence Switch: Activation of the Signal silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field-programmable within the confines of

DANFORTH ON HIGH – PORTLAND, MAINE

all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

3. System Reset Switch: The system reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
 - a. Holding the system RESET switch shall perform a lamp test function.
 4. Drill (Evacuate) Switch: The drill switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
- O. Field Programming:
1. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.
 2. All programming may be accomplished through the standard FACP keypad.
 3. All field-defined programs shall be stored in non-volatile memory.
 4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.
 5. Program edit shall not interfere with normal operation and fire protection. If a fire condition is detected during programming operation, the system shall exit programming and perform fire protection functions as programmed.
 6. A special program check function shall be provided to detect common operator errors.
 7. An Auto-Program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
 8. For flexibility, an off-line programming function, with batch upload/download, shall also be available.
- P. Specific System Operations:
1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all-analog intelligent smoke detectors in the system from the control panel. Sensitivity range shall be within the allowed UL window.
 2. Alarm Verification: Each intelligent addressable smoke detector in the system shall be independently selected and enabled to be alarm verified. The alarm verification delay shall be programmable from 5 to 30 seconds. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
 3. Point Disable: Any device in the system may be enabled or disabled through the system keypad.
 4. Point Read: The system shall be able to display or print the following point status diagnostic functions:
 - a. Device status.
 - b. Device types.
 - c. Custom device labels.
 - d. View analog detector values.
 - e. Device zone assignments.
 - f. All program Parameters.

DANFORTH ON HIGH – PORTLAND, MAINE

5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing system status.
6. System History Recording and Reporting: The Fire Alarm Control Panel shall contain a History Buffer that will be capable of storing up to 650 system alarms/troubles/operator actions. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the History Buffer may be manually reviewed, one event at a time, or printed in its entirety.
 - a. Although the foreground history buffer may be cleared for user convenience, a background, non-erasable buffer shall be maintained which provides the last 650 system events.
 - b. The History Buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable.
7. Automatic Detector Maintenance Alert: The Fire Alarm Control Panel shall automatically interrogate each intelligent smoke detector and shall analyze the detector responses over a period of time.
 - a. If any intelligent smoke detector in the system responds with a reading that is below or above normal limits, then the system will enter the Trouble Mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. Pre-alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field-adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.
9. Software Zones: The FACP shall provide 99 software zones. All addressable devices may be field-programmed to be grouped into software zones for control activation and annunciation purposes.

2.4 "HOUSE" FIRE ALARM COMPONENTS:

- A. Programmable Electronic Sounders:
 1. Electronic sounders shall operate on 24 VDC nominal.
 2. Electronic sounders shall be field programmable without the use of special tools, to provide slow whoop, continuous, Temporal or interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device.
 3. Shall be flush or surface mounted as shown on plans.
- B. Strobe Lights:
 1. Shall operate on 24 VDC nominal.
 2. Shall meet the requirements of the ADA as defined in UL standard 1971 and shall meet the following criteria:
 - a. The maximum pulse duration shall be 2/10ths of one second.
 - b. The strobe intensity shall meet the requirements of UL 1971.
 - c. The flash rate shall meet the requirements of UL 1971.

DANFORTH ON HIGH – PORTLAND, MAINE

- d. The appliance shall be placed 80 in (2,030 mm) above the highest floor level within the space, or 6 in (152 mm) below the ceiling, whichever is the lower.
 - e. Fire alarm notification appliances in sleeping areas within living units shall have a visual intensity of 110 candela where the appliance is mounted 24" or more below the ceiling, or 177 candela where the appliance is mounted less than 24" below the ceiling. Notification appliances shall be installed at 80" above finished floor. All other notification appliances located within living units shall have a visual intensity of 15 candela.
- C. Audible/Visual Combination Devices:
1. Shall meet the applicable requirements of Section A listed above for audibility.
 2. Shall meet the requirements of Section B listed above for visibility.
- D. Addressable Devices – General:
1. Addressable Devices shall provide an address-setting means using rotary decimal switches.
 2. Addressable Devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches. Devices that use a binary address setting method, such as a dipswitch, are not an allowable substitute.
 3. Detectors shall be intelligent and addressable, and shall connect with two wires to the Fire Alarm Control Panel Signaling Line Circuits.
 4. Addressable smoke and thermal detectors shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.
 5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall be automatically adjusted by the panel on a time-of-day basis.
 6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
 7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. An optional base shall be available with a built-in (local) sounder rated at 85 DBA minimum.
 8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
 9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
- E. Addressable Pull Box (manual station):
1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable

DANFORTH ON HIGH – PORTLAND, MAINE

communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.

F. Intelligent Photoelectric Smoke Detector

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
2. The detectors shall be ceiling-mounted and available in an alternate model with an integral fixed 135-degree heat-sensing element.
3. Each detector shall contain a remote LED output and a built-in test switch.
4. Detector shall be provided on a twist-lock base.
5. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.
6. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall periodically flash to indicate that the detector is in communication with the control panel.
7. The detector shall not go into alarm when exposed to air velocities of up to 1500 feet per minute (fpm).
8. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
9. All field wire connections shall be made to the base through the use of a clamping plate and screw.

G. Intelligent Thermal Detectors: Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

H. Addressable Dry Contact Monitor Module:

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLC loops.
2. The monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.
3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch x 1-1/4 inch x 1/2 inch. This version need not include Style D or an LED.

DANFORTH ON HIGH – PORTLAND, MAINE

- I. Two-Wire Detector Monitor Module:
 - 1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
 - 2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.
 - 3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

- J. Addressable Control Module:
 - 1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.
 - 2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
 - 3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
 - 4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.
 - 5. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

- K. Isolator Module:
 - 1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.
 - 2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
 - 3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
 - 4. The isolator module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

- L. Waterflow Indicators:
 - 1. Flow switches shall be integral, mechanical, non-coded, non-accumulative retard type.
 - 2. Flow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30 Å 45 seconds.

DANFORTH ON HIGH – PORTLAND, MAINE

3. Flow switches shall be located a minimum of one (1) foot from a fitting that changes the direction of the flow and a minimum of three (3) feet from a valve.
- M. Sprinkler and Standpipe Valve Supervisory Switches:
1. Each sprinkler system water supply control valve riser or zone control valve, and each standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
 2. Each Post Indicator Valve (PIV) or main gate valve shall be equipped with a supervisory switch.
 3. Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
 4. The mechanism shall be contained in a weatherproof aluminum housing that shall provide a 3/4-inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.
 5. Switch housing to be finished in red baked enamel.
 6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
 7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.
- N. Remote Annunciators
1. The remote annunciator shall be as manufactured by *Notifier* Model LCD-80/ABF-1B, or approved equal. The annunciator shall include an 80 character LCD display and shall include control switches for system acknowledge, signal silence and system reset period. The annunciator cabinet shall be flush recessed type.
- O. House Fire Alarm Control Panel Batteries
1. Shall be 12 volt, Gell-Cell type (two required).
 2. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
 3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.
- 2.5 "LOCAL" FIRE ALARM COMPONENTS
- A. Living Unit Combination Smoke Detector/Horn/Strobe: *Gentex* Model 7109CS. Wall or ceiling mounted station with integral photoelectric smoke detector, horn and strobe. Unit shall be equipped with status light and test switch. Provide a quantity of six (6) detectors for future installation by Owner.
1. Power: 120 VAC with integral 9 VDC battery.
 2. Contacts: Form C
 3. Horn: 90 dB.
 4. Smoke Sensitivity: 3%.
 5. Strobe: UL1971, 177 cd.

DANFORTH ON HIGH – PORTLAND, MAINE

2.6 MUNICIPAL FIRE ALARM MASTER BOX

- A. Provide municipal fire alarm master transmittal box as directed by the City Fire Department to match the City's standard.
- B. Provide communications cable for fire alarm master box to be connected to the municipal fire alarm circuit at Elm Street.
 - 1. Description: IMSA Spec 20-2 shielded, 3-twisted-pair, 600 volt, #16 AWG conductor with black polyethylene jacket. Obtain approval from City Fire Department for cable prior to purchasing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All wiring shall be concealed in finished areas. Exposed wiring in conduit may be used in areas where concealed wiring is not possible; however, prior approval from the Architect must be obtained for any exposed work prior to installation.
- C. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- D. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- E. Connect the remote annunciator to the main fire alarm control panel with one-pair EIA-485 cable and with two 24 VDC conductors, size #18 AWG.
- F. Verify installation detail with Architect for door holders prior to installation.

3.2 TEST

- A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.
 - 1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 - 2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
 - 3. Verify activation of all flow switches.

DANFORTH ON HIGH – PORTLAND, MAINE

4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open and short signaling line circuits and verify that the trouble signal actuates.
6. Open and short Notification Appliance Circuits and verify that trouble signal actuates.
7. Ground all circuits and verify response of trouble signals.
8. Check presence and audibility of tone at all alarm notification devices.
9. Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.
10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
11. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION

- A. At the final inspection a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.4 INSTRUCTION

- A. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The Contractor and/or the Systems Manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16722

DOOR ENTRY ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Combination paging intercom and door control system.

1.2 RELATED SECTIONS

- A. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- B. Section 26 05 19 – Low Voltage Electrical Power Conductors.

1.3 REGULATORY REQUIREMENTS

- A. System: UL listed.

1.4 SYSTEM DESCRIPTION

- A. Intercom Door Control: A door entry access control system shall be provided to facilitate voice paging between the main entrance and the individual living units. In addition, the entrance door lock at the entrance vestibule shall be remotely controlled by local intercom stations in individual living units.

1.5 SUBMITTALS

- A. Provide wiring diagrams, data sheets, and equipment ratings, layout, dimensions, and finishes.

1.6 PROJECT RECORD DRAWINGS

- A. Include location of system devices.

1.7 OPERATION AND MAINTENANCE DATA

- A. Include operating instructions, and maintenance and repair procedures.

PART 2 - PRODUCTS

2.1 INTERCOM/ DOOR CONTROL COMPONENTS

- A. Manufacturers:
 - 1. *TekTone.*

DANFORTH ON HIGH – PORTLAND, MAINE

2. Substitutions: Or Approved Equal.
- B. Master Intercom/Door Control Stations:
1. *TekTone* Model # CM492/035/OF192/OH190
 2. Mounting: Recessed wall
 3. Station capacity: 30 units
 4. Directory: Model # AM190D.
 5. Communications: Integral speaker and microphone.
 6. Size: 16.5" H x 4" W
- C. System Amplifier:
1. *TekTone* Model # PK543A
 2. Mounting: Surface wall.
 3. Delay Timing: Selectable 10 or 20 seconds.
 4. Size: 5.5" H x 3.125" W x 2" D
 5. Power: 16 VAC, 10 VA
- D. Transfer Relay:
1. *TekTone* Model # PK543B
 2. Mounting: Surface mount.
- E. Transformer:
1. *TekTone* Model # SS102A
 2. Primary: 120 VAC
 3. Secondary: 16 VAC
 4. Connection: Hard wired.
- F. Living Unit Intercom Station:
1. *TekTone* Model # IR105E
 2. Mounting: Recessed wall.
 3. Communications: Integral speaker and microphone with call button.
 4. Size: 6.875"H x 5" W x 1.25" D.
 5. Speaker: 3.25" diameter with voice frequency response.
- G. Living Unit Strobe Unit:
1. *TekTone* Model # LI404B
 2. Mounting: Flush mount.
 3. Size: 6.5" W x 8.5" H.
 4. Strobe: Flashes for 15-20 seconds upon receipt of incoming call signal.
- H. Wiring: As recommended by the manufacturer.
1. Audio: Two-pair 22AWG, twisted, shielded.
 2. Low-Voltage: #18 or #22AWG as recommended by the manufacturer.

PART 3 - EXECUTION

DANFORTH ON HIGH – PORTLAND, MAINE

3.1 COORDINATION

- A. Coordinate door entry access control system with door operators and door hardware being provided under the General Contract. Contractor is responsible for coordination of all interface requirements including proper voltages, conductors and terminations.

3.2 INSTALLATION

- A. Install devices in accordance with manufacturer's instructions.
- B. Verify exact location of living unit intercom stations and living unit strobe units with Architect prior to rough-in.
- C. Coordinate mounting height for door entry stations with Architect prior to rough-in.
- D. Install system amplifier, transfer relay and power transformer in Electrical Room B09.

3.3 FIELD QUALITY CONTROL

- A. Provide field-testing and adjustment of installed security alarm devices to assure satisfactory operation.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16725

CARBON-MONOXIDE DETECTION SENSORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section of the specification includes the furnishing, installation, and connection of local carbon monoxide sensors and wiring as shown on the drawings and specified herein.

1.2 SUBMITTALS

A. General:

1. Submit shop drawings and product data under provisions of Division 1 and Section 16010.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent equipment (compatible UL Listed) from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

1.3 GUARANTY

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.4 APPLICABLE STANDARDS AND SPECIFICATIONS

DANFORTH ON HIGH – PORTLAND, MAINE

- A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards.
 - 1. National Fire Protection Association (NFPA) - USA:
 - a. NFPA 720 - Standard for the Installation of Carbon Monoxide Detection and Warning Equipment.
 - 2. Underwriters Laboratories Inc. (UL) - USA:
 - a. No. 2034 - Single and Multiple Station Carbon Monoxide Alarms
- B. Local and State Building Codes.

PART 2 - PRODUCTS

2.1 CARBON MONOXIDE SENSORS

- A. Manufacturers
 - 1. *BRK Brands, Inc.* Model C05120BN
 - 2. Substitutions: Or Approved Equal.
- B. Description: Carbon monoxide sensors shall include an electrochemical CO sensor adjusted not to detect CO levels below 30 PPM. Alarms shall not sound when exposed to constant levels of 30 PPM for thirty days. Alarms shall sound at 400 PPM between four and fifteen minutes, 150 PPM between 10 and fifteen minutes, and 70 PPM between 60 and 240 minutes. Sensors shall conform to the requirements of UL 2034 and NFPA 720.
 - 1. Electrical Rating: 120 VAC with 9 VDC battery backup.
 - 2. Alarm:
 - a. 85 DB at 10 feet.
 - b. Test/silence button to check all alarm functions and to silence any nuisance alarms.
 - c. Low-battery alarm with silence feature.
 - 3. Diagnostics: Self-diagnostic to issue an audible malfunction warning.
 - 4. Visual Indication: LED power ON indicator.

2.2 CONDUIT AND WIRE

- A. Conduit and wire shall be provided in accordance with Specification Sections 16111 and 16123.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NFPA 70 and NFPA 720, as well as local and state codes. Installation shall also conform to all requirements established by the equipment manufacturer.

DANFORTH ON HIGH – PORTLAND, MAINE

B. All wiring shall be concealed in finished areas.

3.2 TEST

A. Upon completion of the system installation, the system shall be tested to determine functionality.

3.3 INSTRUCTION

A. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16742

TELEPHONE SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. The Telephone System shall include interior telephone wire, telephone outlets and boxes.

1.2 RELATED WORK

- A. Section 16130 - Boxes.
- B. Section 16421 - Utility Service Entrance.

1.3 REFERENCES

- A. ANSI/NEMA FB 1 - Telephone conduit fittings.

1.4 PROJECT RECORD DOCUMENTS

- A. Accurately record location of telephone outlet boxes.

1.5 WORK BY OWNER

- A. Telephone instruments will be supplied by the Owner.

PART 2 - PRODUCTS

2.2 TELEPHONE BOXES

- A. Outlet Boxes: Sheet metal, galvanized steel, as specified in Section 16130.

2.3 STANDARD TELEPHONE WIRE

- A. Description: Category 5e unshielded twisted 4-pair wiring (UTP), 24 AWG. Category 5e cable shall meet the physical requirements of ANSI/ICEA publication S-80-576 (ref. B1.6). Exterior jacket color shall be green.
- B. Characteristics:
 - 1. Nominal Impedance: $100\text{-}\frac{1}{2} \pm 15\%$ from 1 MHz to 100 MHz)
 - 2. Maximum DC Resistance: $9.38 \frac{1}{2} / 100 \text{ m.}$
 - 3. Mutual Capacitance (max.): 5.25 nF/100m

DANFORTH ON HIGH – PORTLAND, MAINE

- C. Manufacturers:
 - 1. *AMP*.
 - 2. *Mohawk*.
 - 3. Substitutions: Or Approved Equal.

2.4 TELEPHONE OUTLET JACKS

- A. Manufacturers:
 - 1. *Panduit*
 - 2. *NORDX*
 - 3. *AMP*
 - 4. *Leviton*
 - 5. Substitutions: Approved Equal.
- B. Recessed Wall Type: RJ45, Category 5e, 4-pair for modular type (quick connect terminals) suitable for back wiring and mounting in a standard electrical box. Jack shall include a plastic ivory faceplate and mounting lugs.

2.5 TELEPHONE SERVICE WIRING CONNECTION ENCLOSURE

- A. Description: Provide a service enclosure box with lockable hinged front doors to enclose the telephone service wiring termination 110 blocks for the entire facility. Locate the enclosure box on the telephone service board at the second floor telephone room. Size the enclosure box as necessary to accommodate wiring terminations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Verify that field measurements are as shown on Drawings.
- C. Beginning of installation means installer accepts existing conditions.

3.2 TELEPHONE OUTLETS, WIRING, BOXES AND CONDUIT

- A. Provide telephone outlet boxes and jacks as shown on Drawings. Provide recessed (flush) mounted telephone outlet boxes in all finished areas. Provide surface mounted outlet boxes only in unfinished areas or where installed on existing exposed masonry walls.
- B. Do not install recessed telephone boxes back-to-back in walls; provide minimum 6-inch separation. Provide minimum 24 inches separation in acoustic rated walls.
- C. Secure recessed telephone boxes to interior wall and partition studs. Accurately position to allow for surface finish thickness.

DANFORTH ON HIGH – PORTLAND, MAINE

- D. Coordinate mounting heights and locations of outlet boxes mounted above counters, benches, and backsplashes.
- E. Install telephone outlet boxes 18 inches above finished floor.
- F. Conceal telephone wire within partitions or above ceilings. Provide straps as required to properly support cables.
- G. Do not make splices in telephone wiring. Provide telephone wiring continuous from outlet jacks to 110 telephone termination blocks to be located at the main telephone service board in the electrical room. Make all necessary wiring terminations.
- H. Test all installed telephone wire, outlets and terminations to assure proper operation.

END OF SECTION

DANFORTH ON HIGH – PORTLAND, MAINE

SECTION 16745

CABLE TELEVISION SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide new cable TV interior wiring, wiring taps, backboards and outlet jacks.

1.2 RELATED WORK

- A. Section 16111 - Conduit.
- B. Section 16130 - Boxes.
- C. Section 16421 - Utility Service entrance.

1.3 SUBMITTALS

- A. Product Data: Submit physical and operating characteristics of interior cable and outlet jacks.

1.4 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provision of Division 1.
- B. Accurately record location of cable TV outlets.

1.5 CABLE TELEVISION SERVICE

- A. Cable TV service shall be provided as specified in Section 16421.

PART 2 - PRODUCTS

2.1 INTERIOR CABLE TELEVISION WIRING

- A. Manufacturers:
 - 1. *Belden.*
 - 2. *AT & T.*
 - 3. Substitutions: Or Approved Equal.
- B. Description: Coax cable, 60 degrees C, RG-6 for circuit runs 300 feet and less; coaxial cable, 60 degrees C, RG-11 for circuits longer than 300 feet.

DANFORTH ON HIGH – PORTLAND, MAINE

2.2 CABLE TELEVISION OUTLET BOXES

- A. Outlet Boxes: Sheet metal or non-metallic, as specified in Section 16130.

2.3 CABLE TELEVISION JACKS

- A. Recessed Wall Type: "F" style threaded coaxial cable connector suitable for back wiring and mounting in a standard electrical box. Jack shall include a plastic ivory faceplate and mounting lugs.

2.4 CABLE TELEVISION BACKBOARDS

- A. Local Backboards at Service Closets: $\frac{3}{4}$ " by 30" sq. plywood backboard, painted black. Mount on wall, secured to partition studs.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Verify that field measurements are as shown on Drawings.
- C. Beginning of installation means installer accepts existing conditions.

3.2 CABLE TELEVISION OUTLETS

- A. Provide TV outlet boxes and jacks as shown on Drawings.
- B. Provide recessed (flush) mounted TV outlet boxes in all finished areas except where installed on exposed masonry walls.
- C. Do not install recessed TV outlet boxes back-to-back in walls; provide minimum 6-inch separation. Provide minimum 24 inches separation in acoustic rated and fire rated walls.
- D. Secure recessed TV outlet boxes to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- E. Install TV outlet boxes at height indicated on Drawings.
- F. Adjust TV outlet jacks and wall plates to be flush and level.

DANFORTH ON HIGH – PORTLAND, MAINE

3.2 CABLE TELEVISION WIRING

- A. Route interior cable concealed in partitions above ceilings. Exposed wiring in conduit may be used where concealed wiring is not possible.
- B. Do not make splices of television cables.
- C. Support television cables above ceilings using spring metallic clips or cable ties to support cables from structure. Do not rest cables on lay-in ceiling panels.
- D. Provide television cables continuous from outlet jacks to cable taps and service point at the main electrical room.

END OF SECTION

SECTION 16910

GAS ENGINE DRIVEN GENERATOR SETS

PART 1 – GENERAL

1.1 SCOPE

- A. Provide complete factory assembled natural gas-fired generator set equipment with digital (microprocessor-based) electronic controls.
- B. Provide factory test, startup by a supplier authorized by the manufacturer, and on-site testing of the system.
- C. The generator set manufacturer shall warrant all equipment provided under this section, whether or not is manufactured by the generator set manufacturer, so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

1.2 CODES AND STANDARDS

- A. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of these standards.
 - 1. CSA 282, 1989 Emergency Electrical Power Supply for Buildings
 - 2. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
 - 3. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
 - 4. NFPA99 – Essential Electrical Systems for Health Care Facilities
 - 5. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.
- B. The generator set and supplied accessories shall meet the requirements of the following standards:
 - 1. NEMA MG1-1998 part 32. Alternator shall comply with the requirements of this standard.
 - 2. UL1236 – Battery Chargers
 - 3. UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed.
- C. The control system for the generator set shall comply with the following requirements.

DANFORTH ON HIGH – PORTLAND, MAINE

1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
 2. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
 3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
 4. FCC Part 15, Subpart B.
 5. IEC8528 part 4. Control Systems for Generator Sets
 6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
 7. UL508. The entire control system of the generator set shall be UL508 listed and labeled.
 8. UL1236 –Battery Chargers.
- D. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.3 SUBMITTALS

- A. Within 10 days after award of contract, provide six sets of the following information for review:
1. Manufacturer's product literature and performance data, sufficient to verify compliance to specification requirements.
 2. A paragraph by paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
 3. Manufacturer's certification of prototype testing.
 4. Manufacturer's published warranty documents.
 5. Shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.
 6. Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
 7. Manufacturer's installation instructions.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Only approved bidders shall supply equipment provided under this contract. Equipment specifications for this project are based on microprocessor-based generator sets manufactured by *Cummins Power Generation*. Equipment by the following other supplier that meets the requirement of this specification is acceptable. Proposals must include a line by line compliance statement based on this specification.
1. *Kohler*
 2. *Caterpillar*
 3. Substitutions: None permitted

DANFORTH ON HIGH – PORTLAND, MAINE

2.2 GENERATOR SET

- A. Model: The generator shall be *Cummins* Series GGPA, or approved equal.
- B. Ratings
1. The generator set shall operate at 1800 rpm and at a voltage of: 208/120 Volts AC, three phase, 4-wire, 60 hertz.
 2. The generator set shall be rated at 150 kW, 189 kVA at 0.8 PF, standby rating, based on site conditions of: Altitude 499 ft. (152 meters), ambient temperatures up to 77 degrees F (25 degrees C).
 3. The generator set rating shall be based on emergency/standby service.
- C. Performance
1. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load for both parallel and non-parallel applications. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
 2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.
 3. The engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
 4. Motor starting capability shall be a minimum of ___ kVA. The generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified kVA load at near zero power factor applied to the generator set.
 5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic. Telephone influence factor shall be less than 40.
- D. Construction
1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails
 2. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight, and the enclosure door shall be gasketed. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.
- E. Connections
1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.

DANFORTH ON HIGH – PORTLAND, MAINE

2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel.
3. Generator set control interfaces to other system components shall be made on a common, permanently labeled terminal block assembly.

2.3 ENGINE AND ENGINE EQUIPMENT

- A. The engine shall be natural gas fueled, radiator and fan cooled. Minimum displacement shall be 305 cubic inches, with 8 cylinders. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Engine accessories and features shall include:
 - B. Complete engine fuel system, including all pressure regulators, strainers, and control valves. The fuel system shall be plumbed to the generator set skid for ease of site connections to the generator set. For dual fuel systems, changeover from primary to secondary fuel shall be automatic.
 - C. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous or parallel states.
 - D. Skid-mounted radiator and cooling system rated for full load operation in 104 degrees F (40 degrees C) ambient as measured at the generator air inlet, based on 0.5 in H₂O external static head. Radiator shall be sized based on a core temperature that is 20F higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Radiator shall be provided with a duct adapter flange. The equipment manufacturer shall fill the cooling system with a 50/50-ethylene glycol/water mixture. Rotating parts shall be guarded against accidental contact.
 - E. Electric starter(s) capable of three complete cranking cycles without overheating.
 - F. Positive displacement, mechanical, full pressure, lubrication oil pump.
 - G. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
 - H. Replaceable dry element air cleaner with restriction indicator.
 - I. Flexible fuel lines.
 - J. Engine mounted battery charging alternator, 40-ampere minimum, and solid-state voltage regulator.

DANFORTH ON HIGH – PORTLAND, MAINE

- K. Coolant heater
 - 1. Engine mounted, thermostatically controlled, coolant heater(s) for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 listed and labeled.
 - 2. The coolant heater shall be installed on the engine with high temperature silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall be installed using quick disconnect couplers to isolate the heater for replacement of the heater element. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.
 - 3. The coolant heater shall be provided with a 24VDC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system.
 - 4. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 100F (40C) in a 40F ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.

- L. Provide vibration isolators, spring/pad type or as recommended by the manufacturer, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.

- M. Starting and Control Batteries shall be calcium/lead antimony type, 24 volt DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors.

- N. Provide exhaust silencer(s) for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. The mufflers shall be critical grade. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards.
 - 1. Provide a minimum 12 amp battery charger for each generator set battery bank. Generator sets incorporating two battery banks shall be provided with two chargers connected together and operating in parallel, with alarm output(s) connected in parallel. The charger(s) shall include the following capabilities:
 - 2. Chargers shall be UL 1236-BBHH listed and CSA or CUL certified for use in emergency applications.

DANFORTH ON HIGH – PORTLAND, MAINE

3. The charger shall be compliant with UL991 requirements for vibration resistance.
4. The charger shall comply with the requirements of EN61000-4-5 for voltage surge resistance; EN50082-2 for immunity; EN61000-4-2 for ESD; EN61000-4-3 for radiated immunity; ANSI/IEEE C62.41 category B and IN61000-4-4 for electrically fast transient; EN61000-4-6 for conducted emissions; and FCC Part 15 Class A for radiated emissions.
5. The charger shall be capable of charging a fully discharged battery without damage to the charger. It shall be capable of returning a fully discharged battery to fully charged condition within 24 hours. The charger shall be UL-labeled with the maximum battery amp-hour rating that can be recharged within 24 hours.
6. The charger shall incorporate a 4-state charging algorithm, to provide trickle charge rate to restore fully discharged batteries, a bulk charge rate to provide fastest possible recharge after normal discharge, an absorption state to return the battery to 100 percent of charge, and a float stage to maintain a fully charge battery and supply battery loads when the generator set is not operating. In addition, the charger shall include an equalization timer. Charge rates shall be temperature compensated based on the temperature directly sensed at the battery.
7. The DC output voltage regulation shall be within plus or minus 1%. The DC output ripple current shall not exceed 1 amp at rated output current level.
8. The charger shall include the following features:
 - a. two line alphanumeric display with programming keys to allow display of DC output ammeter and voltmeters (5% accuracy or better), display alarm messages, and perform programming;
 - b. LED indicating lamp(s) to indicating normal charging condition (green), equalize charge state (amber), and fault condition (red);
 - c. AC input overcurrent, over voltage, and undervoltage protection;
 - d. DC output overcurrent protection;
 - e. Alarm output relay
 - f. Corrosion resistant aluminum enclosure

2.4 AC GENERATOR

- A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 150 degrees Centigrade.
- B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.
- C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single

DANFORTH ON HIGH – PORTLAND, MAINE

phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.

- D. The sub-transient reactance of the alternator shall not exceed 15 percent, based on the standby rating of the generator set.
- E. The alternator shall be capable of operation with reverse kVAR of 0.15 per unit.

2.5 GENERATOR SET CONTROL

- A. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
- B. The control shall be mounted on the generator set, or may be mounted in a free-standing panel next to the generator set if adequate space and accessibility is available. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.
- C. The generator set mounted control shall include the following features and functions:
 - 1. Control Switches
 - a. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or MANUAL position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. A separate push-button to initiate starting is acceptable. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
 - b. EMERGENCY STOP switch. Switch shall be Red "mushroom-head" push-button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
 - c. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
 - d. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.
 - 2. Generator Set AC Output Metering. The generator set shall be provided with a metering set including the following features and functions:
 - a. Digital metering set, 1% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor. Generator output voltage shall be available in line-to-line

DANFORTH ON HIGH – PORTLAND, MAINE

- and line-to-neutral voltages, and shall display all three-phase voltages (line to neutral or line to line) simultaneously.
 - b. Analog voltmeter, ammeter, frequency meter, power factor meter, and kilowatt (KW) meter. Voltmeter and ammeter shall display all three phases. Meter scales shall be color coded in the following fashion: green shall indicate normal operating condition, amber shall indicate operation in ranges that indicate potential failure, and red shall indicate failure impending. Metering accuracy shall be within 1% at rated output. Both analog and digital metering are required.
 - c. The control system shall monitor the total load on the generator set, and maintain data logs of total operating hours at specific load levels ranging from 0 to 110% of rated load, in 10% increments. The control shall display hours of operation at less than 30% load and total hours of operation at more than 90% of rated load.
 - d. The control system shall log total number of operating hours, total kWh, and total control on hours, as well as total values since reset.
- D. Generator Set Alarm and Status Display. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. Functions indicated by the lamps shall include:
- 1. The control shall include five configurable alarm-indicating lamps. The lamps shall be field adjustable for any status, warning, or shutdown function monitored by the genset. They shall also be configurable for color, and control action (status, warning, or shutdown).
 - 2. The control shall include green lamps to indicate that the generator set is running at rated frequency and voltage, and that a remote start signal has been received at the generator set. The running signal shall be based on actual sensed voltage and frequency on the output terminals of the generator set.
 - 3. The control shall include a flashing red lamp to indicate that the control is not in automatic state, and red common shutdown lamp.
 - 4. The control shall include an amber common warning indication lamp.
 - 5. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. All conditions indicated below for warning shall be field-configurable for shutdown. Conditions required to be annunciated shall include:
 - a. low oil pressure (warning)
 - b. low oil pressure (shutdown)
 - c. oil pressure sender failure (warning)
 - d. low coolant temperature (warning)
 - e. high coolant temperature (warning)
 - f. high coolant temperature (shutdown)
 - g. high oil temperature (warning)
 - h. engine temperature sender failure (warning)
 - i. low coolant level (warning)
 - j. fail to crank (shutdown)
 - k. fail to start/overcrank (shutdown)
 - l. overspeed (shutdown)
 - m. low DC voltage (warning)

DANFORTH ON HIGH – PORTLAND, MAINE

- n. high DC voltage (warning)
 - o. weak battery (warning)
 - p. low fuel-daytank (warning)
 - q. high AC voltage (shutdown)
 - r. low AC voltage (shutdown)
 - s. under frequency (shutdown)
 - t. over current (warning)
 - u. over current (shutdown)
 - v. short circuit (shutdown)
 - w. over load (warning)
 - x. emergency stop (shutdown)
 - y. (4) configurable conditions
6. Provisions shall be made for indication of four customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above-specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.
- E. Engine Status Monitoring.
4. The following information shall be available from a digital status panel on the generator set control :
- a. engine oil pressure (psi or kPA)
 - b. engine coolant temperature (degrees F or C)
 - c. engine oil temperature (degrees F or C)
 - d. engine speed (rpm)
 - e. number of hours of operation (hours)
 - f. number of start attempts
 - g. battery voltage (DC volts)
5. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.
- L. Engine Control Functions.
4. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15-second rest period between cranking periods.
5. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.
6. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.

DANFORTH ON HIGH – PORTLAND, MAINE

7. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
 8. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.
- M. Alternator Control Functions:
1. The generator set shall include a full wave rectified automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase line to neutral RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristic shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.
 2. Controls shall be provided to monitor the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445. The protection for this function shall be 3rd party certified to very performance.
 3. Controls shall be provided to individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445. The protection for this function shall be 3rd party certified to very performance.
 4. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
 5. A line to neutral sensing AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown

DANFORTH ON HIGH – PORTLAND, MAINE

shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.

6. The generator set control shall include a 120VAC-control heater.

N. Control Interfaces for Remote Monitoring:

1. The control system shall provide four programmable output relays. These relay outputs shall be configurable for any alarm, shutdown, or status condition monitored by the control. The relays shall be configured to indicate: (1) generator set operating at rated voltage and frequency, (2) common warning, (3) common shutdown, (4) load shed command.
2. A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.
3. A fused 10 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.
4. The control shall be provided with a direct serial communication link for the LonWorks communication network interface as described elsewhere in this specification and shown on the drawings.

2.5 OTHER EQUIPMENT TO BE PROVIDED WITH THE GENERATOR SET

- A. The generator set shall be provided with two mounted main line circuit breakers, sized to carry the rated output current of the generator set. The circuit breakers shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided.

DANFORTH ON HIGH – PORTLAND, MAINE

- B. Outdoor Weather-Protective Sound Attenuated Enclosure
1. The generator set shall be provided with an outdoor enclosure, with the entire package listed under UL2200. The package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing. The total assembly of generator set, enclosure, and sub-base fuel tank (when used) shall be designed to be lifted into place using spreader bars. Housing shall provide ample airflow for generator set operation at rated load in an ambient temperature of 100F. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure.
 2. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a two step electro-coating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:
 - a. Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.
 - b. Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
 - c. Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
 - d. Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.
 - e. Salt Spray, per ASTM B117-90, 1000+ hours.
 - f. Humidity, per ASTM D2247-92, 1000+ hours.
 - g. Water Soak, per ASTM D2247-92, 1000+ hours.
 3. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.
 4. Enclosure shall be constructed of minimum 12 gauge steel for framework and 14 gauge steel panels. All hardware and hinges shall be stainless steel.
 5. A factory-mounted exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.
 6. The enclosure shall include the following maintenance provisions:
 - a. Flexible coolant and lubricating oil drain lines, that extend to the exterior of the enclosure, with internal drain valves
 - b. External radiator fill provision.

DANFORTH ON HIGH – PORTLAND, MAINE

7. Provide an external emergency stop switch that is protected from accidental actuation.
 - a. Inlet ducts shall include rain hoods.
8. The generator set shall be provided with a Level 2 sound-attenuated housing which allows the generator set to operate at full rated load in an ambient temperature of up to 100F. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 73 dBA at any location 7 meters from the generator set in a free field environment.
9. The enclosure shall be insulated with non-hydroscopic materials.

PART 3 – OPERATION

3.1 SEQUENCE OF OPERATION

- A. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control.
- B. The generator set shall complete a time delay start period as programmed into the control.
- C. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:
 1. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control system shall shut down and lock out the generator set, and indicate “fail to crank” shutdown.
 2. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate “fail to start”.
 3. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.
- D. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous, synchronize, load share, load demand, or load govern state.
- E. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.
- F. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.

DANFORTH ON HIGH – PORTLAND, MAINE

1. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

3.2 FACTORY TESTING

- A. The generator set supplier shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.
- B. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

3.3 INSTALLATION

- A. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- B. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- C. Equipment shall be installed on concrete pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
- D. Equipment shall be initially started and operated by representatives of the manufacturer.
- E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to final testing of the system.
- F. Provide a concrete foundation pad for the generator. Concrete pad shall conform to the detail for the transformer pad shown on Contract Drawing C-301.

3.4 ON-SITE ACCEPTANCE TEST

- A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the

DANFORTH ON HIGH – PORTLAND, MAINE

manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.

- B. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two hour full load test, and a one step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.
- C. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

3.5 TRAINING

- A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

3.6 SERVICE AND SUPPORT

- A. The manufacturer of the generator set shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.
- B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
- C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

3.7 WARRANTY

- A. The generator set and associated equipment shall be warranted for a period of not less than 5 years from the date of commissioning against defects in materials and workmanship.
- B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

END OF SECTION

SECTION 16950

LIGHTING CONTROL SYSTEM

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. This section of the specification includes the furnishing, installation, connection and testing of a complete lighting control system for both interior and exterior lighting. Provide all equipment required to form a complete, operative, and coordinated system as shown on the drawings and specified herein. Components of the Lighting Control System shall include, but are not limited to, the following:
 - 1. Lighting Time Switch.
 - 2. Occupancy Sensors.
 - 3. Exterior Photocell.

1.2 RELATED SECTIONS

- A. Section 16010 - Electrical General Requirements.
- B. Section 16123 – Building Wire and Cable.
- C. Section 16111 – Conduit.
- D. Section 16130 – Boxes.

1.3 QUALITY ASSURANCE

- A. All system materials shall be UL-listed for their intended duty.

1.4 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 1 and Section 16950.
- B. Shop Drawings and Product Data:
 - 1. Submit complete and at one time. Provide manufacturer's catalog information showing dimensions, colors, and configurations. Isolated items will not be considered for approval, except by prior authorization.
 - 2. A technical data sheet from the manufacturer should be included with the response for each product proposed. This data sheet shall include the physical specifications as well as the electrical characteristic.
 - 3. The following is required for approval, prior to fabrication and installation:
 - a. Catalog Data Sheets of all manufactured items, including manufacturer and model number.

DANFORTH ON HIGH – PORTLAND, MAINE

- b. Wiring diagrams indicating proposed connections of all equipment and indicating equipment types and model numbers.

1.5 TRAINING

- A. Provide sufficient training to personnel selected by the Owner on operation and basic maintenance of all systems and equipment.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Section 16950.
- B. Accurately record location of all equipment items.

1.7 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.
- C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.8 OPERATION AND MAINTENANCE DATA

- A. Submit data under provisions of Section 16950.
- B. Include operating instructions, maintenance and repair procedures.

PART 2 – MATERIALS

2.1 MANUFACTURERS

- A. Lighting systems equipment shown on the Drawings and specified herein is based on equipment as manufactured by *Hubbell Building Automation*.

2.2 NETWORK LIGHTING CONTROL PANEL (LC1)

- A. Network Data Line: The distributed intelligent lighting control network shall consist of intelligent lighting control devices consisting of but not limited to relays, touch tablet graphic user interfaces, controllers, enclosures, switch stations, photo sensors, occupancy sensors, and miscellaneous components linked together via a single data line that uses the Echelon/LonTalk™ protocol for communications.
- B. The distributed intelligent lighting control network shall facilitate data transmission between the distributed intelligent lighting control systems devices over a twisted pair of wires at 78K

DANFORTH ON HIGH – PORTLAND, MAINE

- baud. Network communication shall use the LonWorks communication protocol to transmit/receive and negotiate messaging between networked devices.
- C. Network wiring shall be unshielded, twisted pair data communication wire with insulation ratings as required by local codes. The network shall support free topology wiring allowing loop, star, bus or any mixed combination of connection topologies between devices.
 - D. Wiring distances shall be up to 1500 feet for free topology, 8000 feet for linear bus terminated topology.
 - E. Communication over the network shall allow any switch input from any device to be linked to any relay output or group of relay outputs in the lighting control system for complete, unrestricted control.
 - F. Network Technology: The distributed intelligent lighting control network shall consist of intelligent devices such as lighting control panels, switch stations, photo sensors and motion sensors that communicate with each other using the ANSI/EIA/CEA 709.1 protocol over one or more communications channels.
 - G. Peer-to-Peer (P2P): The distributed intelligent lighting control network shall consist of true peer-to-peer network. In order to eliminate the potential of a single point of failure there shall be no master controller or node required for system operation. All nodes shall be capable of communicating with each other without the need of these types of devices. Systems which utilize master controllers or master/slave networking concepts shall not be acceptable.
 - H. Network Topology: The lighting control system specified herein shall utilize a 2-wire topology free polarity insensitive powered network. Devices connected to the network shall be capable of doing so without regard for network topology or wiring polarity. Systems, which require the contractor to follow any kind of networking topology or to pay attention to the wiring polarity, are not acceptable.
 - I. Network Capacities: Up to 32,000 individual distributed intelligent (NODES) shall be capable of being connected together within a single network.
 - J. Programming: The distributed intelligent lighting control systems shall be capable of being programmed from any point or points anywhere on the system network. Systems that require a single point of system access are not acceptable. The lighting control network must remain completely functional during this process. Lighting control systems that must be taken "OFF LINE" for programming are not acceptable. All programming changes shall take effect immediately as they are programmed.
 - K. System Updates and Upgrades: All device installed upon the distributed intelligent lighting control system network shall be capable of having their programs updated and/or upgraded over the network systems which require hardware or memory chips to be replaced to perform upgrades are not acceptable. Software and firmware upgrades shall be made available free of charge for the life of the system.
 - L. Lighting Control Panels

DANFORTH ON HIGH – PORTLAND, MAINE

1. Where shown on the drawings, the Contractor shall furnish and install lighting control panels of the quantities, sizes, and types shown on the drawings and/or specified herein.
2. Lighting panels shall contain relays, and other devices of the sizes and quantities indicated on the drawings and specified herein.
3. Hardware Features:
 - a. Controller Backbox: Each lighting control panel shall be provided with a factory furnished, UL listed NEMA 1 enclosure designed for wall mounting. Backbox must be capable of being shipped ahead of controller chassis insert to allow for rough-in of all electrical connections prior to receipt of the controller chassis insert.
 - b. Controller Finish: Each lighting control panel shall be of welded construction primed and painted with a powder coat finish. Unpainted or galvanized enclosures are not acceptable.
 - c. Controller Chassis Insert: Each lighting control panel shall be provided with a factory or field installable controller chassis insert. Controller chassis insert shall contain all controller electronics, power supplies, relays, and other required components. Controller chassis inserts shall arrive at the project site completely pre-wired and requiring only the connection of lighting circuits and network cable. Systems that require field assembly of controllers or chassis inserts are not acceptable.
 - d. High-Voltage/Low-Voltage Separation: Each programmable lighting controller shall be provided with a mechanical barrier that separates all high-voltage components and wiring from all low-voltage components and wiring. An additional barrier shall be installed within the high-voltage section that shall provide isolation between normal and emergency circuits where required.
 - e. Controller Covers: Each programmable lighting controller shall be provided with a dead front screw-held hinged locking cover that is designed for either surface or flush mounting.
4. Electrical:
 - a. Controller Power Supply: Each programmable lighting controller shall be provided with a single triple-rated, UL listed Class 2 transformer capable of either being connected to 120/277 or 347 VAC primary (+ or -20% VAC, 50 to 60 Hz).
 - b. Connections: All connections shall be made to clearly and permanently labeled termination points.
5. Lighting Control Panel Electronics:
 - a. Controller Module: Each lighting panel shall be provided with a LonWorks controller module that shall provide for all of the lighting panels controller functions, these functions shall include but not be limited to real time clock, LonWorks network interface, scheduling, relay control, monitoring, status and diagnostic information.
 - b. I/O Controller: I/O (input/output) cards shall be provided to expand the controller capability from 8 to 48 relay outputs in groups of 8. I/O controller cards shall be completely self-configuring and shall not require settings of any kind in order to be configured for use within the lighting control panel.
 - c. Capacity: Each controller shall be capable of controlled 1 to 48 individual lighting control relays. Controllers shall be available in three sizes: 16, 32 and 48 relay outputs. Relay must be capable of being individually added to or removed from

- the lighting controller for the purpose of service or expansion of the controllers capabilities.
- d. Diagnostic Aids: Each lighting control panel shall be provided with a status LED to indicate current operational status. Each relay output shall have an LED pilot to indicate the current status of all controlled relay outputs.
 - e. Data Protection and Storage: All programmed data shall be stored in nonvolatile flash memory that shall protect all stored programming data from loss during a power outage for a minimum period of 20 years without power of any type.
 - f. Power Failure and Power-Up Options: Each lighting control panel shall be provided with circuitry that shall automatically shut down the controller whenever the incoming power fails. When power is returned to the controlled, one of the following power-up modes will be implemented (user selectable) for each controlled relay output in the system.
 - g. No Action: Upon restoration of incoming control power, the lighting control panel electronics shall be restarted and resume normal operations, and all circuits will be maintained in the condition they were last in.
 - h. Forced ON: Controller will force selected relay output(s) to the ON state after power-up.
 - i. Forced OFF: Controller will force selected relay output(s) to the OFF state after power-up.
6. Blink Alert: Each relay output within the lighting control panel shall be individually programmable to blink prior to being turned OFF. Blink alert times shall be adjustable between 1 and 15 minutes. Relays programmed for the blink alert function shall blink prior to turning OFF to warn occupancies of the upcoming OFF event. If an ON command is received during the blink alert time, relay output will be overridden and left ON for the override time. Override times shall be adjustable from 1 to 3 hours.
 7. Real-Time Clock: Each lighting control panel shall have its own Real-Time Clock, which shall be used to perform all time-controlled functions. Real-Time Clock functions shall include time of day, day of week, date and automatic daylight savings and leap year adjustments. Time clock shall be protected against loss of time during a power outage for a period of up to 60 days without power of any type. Systems, which utilize a single central time clock, are not acceptable.
 8. Astronomical Clock: Each lighting control panel shall contain an astronomical time clock that shall calculate sunrise and sunset times based on the geographical positioning information provided during the programming of the system. Sunrise and sunset times may be used as activation times for any system timer. In addition to sunrise and sunset time activation, the control shall be capable of programming activation time for the system time for before and after these times based on an offset of 1 to 999 minutes either before or after the calculated sunrise or sunset event.
 9. Time-of-Day Scheduling: Each programmable lighting control panel shall be provided with a minimum of 99 scheduled events for use in developing time-of-day automated schedules. Each schedule shall have the ability to turn any relay or group of relays ON or OFF or activate a preset lighting scene and the scheduled time. Schedules shall be day-of-week selectable and may be programmed to activate on any combination of days of the week (Sunday through Saturday), on all days, or to activate on a specific date only ("Holiday Schedule"). Each non-holiday scheduled event shall be capable of being programmed either to halt operation on holidays or to ignore holidays and continue normal operations on holidays.

DANFORTH ON HIGH – PORTLAND, MAINE

10. Manual Relay Overrides: Lighting control panel relays shall be provided with 2 means of manual override.
 11. Mechanical Manual Override: Each relay shall be provided with a manual override switch. It shall be possible to change the state of each relay without the need for the controller electronics or any other part of the system to be operational or powered. Lighting control panels that require power to be applied in order to change or maintain the state of relays are not acceptable.
 12. Push Button Override: In addition to but not in lieu of the mechanical manual override each relay output shall be supplied with an ON and OFF manual override push-button with LED pilot that shall allow the system user to view the current status and/or manually override any relay output to the ON or OFF state.
 13. True Relay Status Feedback: Each lighting control panel shall be provided with circuitry that shall monitor the actual current status of each relay.
 14. Staggered Relay Activation: Lighting control panels shall be designed to stagger relays ON and OFF to limit the impact of switching multiple lighting loads ON or OFF at the same time.
- M. 20 Amp Relays
1. Electrical Contractor shall provide and install quantities of mechanically latching lighting control relays as indicated on the drawings and schedules as specified herein. Electrically held or non-mechanically latching relays shall not be considered.
 2. Lighting control relays shall be individually UL and CUL listed and shall bear labels indicating compliance. Lighting control relays shall be tested to UL Standard 508 for both safety and endurance and bare labels signifying compliance.
 3. Lighting control relays shall be designed and tested to have a minimum cycle life of 30,000 ON/OFF cycles @ FULL LOAD switching into any and all loads that the relay is rated to control. Manufacturer shall provide test data certifying compliance to this section.
 4. Lighting control relays shall be specifically designed for control of 120, 277, or 347 VAC lighting loads including but not limited to incandescent, low-voltage, neon, cold cathode, LED, fluorescent and HID lighting sources at a full 20 AMPS and motor loads of 1/2 Hp @ 120 VAC or 1.5 Hp @ 277 VAC.
 5. Lighting control relays shall be designed with a mechanical latching mechanism that shall hold the relay in its last activated state indefinitely, with no change of state during an interruption of power.
 6. Lighting control relay shall contain an electrical means of monitoring the current status of the relay contacts electronically isolated, but mechanically linked to the main contacts for the purpose of true status monitoring and pilot light activation.
 7. Each lighting control relay shall include a mechanical means of turning the relay ON or OFF without the need for electrical power of any kind.
 8. Each lighting control relay shall include a mechanical visual indicator showing the current status of relay itself.
- N. Touch Tablet Graphic User Interface
1. The Electrical Contractor shall provide LX Touch Tablet Graphic User Interface(s) as shown on drawings and described herein.
 2. The LX Touch Tablet Graphic User Interface shall consist of a microprocessor-based lighting control station specifically designed for the control of lighting control systems.

DANFORTH ON HIGH – PORTLAND, MAINE

3. To provide for clarity of operation a high resolution graphic liquid crystal display with wide viewing angle and an electroluminescent backlight shall be used to display system information in both alphanumeric and graphical format.
 4. All programming shall be accomplished through the use of a graphical user interface.
 5. The LX Touch Tablet Graphic User Interface shall provide the system user access to the following system features:
 - a. Current status of any device on the systems network.
 - b. Time and date information and programming.
 - c. Astro-clock and daylight saving time adjustments.
 - d. Scheduling
 - e. Manual overrides.
 - f. System programming.
 - g. System diagnostics.
 6. All programming information stored in the LX Touch Tablet Graphic User Interface shall be stored in nonvolatile flash memory preventing loss of stored information in the event of a power failure up to 20 years.
 7. The LX Touch Tablet Graphic User Interface shall be capable of being to the lighting control system at any point on the network. One or multiple LX Touch Table Graphic User Interface shall be capable of being connected to the system at any time.
 8. The LX Touch Tablet Graphic User Interface shall contain no special programming causing it to become a required part of the lighting control system it is being utilized with. The lighting control system shall provide full-functionality with or without this device attached to the system.
- O. Lx Networked Switch Stations
1. The Electrical Contractor shall provide and install networked switch station of the types and quantities shown on the drawings and specified herein.
 2. Network switch stations shall be injection molded and designed to mount in a standard single-gang junction box with standard Decora switch plate opening.
 3. Networked switch stations shall be available in three colors: white, almond, and gray.
 4. Networked switch stations shall be 2-button standard configurations.
 5. Labeling and switch identification shall be accomplished through the use of hot-stamped labels, permanently attached to the switch face itself. Silk-screened or painted labeling shall not be acceptable.
 - a. Button 1: 'ON'
 - b. Button 2: 'OFF'
 6. Each networked switch station shall be provided with both pilot and non-pilot version of buttons, which can be selected by the Contractor at the time of installation or change at any time throughout the life of the system. Switch stations, which require switches to be ordered with, or without pilots and are not field-modifiable shall not be considered.
 7. Network switch stations shall connect to the self-powered topology free network via a single pair of wires. Network switch stations requiring more than two wires or requiring that the Installing Contractor install them with a stick topology or maintain correct polarity are unacceptable.
 8. Buttons on LX networked switch stations shall be programmed to perform the following functions:

DANFORTH ON HIGH – PORTLAND, MAINE

LIGHTING CONTROL PANEL RELAY SCHEDULE			
Lighting Control Panel	Relay Number	Lights Controlled	Ltg. Ckt. Numbers Controlled
LC1	1	Type S1 Lights	HP-1 #19
LC1	2	Type S2 Lights	HP-1 #21
LC1	3	Type S3 Lights	HP-1 #23
LC1	4	Parking Lot Lights	HP-1 #25
LC1	5	Type S4 Lights	HP-1 #27
LC1	6	Spare Relay	
LC1	7	Spare Relay	
LC1	8	Spare Relay	

2.3 OCCUPANCY SENSORS

- A. Occupancy sensors to control lighting shall be as follows:
 - 1. Type 1 Sensors: *Hubbell* Model LODT, or approved equal. Wall mounted, dual-technology, passive infrared and ultrasonic motion sensor with coverage pattern extending up to 40 feet. Sensor shall have time delay adjustment from 8 to 30 minutes and shall be provided with wall mounting bracket.
 - 2. Type 2 Sensors: *Hubbell* Model OMNIDT2000, or approved equal. Ceiling mounted, dual-technology, passive infrared and ultrasonic motion sensor with coverage pattern extending up to 64 feet. Sensor shall have time delay adjustment from 8 to 30 minutes.
 - 3. Type 3 Sensors: *Hubbell* Model OMN11R, or approved equal. Ceiling mounted, passive infrared motion sensor with 360 degree coverage pattern extending up to 22 feet. Sensor shall have time delay adjustment from 8 to 30 minutes.
 - 4. Type 4 Sensors: *Hubbell* Model PIR1000H, or approved equal. Ceiling mounted, passive infrared motion sensor with 16' BY 80' coverage. Sensor shall have time delay adjustment from 30 seconds to 30 minutes.
- B. Occupancy sensor power packs shall be *Hubbell* model UVPP.
 - 1. Power packs shall include an integral transformer and relay designed for switching 20-ampere loads. Power packs shall be capable of being installed within a standard 4-inch square electrical box.
 - a. Input Voltage: 100-277VAC
 - b. Output Rating: 24VDC, 150 mA

PART 3 – EXECUTION

3.1 GENERAL

- A. Do not install equipment and materials that have not been reviewed by the Architect-Engineer. Equipment and materials that are installed without the Architect-Engineer's review or without complying to comments issued with the review shall be removed from the project when so instructed by the Architect-Engineer. No payment will be made for unapproved or

DANFORTH ON HIGH – PORTLAND, MAINE

removal if it is ordered removed. The Installer shall be responsible for any ancillary costs incurred because of its removal and the installation of the correct equipment and materials.

- B. Obtain detailed information on installation requirements from the manufacturers of all equipment to be furnished, installed or provided. At the start of construction check all Contract Documents, including all Drawings and all Sections of the specifications for equipment requiring electrical connections and service and verify electrical characteristics of equipment prior to roughing.
- C. Equipment and systems shall not be installed without first coordinating the location and installation of equipment and systems with the General Contractor and all other Trades.
- D. Any and all material installed or work performed in violation of above requirements shall be re-adjusted and corrected by the Installer without charge.
- E. Refer to all Drawings associated with the project, prior to the installation or roughing-in of the electrical boxes, conduit and equipment, to determine the exact location of all outlets.
- F. After installation, equipment shall be protected to prevent damage during the construction period. Openings in conduits and boxes shall be closed to prevent the entrance of foreign materials.
- G. Install all systems in strict accordance with the manufacturer's instructions.

3.2 WORK

- A. Any ceilings, walls, floors, furniture, equipment, furnishings, etc., damaged by the work of this Section shall be replaced, or at the Owner's option, repaired with similar materials, workmanship and quality.
- B. Work includes field survey of existing conditions, systems, equipment and tracing of existing circuits in order to determine scope of work.
- C. Clean and touch up all equipment, materials and work sites at the completion of work in each area.

3.3 TERMINATIONS

- A. All conductors of every cable shall be completely terminated at both ends.

3.4 SYSTEM INSTALLATION

- A. Provide occupancy sensors as follows:
 - 1. Type 1 Sensors:
 - a. Storage 32
 - b. Storage 33
 - c. Laundry 31
 - d. Corridor 30

DANFORTH ON HIGH – PORTLAND, MAINE

2. Type 2 Sensors:
 - a. Toilet 13
 - b. Toilet 14
 - c. Community Room 21
 - d. Library 23
 - e. Laundry 24
 - f. Gym 27
3. Type 3 Sensors:
 - a. All areas indicated with occupancy sensors not listed in paragraphs 3.4.A.1, 3.4.A.2, or 3.4.A.4.
4. Type 4 Sensors:
 - a. Corridors

B. Provide all equipment and cabling for a complete installed operating system.

C. All cables shall be installed in a neat and workman-like manner. Cables shall be installed parallel and perpendicular to building elements. Cables to be installed in exposed finished areas shall be installed in conduit. All other cables shall be concealed in partitions or above ceilings.

3.5 SYSTEM TESTING

A. Upon completion of the lighting control system, all components shall be tested to confirm their operation according to specification requirements and manufacturer's instructions.

3.6 CLEANING UP

- A. Upon completion of all work, and testing, thoroughly inspect all exposed portions of the installation and completely remove all exposed labels, markings, and foreign material.
- B. The interior of all boxes and cabinets shall be left clean; exposed surfaces shall be cleaned and plated surfaces polished.
- C. Repair damage to finish surfaces resulting from work under this Section.
- D. Remove material and equipment from areas of work and storage areas.
- E. All equipment shall be clean from dirt, dust, and fingerprints prior to final acceptance.

END OF SECTION